# UNITED STATES AIR FORCE

# JOINT BASE ELMENDORF-RICHARDSON, ALASKA

## *ENVIRONMENTAL RESTORATION PROGRAM*

## 2016 REMEDIAL ACTION LONG-TERM MANAGEMENT REPORT

## XU022 – EAGLE RIVER FLATS, OPERABLE UNIT C

**FINAL**

**AUGUST 2017**

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# 2016
# Remedial Action Long-Term Management Report

**Final**

## XU022 – Eagle River Flats, Operable Unit C
## Joint Base Elmendorf-Richardson, Alaska

**Prepared for:**

**673d Civil Engineer Squadron, Asset Management Flight,**
**Environmental Restoration Section**
**and**
**Air Force Civil Engineer Center**

**August 2017**

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# EXECUTIVE SUMMARY

XU022 – Eagle River Flats (ERF) (State of Alaska Contaminated Sites Database Hazard Identification Number 431) is located on Joint Base Elmendorf-Richardson (JBER)-Richardson (JBER-R), the former Fort Richardson Army Post. XU022 is located within a 2,160-acre estuarine salt marsh at the mouth of the Eagle River in the northwestern portion of JBER-R. Directly adjacent to XU022 to the southeast is XE023, the former Open Burning/Open Detonation (OB/OD) Pad. Together, these two sites make up Operable Unit C (OUC). XU022 is located within an active range that has been used for artillery and munitions training since the early 1940s, which has created craters in the wetlands and associated mud flats. Unusually high mortality of dabbling ducks was attributed to white phosphorus (WP) deposited in sediments during range firing activities. When WP is deposited within saturated sediment, it can persist as particles that can be ingested by dabbling ducks during feeding. When exposed to air (as it would be on a "dry" range), WP oxidizes and sublimates, thereby neutralizing the threat to dabbling duck receptors. In 1990, the firing of smoke munitions containing WP into XU022 was banned. Remedial actions have been largely successful and have reduced the percent mortality attributable to WP to below the long-term remedial action objective (RAO) in the *Record of Decision for Operable Unit C, Fort Richardson, Anchorage, Alaska* (OUC ROD) of less than 1 percent of the total migratory population of dabbling ducks.

This remedial action monitoring report presents the results of 2016 monitoring activities conducted in support of ongoing long-term management (LTM) of XU022. All work was conducted according to the United States Air Force 2016 *Uniform Federal Quality Assurance Program Plan (UFP-QAPP), Remedial Action Monitoring, XU022-Eagle River Flats, Joint Base Elmendorf-Richardson, Alaska* (UFP-QAPP).

## Site-Specific Background

XU022 is surrounded by forested uplands on the west, south, and east, and is bounded by the Knik Arm on the north. The Eagle River flows through XU022 from southeast to northwest, ultimately discharging into Knik Arm. Clunie and Otter Creeks also drain into XU022. Because of its wetlands and small, open water pond areas, XU022 serves as an important staging ground for waterfowl during spring and fall migrations. In addition, XU022 supports local populations of fish, birds, mammals, and macro-invertebrates (primarily insects, snails, and crustaceans), as well as a population of wood frogs. Detailed location information is provided in Table ES-1.

Under the Comprehensive Environmental Response, Compensation, and Liability Act, RAOs were established in the OUC ROD, and a remedy was selected. The OUC ROD, signed in 1998, established the following short- and long-term RAOs for XU022:

1. The short-term objective was to reduce the dabbling duck mortality rate attributable to WP to 50 percent of the 1996 mortality rate (achieved).

2. The long-term objective was to reduce the dabbling duck mortality rate attributable to WP to less than 1 percent of the total annual fall population of dabbling ducks within 20 years of the ROD signing (achieved starting in 2006, 8 years after the ROD was signed).

Major components of the remedy include draining ponds with pumps to treat WP in sediment, minimizing disturbance to wetlands habitat, capping areas that do not dry sufficiently to oxidize the WP, and maintaining land use controls (LUCs). Pumps were used to dry out pond areas where the water level naturally remained above the bottom sediments. Areas of WP contamination that were too deep to expose the bottom sediments through pump and drain treatments were capped with cobble to prevent dabbling ducks from accessing these sediments. Remedial actions have been largely successful, as indicated by the achievement of both the short- and long-term RAOs. The LTM monitoring schedule was established by the ROD, and was later modified based on the accelerated achievement of long-term goals and additional minor changes that had been approved during annual fieldwork planning. These changes to the schedule are documented in the 2011 *Memorandum to the Site File for Operable Unit C – Eagle River Flats Impact Area Joint Base Elmendorf-Richardson* (2011 Memo to Site File).

Approximately 2,097 square meters of sediment were capped (approximately 0.5 acre) because these areas were not effectively dewatered to treat/reduce WP concentrations. LUCs are also in place restricting site access, construction, and road maintenance, as well as requiring training for personnel who work at source areas. These controls will remain in place as long as site conditions do not allow for unlimited use/unrestricted exposure. Ongoing LTM for XU022 to evaluate the continued effectiveness of the remedy is being conducted in accordance with the revised monitoring schedule in the 2011 Memo to Site File.

**Table ES-1: XU022 Location Information**

| Latitude (NAD 83) | Longitude (NAD 83) | Date of Collection | Method of Collection | Reference Point for Which the Coordinates Were Established | Scale of Map Used to Acquire Coordinates | Estimated Accuracy and Associated Unit of Measure |
|---|---|---|---|---|---|---|
| 61.316555 | -149.716243 | 02/28/13 | Esri ArcGIS conversion tool "Feature to Point" to select centroid of polygon site boundary on file. | Center of Site Boundary | Not applicable | Not applicable |

Note:

Survey data were provided in the Alaska State Plane coordinate system, Zone 4. Horizontal data are referenced to the North American Datum 1983 (NAD 83, Latest Adjustment). The unit of measure for NAD83, Alaska State Plane, Zone 4 is U.S. Survey Feet.

## 2016 Remedial Action Monitoring Results

### Sediment Sampling

Historical studies indicate that sediment containing a WP concentration of approximately 1 microgram per gram (µg/g) or greater has the potential to have WP grains capable of killing dabbling ducks if ingested. Previous research has shown that WP contamination at XU022 above 1 µg/g is mainly distributed in relatively small hot spots (localized areas) averaging approximately 2 meters in diameter that were created by detonation of WP ordnance. Because of their small size, detection of these hot spots requires intensive sampling such as multi-increment sampling methods.

2016 sediment sampling included 14 multi-increment grid samples from seven decision units to examine remediated ponds for potential rebound in WP concentrations, and 44 multi-increment systematic random samples collected from cap perimeters to evaluate whether areas of identified WP contamination were effectively covered to prevent access by dabbling ducks.

Results of all sample analysis were nondetect, with the exception of one sample from the perimeter of cap 04DIS97, which had a concentration of 0.0017 µg/g.

Multi-increment samples were compared to a project-specific "trigger" concentration of 0.01 µg/g as stated in the UFP-QAPP. Because studies have indicated that sediments with concentrations of 1 µg/g can cause mortality in dabbling ducks when ingested, composite sediment sample results with concentrations of 0.01 µg/g or greater are considered to have the potential to indicate the presence of areas of sediments with concentrations of 1 µg/g or greater. All 2016 sediment sample results were below the trigger concentration.

**Mortality Monitoring**

Mortality studies are conducted using ground-based transects and aerial surveys. The ground-based transect surveys identify waterfowl (specifically dabbling duck) mortalities in areas where WP contamination had historically been present, and the aerial surveys estimate the numbers and types of waterfowl feeding in XU022. Together, these numbers are used to calculate the mortality rate.

In 2016, mortality monitoring was conducted from September 1 through October 13. During this time, 11 dabbling duck mortalities were recorded, and the total estimated population of dabbling ducks was 1,535. The calculated mortality rate for dabbling ducks was 0.7 percent of the population for 2016.

**Institutional Controls and Other Site Restrictions**

According to the ROD, institutional controls (ICs) at XU022 include restricting site access, construction, and road maintenance as well as requiring specific training (on unexploded ordnance, range procedures, and WP) to work in the area. JBER Environmental maintains a Geographic Information System database with information on all of the contaminated sites onbase. ICs will remain in place as long as hazardous substances remain onsite at levels that preclude unrestricted use. These restrictions are enforced by JBER Environmental and Range Control. Site access is controlled by a locked gate. The LUC inspection in 2016 noted that the locked gate was continuing to prevent unauthorized access, the main access road was in good condition (and vegetation control measures were being applied), and no evidence of unauthorized access was observed near the gate or elsewhere.

In addition to the ICs included in the ROD, firing is restricted to winter months, when ice protects caps and potential buried munitions from being exposed by the impact of ordnance. During field activities, no new impact craters were observed.

## Conclusions

This section describes the status of progress toward the achievement of the RAOs based on reduction of dabbling duck mortality (as a percentage of the total population of dabbling ducks), and also discusses the remedial success relative to the reduction in areas with contaminated sediment.

**Status toward Achievement of RAOs**

The mortality rate of dabbling ducks at XU022 indicates that both RAOs have been achieved. Refinement of the mortality model in 2005 reduced the calculated 1996 number of mortalities from 1,000 to 655 ducks. Therefore, to meet the short-term RAO, the allowable number of duck deaths attributable to WP needed to be less than 327 by 2003. (Although the long-term RAO accounted for possibly adjusting the number of ducks based on actual population data to determine whether the percentage was met, the short-term RAO did not.) Recorded duck mortalities since 1999 have been less than this target number (between 11 and 203). Based on the mortality data, the short-term RAO was met in 1999.

The calculated mortality rate has been below 1 percent since 2006, meeting the long-term RAO within 8 years rather than 20 years as allowed by the RAO. The upper bound of the conservative estimated range also was below 1 percent in 2008, 2010, and 2011. Overall, dabbling duck mortality resulting from WP poisoning has decreased significantly in ERF since remedial activities began.

To ensure the continued success of the remedial actions at XU022, monitoring will be conducted on a limited basis in the future. The 2011 Memo to Site file states that after 2012, monitoring will be conducted during years preceding 5-year reviews. The 2016 event was conducted in preparation for the 5-year review that is scheduled for February 2018. Mortality monitoring will next be conducted in 2021 in preparation for the February 2023 5-year review.

**White Phosphorus-Contaminated Sediment**

Although reduction or elimination of WP-contaminated sediments with concentrations above any specific level is not a specific RAO for this project, the increase of areas considered successfully remediated (where accessible sediment no longer has concentrations of WP capable of causing mortalities in dabbling ducks) is a positive measure of the success of the response actions.

The 1998 ROD identified 57 acres of pond areas as contaminated or potentially contaminated at ERF. Monitoring activities performed since 1999 have indicated that some areas previously thought to be contaminated were not, whereas other areas thought to be uncontaminated were contaminated. The current revised estimate of the total area that had been contaminated by WP (before treatment) is approximately 47 acres. Pumping and draining remediation activities have successfully treated most of the contaminated area. Smaller hot spots with WP concentrations above the target of 1 µg/g in areas that could not be drained or pumped dry consisted of approximately 0.5 acre; these areas were remediated through capping. In 2013, four caps were expanded as a result of sediment sampling results in 2011 and 2012 that indicated the sediment around the cap perimeters potentially contained WP concentrations capable of causing dabbling duck mortalities. Based on the results of the 2016 monitoring, which had no detections of WP for samples collected around the perimeter of the expanded and augmented caps, the areas that had been targeted during the 2013 capping operations have been successfully covered. Although WP was detected in one cap perimeter sample, the concentration was not indicative that contaminated sediment capable of causing dabbling duck mortalities is present.

## Institutional Controls and Other Site Restrictions

Based on field observations, the current ICs and other site restrictions are continuing to prevent unauthorized access and unnecessary damage to the wetland habitat. During monitoring activities, field personnel did not observe any activities or impacts indicating that the existing ICs (specifically, access control measures) are not effective. The site access gates remained locked, and there were no signs of attempted access at any other locations.

In addition, no signs of new impact craters were observed during the monitoring period from September 1 through final demobilization activities on October 18, 2016. This indicates that restrictions on firing within the range also continue to be effective.

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# LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| µg/g | microgram(s) per gram |
| ABR Inc. | ABR Inc. Environmental and Research Services |
| ADEEB | Alaska District Environmental Engineering Branch |
| Army | United States Army |
| Bering Sea | Bering Sea Eccotech |
| BIP | blow-in-place |
| BT | bread truck |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| cm | centimeter(s) |
| CRREL | Cold Regions Research and Engineering Laboratory |
| EB | equipment blank |
| ERDC | Engineer Research and Development Center |
| ERF | Eagle River Flats |
| FD | field duplicate |
| GIS | geographic information system |
| GPS | global positioning system |
| IC | institutional control |
| ID | identification |
| JBER | Joint Base Elmendorf-Richardson |
| JBER-R | JBER-Richardson |
| km | kilometer(s) |
| LTM | long-term management |
| LUC | land use control |
| m | meter(s) |
| $m^2$ | square meter(s) |
| mL | milliliter(s) |
| mm | millimeter(s) |
| NA | not analyzed |
| NAD | North American Datum |
| ND | nondetect |
| NWRC | National Wildlife Research Center |

| | |
|---|---|
| OB/OD | open burning/open detonation |
| OUC | Operable Unit C |
| | |
| RA | remedial action |
| RAO | remedial action objective |
| ROD | record of decision |
| | |
| UFP-QAPP | Uniform Federal Quality Assurance Program Plan |
| USACE | U.S. Army Corps of Engineers |
| USAF | United States Air Force |
| USDA | United States Department of Agriculture |
| UXO | unexploded ordnance |
| UTM | Universal Transverse Mercator |
| | |
| WP | white phosphorus |

# 1.0 INTRODUCTION

XU022 – Eagle River Flats (ERF) (State of Alaska Contaminated Sites Database Hazard Identification Number 431) is located within a 2,160-acre estuarine salt marsh at the mouth of the Eagle River in the northwestern portion of Joint Base Elmendorf-Richardson (JBER)-Richardson (JBER-R) (Figure 1-1). Directly adjacent to XU022 to the east is XE023, the Open Burning/Open Detonation (OB/OD) Pad. Together, these two sites make up Operable Unit C (OUC). XU022 is located within an active range that has been used for artillery and munitions training since the early 1940s, which has created craters in the wetlands and associated mud flats. Unusually high mortality of dabbling ducks was attributed to white phosphorus (WP) deposited in sediments during range firing activities. In 1990, the firing of smoke munitions containing WP into XU022 was banned (United States Army Corps of Engineers [USACE] Alaska District Environmental Engineering Branch [ADEEB], 2012).

XU022 continues to be used for live-fire training exercises, including operations that were conducted in April 2015 and January 2016. To ensure that range operations support the continued protection of waterfowl, these operations were conducted according to the 2005 *Record of Environmental Consideration (REC): Modification of Munitions Firing at Eagle River Flats Impact Area, Fort Richardson, Alaska* (United States Army [Army], 2005). This document outlines general time frames for conducting training at ERF based on the waterfowl migratory patterns, and defines the recommended ice thickness based on specific round types. A description of the procedure for measuring ice thickness is provided in the *Standard Operating Procedure (SOP) for Measuring Ice Thickness at Eagle River Flats (ERF) Impact Area to Determine Adequacy for Firing Point-Detonated Mortars and Artillery, Fort Richardson, Alaska (FRA)* (Army, 2013).

XU022 is surrounded by forested uplands on the west, south, and east, and by the Knik Arm on the north. The Eagle River flows through the ERF from southeast to northwest, ultimately discharging into Knik Arm. Two creeks (Clunie and Otter) also drain into XU022. Because of its wetlands and small, open water ponds, XU022 serves as an important staging ground for waterfowl (e.g., northern pintails, mallards, green-winged teal, and tundra and trumpeter swans) during spring and fall migrations. In addition, XU022 supports local populations of fish, birds, mammals, and macro-invertebrates (primarily insects, snails, and crustaceans), as well as a population of wood frogs (USACE ADEEB, 2003).

The ponds used by dabbling ducks are relatively permanent, vary in depth from 5 to 50 centimeters (cm), and do not dry out even during low tide cycles. The ponds occur within an area known as the inner sedge marsh, which is dominated by emergent sedge and bulrush species that form the border of, as well as islands within, the ponds. Historically, mortalities resulting from WP poisoning have primarily been detected in Areas A, C, C/D, and D, and at Racine Island (Figure 1-2). The ponds on the shallower ends of the range are feeding grounds for the smaller ducks, while the deeper ponds are used by swans (Racine et al., 1992).

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# 2.0 RECORD OF DECISION REQUIREMENTS

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the 1998 OUC Record of Decision (ROD) established two remedial action objectives (RAOs) related to short- and long-term dabbling duck mortality reduction (CH2M HILL, 1998). To support these objectives, remedial action (RA) treatment options designed to expose pond sediments (allowing oxidation and sublimation of the WP), as well as to prevent access to WP in areas that could not be drained, were outlined; and procedures for long-term monitoring of dabbling duck mortality and habitat impacts were indicated. In addition, site access and use by Army, United States Air Force (USAF), and civilian personnel is restricted by institutional controls (ICs) to reduce the potential for human exposure and to prevent damage to previously capped areas.

## 2.1 Remedial Action Objectives

The RAOs for the RA at OUC are presented as follows:

- **Short-term RAO:** Within 5 years of the ROD being signed (in 1998), reduce the dabbling duck mortality rate attributable to WP to 50 percent of the 1996 mortality rate attributable to WP (achieved in 1999). Based on radio telemetry data at the time, the number of allowable duck deaths from WP was estimated to be approximately 500 (the short-term RAO did not specify that adjustments for total population would be incorporated.)

- **Long-term RAO:** Within 20 years of the ROD being signed, reduce the mortality rate attributable to WP to no more than 1 percent of the total annual fall population of dabbling ducks at XU022 (achieved starting in 2006, 8 years after the ROD was signed).

These reductions in mortalities were expected to occur as a result of reducing the area of contaminated media accessible to dabbling ducks. As that area decreased, a corresponding reduction in mortalities was expected to occur. There has been a consistent downward trend in mortality since 2000, which is a strong indication of the success of the selected remedy, as well as the strength and reliability of the data.

## 2.2 Selected Remedy and Remedial Design Summary

The remedy at XU022 includes multiple components, as summarized in Table 2-1. The remedy consists of RAs such as pond pumping/draining and capping/filling operations; long-term monitoring of dabbling duck mortality rates, habitat changes, and WP concentrations in sediment; ICs; and restrictions on invasive activities within XU022.

The ROD provided an initial schedule for performing actions described in the remedy components (CH2M HILL, 1998). Per agreement of the restoration project managers reached during a quarterly federal facility meeting in January 2008, this schedule was modified in 2011 based on the accelerated achievement of the long-term (20-year) mortality objective. The modified schedule through 2018 was presented in a table in the *Operable Unit C – Eagle River Flats Impact Area Joint Base Elmendorf-Richardson, Memorandum to the Site File* (2011 Memo to Site File) (USAF, 2011). The modified schedule is presented in Table 2-2, and the complete 2011 Memo to Site File is included in Appendix A of this report. The individual components of the RAs are discussed further in subsequent sections. The work described in this report was conducted in accordance with the schedule as outlined in Table 2-2 and in accordance with the *Uniform Federal Quality Assurance Program Plan (UFP-QAPP), Remedial Action Monitoring, XU022-Eagle River Flats, Joint Base Elmendorf-Richardson, Alaska* (UFP-QAPP) (USAF, 2016).

### 2.2.1 Remedial Actions

Because WP does not sublimate and oxidize when wet or submerged, wetland conditions at XU022 are conducive to retention of WP in the sediments. Therefore, a major component of the selected remedy was draining the ponds sufficiently to allow the sediments to dry, thereby facilitating sublimation and oxidation of the WP. The selected remedy incorporated pumping to drain the ponds, followed by capping and filling for areas that had not dried sufficiently. Draining of the ponds and drying the WP-contaminated sediments to the maximum extent practicable was the preferred component of the RA before application of cap and fill material. RAs involving pumping and draining areas to dry sediment occurred from 1999 through 2007. Capping and filling operations have taken place in 2007, 2008, 2009, 2011, and 2013. The success of targeted remediation efforts is evaluated with sediment sampling. Additional information on the history of remedy component implementation is included in Table 2-1. Table 2-3 lists the ponds (by number) according to their current status (remediated or never contaminated), and Table 2-4 provides information on cap locations and surface areas. Pond locations are shown on Figure 1-2; cap locations are shown on Figure 2-1.

### 2.2.2 Long-Term Management

Long-term management (LTM) including monitoring is conducted to determine dabbling duck populations, habitat usage and changes, and mortality rates. Monitoring results are used to document negative habitat changes (impacts) resulting from RAs (pond pumping and channel construction) and habitat recovery after pumping efforts are discontinued. Thus, these results are used to document success of RAs in reducing/eliminating areas of WP contamination (Table 2-1). The goals of long-term monitoring as written in the ROD are as follows (CH2M HILL, 1998):

1. Verify that an exposure pathway does not exist between waterfowl (dabbling ducks) and WP-contaminated sediment.

2. Determine the number of waterfowl using ERF.

3. Determine the number of waterfowl (dabbling ducks) dying as a result of feeding in WP-contaminated sediment.

4. Determine whether RA is effective or needs modification.

Implementation and evaluation of the first and fourth goals involve analysis of sediments to (1) locate areas of contamination, and (2) confirm the success of the remediation (i.e., pumping or capping).

The second goal is accomplished using aerial census surveys. These surveys have been conducted concurrently with telemetry studies (used through 2002) or ground-based mortality surveys (2004 through the present) (USAF, 2012). The combination of the mortality and total population data, along with laboratory analysis of gizzard contents for WP, is used to accomplish the third goal.

Additionally, a fifth (secondary) goal of monitoring is outlined in the components of the remedy. This involves minimizing and monitoring the impact of the RA on the natural salt marsh habitat. Minimization strategies include restricting the area used for performing ground-based actions such as remediation and surveys. Monitoring the impacts of remediation has been conducted using aerial and ground-based photography to provide a means of comparing historical and present conditions of the marsh vegetation overall and at specific study plots.

### 2.2.3 Institutional Controls and Other Site Restrictions

According to the ROD, ICs at XU022 include restricting site access, construction, and road maintenance as well as requiring specific training (on unexploded ordnance, range procedures, and WP) to work in the area. JBER Environmental maintains a Geographic Information System database with information on all of the ICs for contaminated sites onbase. These controls will remain in place as long as hazardous substances remain onsite at levels that preclude unrestricted use.

In addition to the ICs included in the ROD, firing is restricted to winter months, when ice protects caps and potential buried munitions from being exposed by the impact of ordnance. During field activities, no new impact craters were observed.

Additional information on the major components of the selected remedy, including specific objectives, historic occurrence, and other details, is included in Table 2-1.

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## Table 2-1: Components of the Selected Remedy

| Component | Description | Objective | Duration/History | Additional Notes |
|---|---|---|---|---|
| Remedial Action – Pond Pumping/Draining | Use of pumps to drain water from ponds in selected areas allowing for drying of sediments | Enable the sublimation and oxidation of WP | 1999-2003: Six pump systems installed throughout the wetland – about 90 percent of area remediated during this time frame<br>2004-2007: Limited pumping using one or two systems in Area C to address remaining WP<br>2008-2012: One pump system deployed to facilitate sampling and provide safer working environment<br>2016: No pumps used | During active remediation (1999-2003), pumps were operated May through September each year.<br>Elevation of pumps was optimized by conducting pond elevation surveys.<br>Float-mounted pumping systems used automated start/stop water table elevations.<br>Explosives were used to create sumps and shallow drainage channels to enhance hydraulic connectivity between ponds. |
| Remedial Action – Cap and Fill Operations | Application of geotextile membrane and cobble in WP-contaminated ponds that could not be drained | Provide a barrier between the WP-contaminated sediment and dabbling ducks | Placed after RAOs achieved and active pumping efforts discontinued<br>Cap and fill material to be monitored for 4 years following placement to verify cap integrity<br>2007: Test cap (geotextile and gravel) installed at Pond 23<br>2008: Twenty-two gravel caps installed<br>2009: Eight new caps installed; six existing caps expanded<br>2011: Three new caps installed; three existing caps expanded; three temporary caps installed<br>2013: Three temporary caps augmented; three existing caps expanded<br>2016: No new cap or cap expansion locations identified | |
| Long-Term Monitoring – Waterfowl/Dabbling Duck Mortality | Telemetry, aerial surveys, and ground-based surveys | Determine waterfowl populations, habitat usage and changes, and mortality rates | Aerial surveys performed annually since 1999<br>Telemetry (ROD scheduled for first 5 years):<br>• Performed in 1999, 2001, and 2002 concurrent to pumping activities<br>• Not conducted in 2000 and 2003 as a result of reduced helicopter and pilot availability<br>• Ceased in 2004 and replaced with ground-based surveys<br>Ground-based dabbling duck mortality surveys: 2004-2016 (varying frequency) | Ground-based dabbling duck surveys replaced telemetry in 2004 as a less costly option of determining mortality rates. |
| Long-Term Monitoring – Habitat | Aerial photography (natural and infrared), ground-based photos of established vegetation plots, and habitat mapping | Document habitat changes (impacts) resulting from RAs (pond pumping and channel construction) and habitat rebound after pumping efforts are discontinued | Vertical false color infrared aerial photography (scale of 1”=600’)<br>Aerial photography conducted in 1991, 1993, 1994, 1995, 1998, 2001, 2002, 2003, 2006, 2008, 2009, 2010, and 2012<br>Ground-based vegetation plot photography: 1992, 1999, 2004, and 2012<br>Habitat mapping using aerial photography and vegetation plot photography was scheduled to be conducted every 4 years for 20 years; however, prior to the evaluation of 2012 data, the last habitat mapping effort occurred in 1999. Based on the 2011 Memo to Site File (USAF, 2011), 2012 was the last year habitat mapping was to occur unless major changes to land use or habitat occurs. No major changes have been identified since 2012. | Changes in drainage, topography, and vegetation evaluated. |
| Long-Term Monitoring – WP in Sediment | Baseline and follow-up sediment sampling, including discrete and multi-incremental sampling strategies; sediment dataloggers also used to monitor sediment moisture and temperature | Document success of RAs in reducing/eliminating areas of WP contamination | Sediment sampling for WP has occurred annually from 1999–2012. This includes targeting new areas if an area of suspected contamination can be identified, and follow-up sampling in remediated (drained or capped) areas to determine whether remediation has been successful.<br>Starting in 1999 and continuing through 2011, dataloggers recorded moisture and temperature of sediments during active pumping remediation to help determine the effectiveness of pump operations. | Discrete sampling is used to target specific locations, while multi-incremental sampling is used to examine larger areas such as ponds (or sections of ponds) or the perimeter of a capped area.<br>Study strategies have also included planting known quantities of WP at specific locations and repeatedly sampling those locations on an annual basis to observe the effects of remediation. |
| ICs | Limiting or preventing access to contaminated areas or closing exposure pathways | Protect human health, safety, and the environment | Restrictions to remain in place as long as hazardous substances remain onsite at levels that preclude unrestricted use. | Restrictions apply to site access, construction, and road maintenance.<br>All personnel working at OUC must complete required training, including receiving briefings from Range Control and Explosive Ordnance Disposal personnel, as well as becoming familiar with the route from OUC to the Base hospital. |
| Protective Measures | Restrictions on invasive activities within ERF | Minimize disturbances to wildlife and wetland habitat | Ongoing (1999–2016) | Remedial activities in prime waterfowl habitat (Areas B and D) are restricted.<br>Foot traffic is restricted to shortest/narrowest walking corridors feasible.<br>Equipment/structures are properly maintained for maximum efficiency and minimal waste/ spills.<br>There is minimal use of equipment and explosives.<br>There is a limited staging area footprint.<br>Impacts to wetland and waterfowl at ERF are monitored.<br>Agency-approved work plans (UFP-QAPPs) are used |

## Table 2-1: Components of the Selected Remedy

| Component | Description | Objective | Duration/History | Additional Notes |
|---|---|---|---|---|
| Record Keeping | GIS Database and General Reporting | Collect and maintain results of all XU022 data in a single, comprehensive database<br>Coordinate with agencies and stakeholders | 1994: Database established<br>Database updated regularly as additional data are collected<br>Work plans (UFP-QAPPs) composed for each field season, adapted as conditions change, and reviewed by agencies and stakeholders<br>Activities and results reported annually and reviewed by agencies and stakeholders | Data include the following:<br>• WP sampling results<br>• Telemetry survey data<br>• Aerial survey data<br>• Dabbling duck mortality data<br>• Habitat and physical landform data |
| Waterfowl Hazing | Activities to purposely scare away waterfowl | Deter waterfowl (especially dabbling ducks) from feeding in contaminated areas | ROD designated “contingency” action if remedial action activities were not enough to deter bird usage of contaminated area. Such measures were not used because RA activities proved sufficient for deterring waterfowl usage. | |

Note:

GIS = Geographic Information System

## Table 2-2: Modified Remedial Action Schedule from 2011 Memo to Site File

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| **Monitoring** | | | | | | | |
| M1. Waterfowl mortality surveys using telemetry (1999 through 2004) and ground-based surveys (2005 through present) | X | | | | X | | |
| M2. Aerial waterfowl surveys | X | | | | X | | |
| M3. WP monitoring of treated ponds | X | | | | X | | |
| M4. WP composite sampling in untreated areas | This element complete, conducted from 1999 to 2003 to identify areas of WP contamination. | | | | | | |
| M5. GIS database management | X[a] | X[a] | | | | X[a] | X[a] |
| M6. Pond surveys, ground truthing, limited aerial survey | This element has been removed from the revised schedule. | | | | | | |
| M7. Aerial photography and interpretation | X | | | | | X[b] | |
| M8. Mapping of physical habitat changes and vegetation rebound | X | | | | | X[b] | |
| **Treatment** | | | | | | | |
| T1. Pond pumping treatment (active) | Active pumping occurred through 2007. This element has been discontinued because no new areas of WP have been identified that could be remediated through pumping and drying operations. | | | | | | |
| T2. Cap and fill application | | X | | | | X | |
| T3. Cap and fill integrity inspection | | X[c] | | | | X[c] | |
| T4. Hazing (contingency) | This element was intended to deter waterfowl use of WP-contaminated areas prior to remediation, and was discontinued in 1999. | | | | | | |

[a]GIS database management, scheduled for 2013 and 2017, actually began in the previous year for each event, when mortality and sediment data were collected.

[b]Based on the 2011 Memo to Site File (USAF, 2011), 2012 was the last year habitat mapping was to occur unless major changes to land use or habitat occur. No major changes have been identified since 2012.

[c]Cap and fill integrity inspection, conducted by sampling cap perimeters to determine whether targeted WP-contaminated sediments had been successfully covered, also was completed a year earlier than the 2011 Memo to Site File schedule during the 2012 and 2016 remedial action monitoring.

## Table 2-3: Pond Status as of 2016

| Ponds Determined (through sample collection) to Never Have Been Contaminated | | Ponds that Have Been Successfully Remediated through Draining and Capping Actions (confirmed by sample collection) | | | | |
|---|---|---|---|---|---|---|
| 40 | 112 | 23 | 145 | 183 | 258 | 297 |
| 49 | 138 | 75 | 146 | 226 | 285 | 730 |
| 85 | 208 | 109 | 155 | 246 | 290 | 731 |
| 93 | 228 | 129 | 171 | 256 | 293 | |

Note:

Ponds are shown by number on Figure 1-2.

# Table 2-4: Cap Information

| Year Installed | Cap ID | Area ($m^2$) | Easting | Northing |
|---|---|---|---|---|
| 2008 expanded in 2013 | 03DIS03 | 115.5 | 355185 | 6801454 |
| 2009 | 03DIS11 | 29.1 | 355212 | 6801441 |
| 2009 expanded in 2013 | 03DIS18 | 119.9 | 355209 | 6801430 |
| 2008 | 03DIS21 | 45.8 | 355153 | 6801443 |
| 2008 expanded in 2009 | 03DIS36 | 34.1 | 355233 | 6801449 |
| 2009 | 03DIS37 | 20.7 | 355220 | 6801465 |
| 2008 | 03DIS38 | 17.7 | 355217 | 6801490 |
| 2008 expanded in 2009 | 03DIS40 | 35.2 | 355168 | 6801505 |
| 2009 | 03DIS42 | 29.0 | 355144 | 6801509 |
| 2009 | 03DIS43 | 26.9 | 355138 | 6801473 |
| 2009 | 04DIS68 | 37.6 | 355177 | 6801436 |
| 2009 | 04DIS76 | 29.9 | 355133 | 6801512 |
| 2008 | 04DIS82 | 20.6 | 355247 | 6801461 |
| 2008 expanded in 2013 | 04DIS84 | 185.5 | 355249 | 6801443 |
| 2008 | 04DIS85 | 12.6 | 355221 | 6801425 |
| 2008 | 04DIS86 | 12.6 | 354857 | 6801626 |
| 2008 | 04DIS90 | 12.3 | 354827 | 6801651 |
| 2008 | 04DIS93 | 11.5 | 354823 | 6801706 |
| 2008 | 04DIS96 | 15.5 | 354833 | 6801722 |
| 2008 | 04DIS97 | 13.1 | 354780 | 6801724 |
| 2008 | 04DIS106 | 10.8 | 354798 | 6801650 |
| 2011 temporary cap, made permanent in 2013 | Area BT Duck Pond Drainage Channel | 35.5 | 354790 | 6801633 |
| 2011 temporary cap, made permanent in 2013 | Area C Pond 155 | 62.4 | 355117 | 6801545 |
| 2008 | BIP 2 | 18.9 | 355242 | 6801531 |
| 2008 expanded in 2009 | BIPS 5 to 9 | 142.7 | 355185 | 6801565 |
| 2008 | BIP 10 | 16.8 | 355167 | 6801567 |
| 2008 expanded in 2009 | BIP 11 | 29.4 | 355169 | 6801590 |
| 2011 | Bomb Crater Ditch | 235.1 | 355354 | 6801671 |
| 2008 expanded in 2009 | North Ditch | 92.9 | 355215 | 6801643 |
| 2007 expanded in 2008/2011 | Pond 23 | 99.2 | 355292 | 6801535 |
| 2011 temporary cap, made permanent in 2013 | Pond 730 North Arm | 21.9 | 354885 | 6801896 |
| 2011 | Pond 730 SW (30 to 40 m) | 46.5 | 354791 | 6801800 |
| 2011 | Pond 730 SW (0 to 10 m) | 108.4 | 354791 | 6801813 |
| 2009 | South Ditch East | 52.6 | 355253 | 6801517 |
| 2008 expanded in 2011 | South Ditch Junction | 248.5 | 355226 | 6801523 |
| 2008 expanded in 2009 | South Ditch West | 68.9 | 355167 | 6801527 |
| **Total** | **36 Caps** | **2,096.6** | | |

Notes:

Red font highlights the most recently expanded cap locations; 2016 was the first time samples were collected around the "new" edges of these caps.

Northing/easting coordinates based on North American Datum (NAD)27 UTM grid, meters and represent cap centers

"Temporary caps" were created by field crew during summer operations by bringing enough ballast to form a thin layer in an area identified with high WP concentrations.

Area data was collected during the 2016 sampling event with a handheld Trimble Geo XH.

BIP = blow-in-place
$m^2$ = square meter(s)
SW = southwest
UTM = Universal Transverse Mercator

# 3.0 LONG-TERM MANAGEMENT ACTIVITIES CONDUCTED IN 2016

LTM activities addressed in this monitoring report were conducted during the period from September 1 through October 13, 2016. LTM activities conducted during 2016 included dabbling duck mortality surveys, aerial waterfowl surveys, and sediment sampling. Activities were documented in field logs (Appendix B). All ground-based field activities were supported by unexploded ordnance (UXO) technicians.

The waterfowl monitoring period is generally scheduled to attempt to document the presence of migrating waterfowl during the fall migration, usually starting in mid-August and ending when ice cover prevents waterfowl usage (and foot travel) in mid-October. In 2016, although signs of migratory bird activity were first observed in the area around August 16 (Morrill, 2016), range operations prevented access to XU022 until September 1.

During the early years of investigations at XU022, subareas were designated based on geographical features and landmarks. These subareas are frequently referred to in the discussion of field activities, and are shown on Figure 1-2. Similarly, individual ponds (areas of open water within the marsh) have been given numbers; ponds are shown on Figure 1-2.

## 3.1 UXO Support

The following presents a summary of the UXO screening and avoidance activities conducted at XU022 to support the site-related sampling and monitoring performed in 2016.

### 3.1.1 UXO Avoidance

Before workers entered an area at ERF, each area was screened for UXO. Bering Sea Eccotech (Bering Sea) was contracted to provide UXO support for monitoring and remediation activities during the 2016 reporting period. Bering Sea provided a UXO technician on the following two occasions:

- From September 1 through September 8, the technician performed an avoidance survey of the work staging areas and pathways in the XU022 for monitoring dabbling duck mortalities in Areas A, C, CD, and Bread Truck (BT). Clearing the pathways within the marsh involved the installation and marking of 10-foot-wide lanes. The UXO technician swept the lane width for the presence of UXO and marked items for avoidance. This allowed the survey team to subsequently walk the lane periodically to conduct the mortality surveys without UXO technician escort.

- From September 13 through 19, a UXO technician was present for sediment sample collection to perform avoidance surveys of areas in remediated ponds and around cap perimeters before sampling was conducted.

For the initial September field efforts, the UXO technician first conducted a visual inspection of the ground surface (where possible) and used a magnetometer to scan areas for buried ferrous metal objects. If a buried object was detected, the spot was marked and flagged. These areas were avoided, and walking paths were adjusted to safely avoid the location. Walking paths used throughout the monitoring season were cleared and marked during the initial September field efforts.

The following areas (see Figure 1-2) were cleared to accommodate fieldwork:

- Observation Point Fagan
- OB/OD Pad Staging Area (also known as Explosive Ordnance Disposal Pad)
- Road to the OB/OD Pad
- Bomb Crater Road
- Road to Clunie Point and Pad
- Generator pad
- Access routes to each of the capped areas
- Areas C, CD, and BT mortality transects
- Path to canoe transect
- Area A mortality transects
- Firing Point Cole
- Area surrounding the pump and generator

Bering Sea's report on the UXO monitoring activities, *Eagle River Flats 2016 UXO Anomaly Avoidance Support*, is included in Appendix C.

## 3.2 Sediment Sampling

Historical studies indicate that sediment containing a WP concentration of approximately 1 microgram per gram (µg/g) or greater has the potential to have WP grains capable of killing dabbling duck if ingested. Previous research has shown that WP contamination at XU022 above 1 µg/g is mainly distributed in relatively small hot spots (localized areas) averaging approximately 2 meters (m) in diameter that were created by detonation of WP ordnance (Walsh et al., 1997). Because of their small size, detection of these hot spots requires intensive sampling such as multi-increment sampling methods. Three types of multi-increment sampling as well as discrete sampling methods have been used to assess WP contaminant conditions in the XU022 wetland.

In 2004, a sampling program was initiated with the objectives to determine whether sediments at XU022 contain WP particles that could be ingested by dabbling ducks and to determine whether remediated ponds remain uncontaminated.

The monitoring methods for this program include or have included the following:

- Multi-increment sampling from pond surface sediments to determine whether WP is present

- Discrete sampling to monitor temporal changes in WP concentrations or to identify potential hot spots (such as those associated with suspected WP rounds)

- Measuring sediment moisture and temperature to assess sublimation/oxidation conditions at select locations within contaminated and remediated ponds

- Measuring residual WP from planted WP particles of known initial mass

Sediment sampling was conducted at ERF in September 2016 to meet the following objectives:

- Assess continued clean status of ponds previously remediated using pond pumping, and determine whether there has been rebound in contamination resulting from exposure of buried WP residue
- Determine whether the gravel caps completely cover the WP-contaminated sediments

Additional potential samples were included in the UFP-QAPP (USAF, 2016) to allow for sampling in specific areas where concentrations of dabbling duck deaths coincided with pond habitat or near anomalies that could be WP-containing rounds. No discrete samples were collected because the criteria outlined above were not met; therefore, no specific areas of suspected WP contamination were identified.

During previous sampling events, limited pumping operations have been conducted to help lower the water table. However, during 2016 pumping was not conducted because of mechanical issues with available pumps. Samples were collected with deeper water levels, but general procedures remained the same.

September 2016 sampling locations are shown on Figure 3-1. The sampling methods used and locations where the samples were collected in 2016 are shown in Table 3-1 and discussed below.

**Table 3-1: Sediment Sample Locations**

| Sample Location | Sample Date | Area |
|---|---|---|
| **Grid Multi-Increment Samples** | | |
| Pond 171 C Marsh | 14-Sep-16 | C |
| Pond 155 Southwest Grid | 14-Sep-16 | C |
| Pond 183 C 100 m + | 14-Sep-16 | C |
| Pond 109 BT South 100 m + | 15-Sep-16 | BT |
| Pond 109 BT South 100 m - | 15-Sep-16 | BT |
| Pond 146 Canoe Point 1 (East, Shore) | 13-Sep-16 | C |
| Pond 146 Canoe Point 2 (West) | 13-Sep-16 | C |
| **Systematic-Random Multi-Increment Sediment Samples** | | |
| *Gravel Cap Perimeters* | | |
| 03DIS03 | 15-Sep-16 | C |
| 03DIS11 | 15-Sep-16 | C |
| 03DIS18 | 15-Sep-16 | C |
| 03DIS21 | 15-Sep-16 | C |
| 03DIS36 | 15-Sep-16 | C |
| 03DIS37 | 15-Sep-16 | C |
| 03DIS38 | 15-Sep-16 | C |
| 03DIS40 | 19-Sep 16 | C |
| 03DIS42 | 19-Sep 16 | C |

# Table 3-1: Sediment Sample Locations

| Sample Location | Sample Date | Area |
|---|---|---|
| 03DIS43 | 19-Sep 16 | C |
| 04DIS68 | 15-Sep-16 | C |
| 04DIS76 | 19-Sep 16 | C |
| 04DIS82 | 15-Sep-16 | C |
| 04DIS84 | 15-Sep-16 | C |
| 04DIS84 (South of Cap) | 15-Sep-16 | C |
| 04DIS85 | 15-Sep-16 | C |
| 04DIS86 | 16-Sep-16 | BT |
| 04DIS90 | 16-Sep-16 | BT |
| 04DIS93 | 16-Sep-16 | BT |
| 04DIS96 | 16-Sep-16 | BT |
| 04DIS97 | 16-Sep-16 | BT |
| 04DIS106 | 16-Sep-16 | BT |
| Area BT Duck Pond | 16-Sep-16 | BT |
| Area C Pond 155 | 19-Sep-16 | C |
| BIP 10 | 19-Sep 16 | C |
| BIP 11 | 19-Sep 16 | C |
| BIPS 5 to 9 West Side | 19-Sep 16 | C |
| BIPS 5 to 9 East Side | 19-Sep 16 | C |
| Bomb Crater West Side | 19-Sep 16 | C |
| Bomb Crater East Side | 19-Sep 16 | C |
| North Ditch West Side | 19-Sep 16 | C |
| North Ditch East Side | 19-Sep 16 | C |
| South Ditch East-West Side | 19-Sep 16 | C |
| South Ditch East-East Side | 19-Sep 16 | C |
| Cross-South Ditch Junction-North Side | 19-Sep 16 | C |
| Cross-South Ditch Junction-West Side | 19-Sep-16 | C |
| Cross-South Ditch Junction-East Side | 19-Sep-16 | C |
| South Ditch West-West Side | 19-Sep-16 | C |
| South Ditch West-East Side | 19-Sep-16 | C |
| Pond 23 | 19-Sep-16 | C |
| Pond 730S | 16-Sep-16 | BT |
| Pond 730 SW 0 to 10 m-West Side | 16-Sep-16 | BT |
| Pond 730 SW 0 to 10 m-East Side | 16-Sep-16 | BT |
| Pond 730 North | 16-Sep-16 | BT |

Note:
C = Area C

### 3.2.1 Grid Multi-Increment Sampling

The grid multi-increment sampling method used at XU022 was developed in 1996 (Walsh et al., 1997) to determine whether a mass of WP sufficient to poison dabbling duck was present in a defined area or "decision unit." The Interstate Technology Regulatory Council defines a decision unit as "the smallest volume of soil (or other media) for which a decision will be made based on incremental sampling methodology" (Interstate Technology Regulatory Council, 2012). The spacing between increments was 1.82 m, which coincides with a 10 percent chance of missing a 2-m-diameter WP-ordnance impact point, if one exists (Gilbert, 1987; Walsh et al., 1997). Several 5.46- by 20-m decision units were established in various ponds between 1997 and 2000. These decision units have been resampled in multiple years to evaluate the success of remediation in those areas.

In 2016, grid multi-increment samples were collected from decision units within Area C Ponds 183, 171, 146, and 155, and in BT Area Pond 109 to look for potential rebounds of WP concentrations in remediated areas (Figure 3-1). Subsamples for each grid were collected primarily by 2-cm core sampler as described in the UFP-QAPP (USAF, 2016). A 5-cm-diameter hand auger was occasionally used in areas where difficulty was encountered retrieving the required subsample volume with the sediment corer because of the presence of excessive submerged vegetation above the sediment.

In the field, grids were positioned on a north-south orientation using the coordinates provided in the UFP-QAPP as the center point, and orienting the grid so that the longer sides were on the east and west (shorter sides were north and south) (USAF, 2016). For three grids, the local pond morphology required shifting the orientation by 45 degrees (long sides on the southeast/northwest for Pond 155 and Pond 171 C Marsh, and long sides on the southwest/northeast for Pond 146 Canoe Point grids).

### 3.2.2 Systematic-Random Multi-Increment Sampling

Systematic-random multi-increment samples are used to sample larger decision units and linear features such as drainage channels and the perimeter of gravel caps. The samples are formed by collecting sediment aliquots at evenly spaced intervals (e.g., 1 to 2 m) starting at a random location within a decision unit. Larger caps were divided into multiple decision units. This method was used to sample around the perimeter of the gravel caps in Areas C and BT (Figure 3-1). Sediment subsamples were collected by hand in accordance with the UFP-QAPP (USAF, 2016), except in cases where thick, submerged vegetation prevented successful retrieval of the surface sediments with the 2-cm core sampler. In these cases, a 5-cm-diameter hand auger was used to retrieve the samples. The larger diameter core samples were split under water to retrieve only the interior portion of the sample that was included in the sample aliquot. Vegetation and debris were also removed from the core sample when the sample was split.

### 3.2.3 Sieved Multi-Increment Sampling

Sieved multi-increment samples have been used to sample large areas (entire ponds) and to intensively sample smaller areas by taking increments of sediment at 1- to 2-m intervals and placing them in a sieve bucket (0.59-millimeter [mm] mesh). The sediment is then stirred underwater during collection to remove the fine-grain fraction. The mesh retains WP particles that, if present, would pose significant hazard to dabbling duck. This method was last used in 2010 and 2011 to sample Ponds 226 and 258 in Area A at two locations where WP was detected in the 1990s (ponds are shown on Figure 1-2). Sieved multi-increment sampling has not been used in more recent years because no areas have been identified that appeared to be causing concentrations of dabbling duck deaths.

### 3.2.4 Discrete Sampling

In the past, discrete samples were collected near magnetic anomalies suspected of possibly being WP ordnance. Each discrete sample was composed of at least 120 milliliters (mL) of sediment collected adjacent to the metal ordnance item. During 2016, magnetic anomalies were flagged and left in place. No discrete samples were collected because dabbling duck mortality monitoring results did not suggest that any of the anomalies were current sources of WP poisoning for dabbling duck.

## 3.3 Dabbling Duck Mortality Monitoring

As described in Section 2.1, the RAOs at XU022 are based on dabbling duck mortality rates. The use of dabbling duck mortality rates for RAOs, rather than a regulatory cleanup level, presents some challenges in that both the dabbling duck population and the dabbling duck mortality numbers must be measured each year that the mortality rate is calculated, neither of which is a simple task. However, the use of mortality rates in the RAOs is necessary because there is not an established cleanup level for WP in sediment, and the overall goal is to minimize mortality of dabbling duck using the site.

Dabbling duck mortality rates are determined by collecting mortality data through ground-based mortality surveys to record dabbling duck deaths in areas where remediation has been required and implemented. The number of dabbling duck deaths is then compared with the total population of dabbling ducks using the site as recorded by aerial surveys over the same time frame. The concurrent surveys are conducted over the course of a migration period; in recent years, the fall migration period has been evaluated to determine mortality rates. The beginning of the migration period is determined by a United States Department of Agriculture (USDA) observer who conducts bird counts for the Base to monitor activity for potential bird aircraft strike hazards. In fall 2016, the USDA observer indicated that the migration appeared to be starting (based on a general increase in the number of waterfowl in the area) around August 16 (Morrill, 2016).

### 3.3.1 Ground-Based Mortality Surveys

Ground-based surveys have been conducted since 2004. These surveys have been a successful, cost-effective, and repeatable process for determining dabbling duck mortality and, ultimately, the success of remediation activities. During the early years of investigation at ERF (1998 through 2002), telemetry studies were used to determine the number of dabbling duck mortalities. The National Wildlife Research Center (NWRC) conducted mortality studies from 1996 through 2002 by attaching radio-collars to dabbling ducks (mallards) and tracking their movements and mortality (NWRC, 2004). For a more detailed description of the telemetry studies (by year), refer to the Cold Regions Research and Engineering Laboratory (CRREL) report titled *Interagency Expanded Site Investigation, Evaluation of White Phosphorus Contamination and Potential Treatability at Eagle River Flats, Alaska, FY 98 Report* (CRREL, 1999) and the Interagency Expanded Site Investigation, Evaluation of White Phosphorus Contamination and Potential Treatability at Eagle

River Flats, Alaska for 1999 through 2002 (CRREL, 2000; CRREL, 2002; CRREL, 2003). Because of contracting issues or lack of helicopter availability, studies were not completed in 2000 or 2003.

Starting in 2004, ground-based monitoring surveys by patrolling established transects were introduced as a less costly way to monitor for dabbling duck mortalities. Ground-based mortality studies focus on areas A, C, C/D, and BT. These areas (1) continue to provide suitable habitat, and (2) are the location of ponds that have been remediated for WP contamination. One additional area, Racine Island, was historically the location of WP-contaminated ponds. The ponds on Racine Island have been remediated, little suitable habitat remains, and aerial surveys have indicated that since 1997, the population of dabbling ducks using this area has made up an average of only 0.7 percent of the total usage at XU022. As a result of these factors, as well as difficulties with accessing this area without aerial support, monitoring on Racine Island has been discontinued.

In 2016, mortality surveys were conducted in Areas A, C, C/D, and BT during the fall migration period. Although the migration appeared to be starting around August 16 (Morrill, 2016), military operations on the range delayed the start of monitoring until September 1. Monitoring continued through October 13. At the conclusion of the surveys in October 2016, the ponds on XU022 were estimated to be at least 80 percent frozen, precluding most waterfowl use and the need/ability for continued surveying.

**Transect Descriptions and Monitoring Frequency**

The ground-based mortality surveys consist of monitoring a total of 13 transects. These transects are modified and monitored at varying frequencies based on where mortalities have been recorded in recent monitoring events. When few to no mortalities were recorded over a period of years, monitoring frequencies or transect lengths had been reduced. In an attempt to more closely reproduce original monitoring transects prior to the 2018 Five-year Review, portions of C/CD Grid and BT Grid that had not been monitored in more recent years were added to the UFP-QAPP (USAF, 2016). However, as a result of thigh-deep water in the northern portion of the area, several segments planned for reinstatement were not monitored; this included the northern half of the Area C/CD grid and the eastern portion of the northern side of the BT grid. Not only did the water depth make foot-travel difficult, it also indicated that these areas would not provide dabbling duck feeding habitat, which typically ranges in depth from around 5 to 50 cm (Racine et al., 1992). Water depth may have been more conducive to monitoring on foot and dabbling activities in these areas during earlier operations when the water levels were lowered for remediation efforts.

The transects surveyed during the 2016 migration period are shown on Figure 3-2, and associated access points are shown on Figure 1-2. Transect descriptions and changes from the planned transects as outlined in the UFP-QAPP (USAF, 2016) are presented in Table 3-2.

The southern half of Area C/CD Grid, Ditch, southern east-west leg of BT Grid, Pond 730, Duck Ponds, and Pond 183 transects are located in areas where occasional mortalities have been found. These transects were accessed from Clunie Point or the northern end of Bomb Crater Road, and were surveyed three times per week. The Area A transect (accessed through Firing Point Cole) and C/D Canoe transect (accessed from a trail off of Bomb Crater Road) were monitored weekly. The canoe transect was the only transect conducted regularly by canoe because the pond was too deep for safe foot travel.

## Table 3-2: Mortality Survey Transect Descriptions

| Transect | Description (including any changes from UFP-QAPP) |
|---|---|
| **Core Transects (surveyed three times weekly)** | |
| Ditch | Small pools in the northern area where two large interconnected drainage ditches were excavated for pumping remediation. |
| Pond 183 | Large dabbling duck feeding ponds previously remediated by pumping in Area C. |
| Pond 730 and Duck Ponds | Large dabbling duck feeding ponds previously remediated by pumping in western Area C/D. |
| Area C/CD Grid | Large rectangular grid extending across northern portion of C Area and southern portion of C/D Area. Extends across both ponded and thickly vegetated areas. In 2016, the northern segment and northern portions of the east and west legs were not monitored as planned as a result of thigh- to waste-deep water. |
| BT Grid | Large, mostly rectangular grid extending across the southwestern portion of C/D Area and the northeastern portion of BT Area. Western edge generally follows the edge of an irregularly shaped, many-fingered drainage channel. |
| **Weekly or Biweekly Transects** | |
| Area A | Starts at the southern end and follows the eastern side of Pond 290, then continues along the eastern side of the northern A pond complex, returning along the western side of Pond 290.<br>Approach from an access trail from Lower Cole Point along Otter Creek and the western edge of ERF. |
| Canoe Transect of Pond 40 | Starts along the eastern shore of Area C/D; follows the entire edge of Pond 40. Accessed by walking north approximately 1.2 km along the trail from the former OB/OD Pad, continuing along a short path down the bluff to the edge of the area. A canoe was used to follow along the entire edge of Pond 140. |
| **Upland Transects** | |
| Forest Edge (four transects) | Four 400-m-long transects running perpendicular into the forest from the salt marsh boundary on the eastern side of ERF. |
| Woodland Transect | One 50- by 200-m quadrant was located along the forest edge east of the northern Area C marsh, just north of Clunie Inlet. |

Note:
km = kilometer(s)

The final transects were the Upland transects, which were scheduled to be surveyed once and include the Woodland transect and Transects 1 through 4; and the Upland transects were accessed from Bomb Crater Road. The purpose of the Upland transect monitoring was to account for duck carcasses that may have been found by predators and carried to upland areas for consumption. Prior to pumping and draining operations, when duck mortality rates were higher, predators (particularly eagles) and ravens were commonly observed to scavenge carcasses of dabbling ducks found in ERF, sometimes carrying the carcasses to upland perches to feed (Army Engineer Research and Development Center [ERDC]/CRREL, 2005). As the numbers of mortalities were reduced through remediation, the predators were observed less frequently and at lower numbers; however, such scavenging was expected to have continued on a limited basis.

Wetland transect locations were surveyed to sub-meter accuracy using a global positioning system (GPS) unit. The centerline of the 10-m-wide lanes was marked at transect ends or corners with 1.5-m orange fiberglass markers with the tops painted fluorescent lime green. Some small variations in the pathways occur from year to year based on interpretation of pond edges (where carcasses are often found) and best paths between the corner/transect end stakes. Lanes were further delineated with 1.2-m wood lath with neon orange-painted tops, placed every 50 or 100 m along the survey lanes.

**Survey and Mortality Recording Procedures**

Surveys were conducted by a two-person observation team walking or canoeing (Canoe Transect of Pond 40 and occasionally some of the core transects during flood tides) each transect lane and visually scanning for dabbling duck carcasses or feather pile remains. When a carcass or feather pile was found, the field team recorded the date, location (NAD 27 UTM coordinate using a GPS unit or estimated from NAD 27 UTM-gridded photo maps of the areas), species (if possible), and a description of the carcass (i.e., degree of decay, partial or whole, and so on). A unique sequential sample identification (ID) number was assigned (e.g., MORT 01 and MORT 02) to all carcasses and feather piles. Carcass or feather pile locations were marked with a polyvinyl chloride pin flag with the ID number and date. Dabbling duck carcasses in good condition were removed from the site to avoid later double-counting that could result from the carcass being moved by a predator. If possible, gizzards were also removed from carcasses for WP analysis.

If a carcass or feather pile was seen outside of a cleared transect lane, the approximate location was recorded in the field notes; however, the carcass was not collected unless the area had been cleared by the UXO technician.

### 3.3.2 Aerial Waterfowl Census Surveys

A total of 13 aerial census surveys was conducted by ABR Inc. Environmental and Research Services (ABR Inc.), from September 1 to October 16, 2016. In general, surveys were conducted twice per week, and were flown with a fixed-wing aircraft at an airspeed of 105 to 160 km per hour and an altitude of 30 to 90 m. Total coverage of XU022 was obtained by overlapping transects. Over the duration of the study period, surveys were spaced an average of 3.3 days apart. Observations were recorded regarding the types and numbers of birds observed. ID was made by species group (such as “dabbling ducks” or “shorebirds”) or species (when possible). The results of the surveys were compiled and used to determine the approximate fall population of waterfowl. Population results recorded by ABR assumed a 100 percent turnover rate (i.e., each time a survey was conducted, all the birds observed had arrived since the previous survey, and all the birds counted during the previous survey had departed). A complete report on the ABR Inc. observations in 2016 is included in Appendix D.

The Third CERCLA Five-year Review Report (USAF, 2013a) included the following comment in Table 8-2, Issues Identified During the Five-Year Review that do not Affect Protectiveness, regarding waterfowl census data for XU022: “**Waterfowl Mortality**: Waterfowl populations may be biased slightly low due to unintentional hazing during seasonal field activities.” The recommended follow-up action as included in Table 9-2 is “Waterfowl populations should be re-addressed upon completion of seasonal field activities at the site to ensure that no bias is represented.” These concerns are considered in Section 4.2.2, where results of aerial surveys are discussed.

## 3.4 Institutional Controls and Other Site Restrictions

XU022 restrictions, enforced by JBER Environmental and Range Control, include preventing site access to personnel without appropriate site-specific training on UXO, range procedures, and WP. Construction and road maintenance activities are also restricted to prevent unnecessary damage to wetland habitat. Site access is controlled by a locked gate.

In addition, firing is restricted to winter months, when ice protects caps and potential buried munitions from being exposed by the impact of munitions (Army, 2001; Army, 2005). ICs will remain in place as long as hazardous substances remain onsite at levels that preclude unrestricted use.

Field teams were prepared to record observations of impacts to access control measures, by construction and road maintenance activities, or from munitions during monitoring activities in 2016.

## 3.5 Habitat Monitoring

Habitat monitoring has consisted of comparisons of aerial photography of the ERF area and ground-based photographs of vegetation plots over time to identify changes in vegetation communities that may be the result of RAs. Since remedial actions have been reduced in recent years and rapid and dramatic changes in vegetation have not been observed, habitat monitoring has been discontinued (USAF, 2012; USAF, 2013b). If changes in habitat are suspected as a result of changes to land use or natural events/disasters (earthquakes or extreme flooding), habitat mapping could be reinstated.

## 3.6 Deviations from the Work Plan

### 3.6.1 Sediment Sampling

The following issues were noted as deviations from the UFP-QAPP (USAF, 2014; USAF, 2016):

- Equipment blanks (EBs) were collected after the completion of all sampling rather than associated with batches of 20 samples as they were collected in the field.
- Field duplicates (FDs) were named using a “D” suffix; as a result, FDs were not submitted as “blind” samples to the laboratory.
- The effects of these deviations on the data, if any, are discussed in the DQE summary in Section 4.1.4.

### 3.6.2 Dabbling Duck Mortality Monitoring

As noted under Section 3.3.1 in Transect Descriptions and Monitoring Frequency, some changes were made to the transect routes during fieldwork when some areas were found to be deeper than expected, making them more difficult to access on foot and less likely to provide suitable habitat for dabbling waterfowl (see Section 3.3.1 for specific changes to the transects). Because the areas did not appear to be suitable dabbling habitat, no effect on the mortality data is expected to have occurred as a result of the changes.

## 4.0 MONITORING RESULTS AND DISCUSSION

This section presents the results of sediment sampling, dabbling duck mortality surveys, aerial waterfowl surveys, and habitat mapping activities, including comparisons to historic results. Observations of IC measures are also discussed.

### 4.1 Sediment Sampling

Sediment sampling in 2016 included grid multi-increment sampling and systematic-random multi-increment sampling for WP. Figure 4-1 shows the locations of all samples, and Table 4-1 presents the results. Grid multi-increment sampling was used to examine pond areas that had been remediated to determine whether rebounds in WP concentrations had occurred; systematic-random multi-increment sampling was used to analyze sediments around cap perimeters to determine whether caps continued to provide effective barriers over the targeted WP-contaminated sediments. Multi-increment samples were compared to a project-specific "trigger" concentration of 0.01 µg/g as stated in the UFP-QAPP (USAF, 2016). Studies have indicated that sediments with concentrations of 1 µg/g can cause mortality in dabbling duck when ingested. Composite sediment sample results with concentrations of 0.01 µg/g or greater are considered to have the potential to indicate the presence of areas of sediments with concentrations of 1 µg/g or greater.

**Table 4-1: White Phosphorus Concentrations in Sediment Samples**

| Sample Location | Sample Date | Area | Sample Type | Result (µg/g) |
|---|---|---|---|---|
| **Grid Multi-Increment Samples** | | | | |
| Pond 171 C Marsh | 14-Sep-16 | C | Primary | ND (0.002) |
| | | | Duplicate | ND (0.0023) |
| Pond 155 Southwest Grid | 14-Sep-16 | C | Primary | ND (0.0021) |
| | | | Duplicate | ND (0.0023) |
| Pond 183 C 100 m + | 14-Sep-16 | C | Primary | ND (0.0017) |
| | | | Duplicate | ND (0.0017) |
| Pond 109 BT South 100 m + | 15-Sep-16 | BT | Primary | ND (0.0018) |
| | | | Duplicate | ND (0.0017) |
| Pond 109 BT South 100 m - | 15-Sep-16 | BT | Primary | ND (0.0017) |
| | | | Duplicate | ND (0.0017) |
| | | | Triplicate | ND (0.0018) |
| Pond 146 Canoe Point 1 (East, Shore) | 13-Sep-16 | C | Primary | ND (0.0017) |
| | | | Duplicate | ND (0.0016) |
| Pond 146 Canoe Point 2 (West) | 13-Sep-16 | C | Primary | ND (0.0016) |
| | | | Duplicate | ND (0.0016) |
| **Systematic-Random Multi-Increment Sediment Samples** | | | | |
| *Gravel Cap Perimeters* | | | | |
| 03DIS03 | 15-Sep-16 | C | Primary | ND (0.002) |
| 03DIS11 | 15-Sep-16 | C | Primary | ND (0.0021) |
| 03DIS18 | 15-Sep-16 | C | Primary | ND (0.0033) |

## Table 4-1: White Phosphorus Concentrations in Sediment Samples

| Sample Location | Sample Date | Area | Sample Type | Result (µg/g) |
|---|---|---|---|---|
| 03DIS18 | 15-Sep-16 | C | Duplicate | ND (0.0067) |
| 03DIS21 | 15-Sep-16 | C | Primary | ND (0.002) |
| 03DIS36 | 15-Sep-16 | C | Primary | ND (0.012) |
| 03DIS37 | 15-Sep-16 | C | Primary | ND (0.002) |
| 03DIS37 | 15-Sep-16 | C | Duplicate | ND (0.005) |
| 03DIS38 | 15-Sep-16 | C | Primary | ND (0.011) |
| 03DIS40 | 15-Sep-16 | C | Primary | ND (0.0019) |
| 03DIS42 | 19-Sep-16 | C | Primary | ND (0.003) |
| 03DIS43 | 19-Sep-16 | C | Primary | ND (0.0018) |
| 04DIS68 | 15-Sep-16 | C | Primary | ND (0.0021) |
| 04DIS76 | 19-Sep16 | C | Primary | ND (0.0019) |
| 04DIS82 | 15-Sep-16 | C | Primary | ND (0.0025) |
| 04DIS84 | 15-Sep-16 | C | Primary | ND (0.0047) |
| 04DIS84 (South of Cap) | 15-Sep-16 | C | Primary | ND (0.0048) |
| 04DIS85 | 15-Sep-16 | C | Primary | ND (0.0021) |
| 04DIS86 | 16-Sep-16 | BT | Primary | ND (0.0018) |
| 04DIS90 | 16-Sep-16 | BT | Primary | ND (0.0019) |
| 04DIS93 | 16-Sep-16 | BT | Primary | ND (0.0019) |
| 04DIS96 | 16-Sep-16 | BT | Primary | ND (0.0018) |
| 04DIS97 | 16-Sep-16 | BT | Primary | **0.0017** J |
| 04DIS106 | 16-Sep-16 | BT | Primary | ND (0.0017) |
| Area BT Duck Pond | 16-Sep-16 | BT | Primary | ND (0.0017) |
| Area C Pond 155 | 19-Sep-16 | C | Primary | ND (0.0018) |
| BIP 10 | 19-Sep-16 | C | Primary | ND (0.0018) |
| BIP 11 | 19-Sep-16 | C | Primary | ND (0.0019) |
| BIPS 5 to 9 West Side | 19-Sep-16 | C | Primary | ND (0.0019) |
| BIPS 5 to 9 East Side | 19-Sep-16 | C | Primary | ND (0.0022) |
| BIPS 5 to 9 East Side | 19-Sep-16 | C | Duplicate | ND (0.0025) |
| Bomb Crater West Side | 19-Sep-16 | C | Primary | ND (0.0023) |
| Bomb Crater East Side | 19-Sep-16 | C | Primary | ND (0.0063) |
| North Ditch West Side | 19-Sep-16 | C | Primary | ND (0.0018) |
| North Ditch East Side | 19-Sep-16 | C | Primary | ND (0.0021) |
| Pond 23 | 19-Sep-16 | C | Primary | ND (0.0025) |
| South Ditch East-West Side | 19-Sep-16 | C | Primary | ND (0.0035) |
| South Ditch East-East Side | 19-Sep-16 | C | Primary | ND (0.0016) |
| Cross-South Ditch Junction-North Side | 19-Sep-16 | C | Primary | ND (0.002) |
| Cross-South Ditch Junction-West Side | 19-Sep-16 | C | Primary | ND (0.0025) |
| Cross-South Ditch Junction-East Side | 19-Sep-16 | C | Primary | ND (0.0019) |

**Table 4-1: White Phosphorus Concentrations in Sediment Samples**

| Sample Location | Sample Date | Area | Sample Type | Result (µg/g) |
|---|---|---|---|---|
| South Ditch West-West Side | 19-Sep-16 | C | Primary | ND (0.0017) |
| South Ditch West-East Side | 19-Sep-16 | C | Primary | ND (0.0018) |
| South Ditch West-East Side | 19-Sep-16 | C | Duplicate | ND (0.0019) |
| Pond 730 SW West Side | 16-Sep-16 | BT | Primary | ND (0.002) |
| Pond 730 SW East Side | 16-Sep-16 | BT | Primary | ND (0.0022) |
| Pond 730 North | 16-Sep-16 | BT | Primary | ND (0.0021) |
| Pond 730 North | 16-Sep-16 | BT | Duplicate | ND (0.0023) |
| Pond 730 South | 16-Sep-16 | BT | Primary | ND (0.002) |

Notes:

**Bold font highlights a WP detection**.

Red font indicates sediment sample collected from caps that were expanded or augmented in February 2013.

Sample location names are based on historical CRREL naming scheme for alignment with previous samples at the same locations.

ND = nondetect (at or above the indicated limit of detection)

### 4.1.1 Grid Multi-Increment Sampling

As described in Section 3.2.1, grid multi-increment sampling is designed to detect a 2-m-diameter WP-ordnance impact point if one exists within the 5.46- by 20-m decision unit. Grid multi-increment samples were collected from seven decision units within the ponds that previously had the highest WP concentrations before treatment, including Ponds 109, 146, 155, 171, and 183 (Figure 4-1). WP was not detected in grid multi-increment samples.

Previous samples in the Pond 155 grid area indicated that low levels of WP were present; in 2010, 2011, and 2012, sample results ranged from 0.00008 to 0.054 µg/g. Historical data are included in Appendix E. A temporary cap (composed of hand-carried cobble) was installed in the area in July 2011, and a permanent cap was installed in February 2013 to prevent dabbling duck from accessing the contaminated sediment. This required the Pond 155 sampling grid to be shifted approximately 11.4 m west of the planned location.

The results of 2016 grid multi-increment sediment sampling are presented in Table 4-1 and Figure 4-1; historic sampling results can be found in Appendix E; and the 2016 analytical data package and a summary table can be found in Appendix F.

### 4.1.2 Systematic-Random Multi-Increment Sampling

A total of 44 primary and five duplicate systematic-random samples were collected from around permanent and temporary caps in Areas C and C/D (Figure 4-1). These samples were used to determine whether the gravel caps effectively covered areas that had been previously identified as having WP contamination, thereby preventing access by dabbling duck. One sample, collected from the perimeter of cap 04DIS97, contained a detectable concentration of WP (0.0017 µg/g) below the trigger concentration of 0.01µg/g. It should be noted that two samples, collected from cap perimeters 03DIS36 and 03DIS38, had limits of detection greater than the trigger concentration of 0.01 (0.011 and 0.012 µg/g, respectively); however, minimum detection limits for both were below the trigger concentration (0.003 and 0.0032 µg/g, respectively.)

Six of the caps were expanded or augmented in February 2013 following the previous 2012 sampling event. Caps were expanded based on previous sediment sampling results, observations of magnetic anomalies, and concentrations of dabbling duck deaths. The caps that were expanded include the following:

- 03DIS03
- 03DIS18
- 04DIS84
- Area BT Duck Pond Drainage Channel
- Area C Pond 155
- Pond 730 North Arm

Based on the results of the 2016 monitoring, which had no detections of WP for samples collected around the perimeter of the expanded and augmented caps, the areas that had been targeted during the 2013 capping operations have been successfully covered.

#### 4.1.3 Discrete Sampling

Historically, when potential WP-containing anomalies were detected during UXO clearance activities, a discrete sample was collected from the surrounding sediment to determine whether the round had associated residual WP. In 2016, although magnetic anomalies were identified and marked for avoidance purposes, none were identified as potential WP-containing rounds (i.e., no visual clues such as “grains” of white in nearby sediments, identifiable exposed portions of the anomaly, or concentrations of dabbling duck deaths near the anomaly were observed). As a result, no discrete sediment samples were collected during the 2016 monitoring event.

#### 4.1.4 Data Quality Analysis

Sediment samples were stored, processed, and analyzed according to procedures outlined in the UFP-QAPP (USAF, 2016). Samples were analyzed using U.S. Environmental Protection Agency Method 7580. A data quality evaluation was conducted to assess whether the data met project objectives. The evaluation found the following:

- Quality control samples including FDs, matrix spike/matrix spike duplicates, and EBs were collected at the frequencies outlined in the UFP-QAPP.

- The FD sample identifications were labeled with a “D” suffix on the original sample identification. This naming convention would allow the laboratory to identify FD sets. There was no net effect on the data quality because all FD sets were nondetect for the target analyte.

- The collection of EBs at the end of the field event (rather than associated with batches of 20 samples as they were collected in the field) did not affect data quality. All EB results were nondetect, and only one sediment sample had a detection of WP; therefore, there is no indication of cross-contamination. Because WP oxidizes on contact with air, if trace amounts remained on sampling implements following decontamination procedures, they would have oxidized in seconds during travel between sampling locations (which generally took a minimum of about 5 minutes between systematic-random samples around cap locations and longer for grid multi-increment sampling for ponds).

- No data were rejected, and completeness for all method/matrix/analyte combinations was 100 percent.

- No data were qualified because of low-level detections in the method blanks and EBs.

Overall precision and accuracy of the data, as measured by field and laboratory quality control indicators, suggest that data are usable for project objectives. The complete Data Quality Evaluation can be found in Appendix F.

## 4.2 Dabbling Duck Mortality Studies

Waterfowl mortality studies were conducted using ground-based transects and aerial surveys. The ground-based transect surveys identify waterfowl mortalities, and the aerial surveys estimate the numbers of waterfowl feeding in the XU022 area. Together, these numbers were used to calculate the mortality rate.

### 4.2.1 Dabbling Duck Mortality Transects

A total of 11 dabbling duck mortalities, including nine feather piles and two carcasses, were recorded during the 2016 field season (Figure 4-2 and Table 4-2). “Feather piles” are mortalities that were depredated by scavengers; therefore, the term includes locations where only feathers remained as well as partial carcasses (generally including feathers as well as bones or wings, and occasionally organs). In addition to dabbling ducks, a single tundra swan carcass was observed on the canoe transect.

**Table 4-2: Summary of 2016 Mortalities by Transect**

| Transect | Carcass | Feather Pile | Total |
|---|---|---|---|
| Ditch | 1 | 2 | 3 |
| Pond 730 | 0 | 1 | 1 |
| Pond 183 | 0 | 0 | 0 |
| Duck Pond | 0 | 1 | 1 |
| BT | 0 | 0 | 0 |
| C/D | 0 | 1 | 1 |
| Other Area C | 1 | 2 | 3 |
| Canoe (Pond 40) | 0 | 0 | 0 |
| Upland | 0 | 0 | 0 |
| Area A | 0 | 2 | 2 |
| **Total** | **2** | **9** | **11** |

Note: “Other Area C” category includes off-transect locations such as access routes and capped locations that were not part of the required transect monitoring.

In general, carcasses were discovered near pond edges, presumably near the location where the duck had ingested a lethal dose of WP. Based on studies of WP ingestion by ducks in 1992, the behavior of ducks after WP ingestion included a variety of abnormal postures such as arching the neck over the back, swimming with the head down, swimming in circles, and convulsing (Racine et al., 1992). These symptoms suggest that after manifestation begins, the individual is unlikely to be oriented enough to fly or travel purposefully, and would therefore perish in the general area where the poison was ingested.

Being the product of predation, feather piles were more frequently associated with available vantage points such as the stone ballast caps, muskrat “popups” (piles of vegetation), logs, towers, and range targets such as vehicles or portions of vehicles, and other debris. Mortality transects, when possible, were positioned along the edges of actively used feeding ponds, and passed by area vantage points to aid in the detection of the mortalities.

Gizzards were collected from two dabbling duck carcasses. (Although swans have the potential to ingest WP during feeding, only dabbling ducks are included in the mortality metrics; therefore, the swan’s gizzard was not collected for analysis.) Both gizzards tested positive for WP (concentrations of 0.0024 µg/g for Mort 001 and 0.25 µg/g for Mort 008 [Figures 4-1 and 4-2]). Dabbling ducks with gizzards that test positive for WP are assumed to have been killed from ingesting WP-contaminated sediment, regardless of concentration. Because of the uncertainties in determining the cause of death from evidence remaining at a feather pile, it is standard operating procedure to assume that all dabbling duck represented by feather piles also died as a result of WP poisoning. This provides a conservative estimation, or a possible overestimation, of 11 dabbling duck mortalities resulting from WP poisoning in 2016.

Ultimately, mortality numbers and locations are dependent upon the presence of accessible WP-contaminated sediment and the size of the populations feeding in those areas where accessible WP-contaminated sediments persist. As shown in Tables 4-2 and 4-3, the highest numbers of mortalities since 2004 have been found along the Ditch transects, followed by Pond 730 transects. Together, these two transects had approximately two-thirds of the total mortalities found during the 2004 through 2016 field seasons combined. These results are consistent with historical sediment sampling results, which identified localized WP hot spots in these areas through 2011. Five of the six caps that were expanded in February 2013 (to cover the identified WP hot spot areas) were located in these two transect areas; the sixth cap expanded in 2013 was associated with an active drainage channel. The Canoe transect and Area A had the next-highest frequency of mortalities, with 28 total each. During 2004–2016, Pond 183, the Duck Pond, C/D transect, and other areas between transects in Area C had mortalities recorded less frequently. The low occurrence of mortalities in areas other than the Ditch and Pond 730 transects, especially in the last 3 years, indicates that there is less probability of the persistence of accessible WP hot spots in these areas.

**Table 4-3: Summary of 2004-2016 Mortalities by Transect**

| Transect | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2016 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ditch | 64 | 25 | 6 | 13 | 4 | 5 | 11 | 2 | 6 | 3 | 139 |
| Pond 730 | 17 | 7 | 9 | 9 | 5 | 21 | 6 | 8 | 6 | 1 | 89 |

### Table 4-3: Summary of 2004-2016 Mortalities by Transect

| Transect | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2016 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pond 183 | 9 | 1 | 3 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 17 |
| Duck Pond | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 1 | 12 |
| BT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C/D | 6 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 16 |
| Other Area C | 3 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 3 | 13 |
| Canoe (Pond 40) | 6 | 4 | 1 | 0 | 2 | 8 | 0 | 4 | 3 | 0 | 28 |
| Upland | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| Area A | 1 | 4 | 2 | 7 | 0 | 9 | 3 | 0 | 0 | 2 | 28 |
| **Total** | **111** | **49** | **23** | **36** | **13** | **44** | **22** | **14** | **22** | **11** | **345** |

As shown in Table 4-4, the number of recorded dabbling duck mortalities has dramatically declined since 1996. Full-scale remediation, which occurred from 1999 to 2004, reduced the area of WP-contaminated sediments by pumping large areas dry and allowing the WP to sublimate and oxidize. Subsequent operation targeted smaller areas with pumping or capping.

### Table 4-4: Recorded Dabbling Duck Mortalities in Eagle River Flats (1996-2016)

| Year | Remedial Activity | Recorded Mortalities |
|---|---|---|
| 1996 | Investigative studies | 655 |
| 1997 | | 240 |
| 1998 | | 355 |
| 1999 | Full-scale remediation (pumping large areas dry) | 198 |
| 2000 | | NA |
| 2001 | | 87 |
| 2002 | | 203 |
| 2003 | | NA |
| 2004 | Limited remediation (smaller-scale pumping and capping operations) | 111 |
| 2005 | | 49 |
| 2006 | | 25 |
| 2007 | Capping operations (with very limited pumping to facilitate sediment sampling) | 35 |
| 2008 | | 12 |
| 2009 | | 44 |
| 2010 | | 22 |
| 2011 | | 14 |
| 2012 | | 22 |
| 2016 | | 11 |

Note:

From 1996 to 2002, recorded mortalities were based on dabbling duck telemetry. From 2004 to the present, recorded mortalities have been based on surveying ground-based mortality transects.

### 4.2.2 Aerial Mortality Surveys

A total of 13 aerial census surveys were conducted by ABR Inc. from September 1 to October 13, 2016, to determine the fall 2016 waterfowl population. In comparison, 21 aerial surveys were conducted in 2012, 24 were conducted in 2011, and 28 were conducted in 2010. Although the frequency of surveys was relatively the same (a goal of twice per week and an overall average of one survey every 3.3 days), the observation period was shorter in 2016. This shortening was a result of range activities preventing the normal mid-August start and 80 percent ice coverage occurring in mid-October.

The two most common species of waterfowl in 2016 (2,439 Canada geese and 3,838 mallard ducks) were the same as in 2012 and previous years, although unlike previous years, mallards were more common than Canada geese in 2016. In descending order, the next most common species included American wigeon (1,944), swans (512), northern pintails (491), sandhill cranes (400), green-winged teal (342), and white-fronted geese (191). Of these species, mallards, American wigeons, northern pintails, and green-winged teal are dabbling ducks (the types most likely to consume WP-contaminated sediment while feeding). The ABR Inc. report detailing the 2016 aerial census survey results is included in this report as Appendix D. The population numbers listed here are based on totaling the numbers of each species or species group across all surveys without any adjustments (e.g., adjustments for birds that might be present during more than one survey, and so on).

Estimating a total dabbling duck population for comparison to the number of dabbling duck mortalities from periodic aerial census data is complicated by (1) lack of information regarding whether any of the ducks counted during one census flight were also present during the previous census, and (2) not knowing how many transient dabbling ducks use the area between censuses and are therefore not counted.

Part of the purpose for the telemetry studies conducted during 1996-2002 was to estimate the turnover rate. The turnover rate was used to calculate the number of ducks that migrate into ERF to feed and then leave before the next aerial census flight, and ultimately estimate the fall dabbling duck population. This is important because these transient dabbling ducks need to be accounted for to accurately determine the annual fall population of ducks. NWRC calculated an average annual turnover rate of 0.83 during the survey period based on the telemetry data, and determined that the turnover rate was fairly constant from year to year.

Using the turnover rate of 0.83, the NWRC model uses the dabbling duck population as counted in the aerial survey (Aerial Count of Dabbling Ducks), and then adjusts for the average turnover to determine an estimated total duck population for that census period (Total Population Adjusted for Turnover). The total increase (Population Change) in duck population for each census period is then estimated by subtracting the previous period's adjusted population from the current period's adjusted population. If the current period's population is higher than the previous period, then the difference is the total increase in duck population for that period. If the current period's population is lower than the previous period, then there was no net increase in the duck population for that period. At the end of the season, the increases for each census period are summed to give the total estimated dabbling duck population for the season.

Table 4-5 presents the 2016 fall population estimate. The total fall dabbling duck population was determined to be 1,535 birds in 2016. As shown in Table 4-6, the fall population for 2016 was the second lowest since 2004 (2012 was the third lowest recorded population). For comparison, the observed number of mortalities was 22 in 2012 (out of an estimated total population of 2,239); 14 in 2011 (out of an estimated total population of 2,695); and 22 in 2010 (out of an estimated total population of 5,245).

To address the Five-year Review Report comment from 2013 regarding ensuring that population data is not biased low as a result of unintentional hazing during seasonal activities, the following information was considered: the 2016 population was one of the lowest populations recorded, which could have been the result of many individual or combined factors, including military training activities conducted on the JBER ranges in August, survey techniques, the late start to monitoring, or other factors such as unintentional hazing by survey crew. Field observations did not indicate that unintentional hazing by personnel on foot caused waterfowl to depart the wetland, only to move to the next open pond area. This could affect concurrent aerial surveys if the waterfowl happened to move to a nearby area that had already been observed, or if the waterfowl had already been counted and moved to an area that had not been counted. However, it seems unlikely that waterfowl would consistently move in a way such that they would not be counted or would be counted twice consistently. Field crews did not observe movement of waterfowl that appeared to be the result of unintentional hazing by the survey plane. It also seems unlikely that unintentional hazing would bias population numbers differently compared with previous monitoring years.

In sum, waterfowl were not observed leaving the wetland as a result of ground or aerial survey activities, and movement of waterfowl within the wetland (although not purposefully tracked) seems unlikely to result in consistent under- or over-counting the population present. Biasing the population count low (if it did occur as a result of unintentional hazing) would consequently bias the calculated mortality rate high, which would result in a more conservative estimation of the percent mortality and would not affect the protectiveness of the RAOs. In addition, the mortality rate calculations are also provided as a range based on the acknowledgement that there are many uncertainties involved in accurately determining the number of mortalities and total population for the dabbling ducks (see Section 4.2.3).

**Table 4-5: Aerial Census Data and Estimated Population**

| Observation Date | Aerial Count of Dabbling Ducks (D) | Total Population Adjusted for Turnover (Total = D/0.83) | Population Change |
|---|---|---|---|
| 1-Sep-16 | 752 | 906 | 906 |
| 6-Sep-16 | 894 | 1,077 | 171 |
| 9-Sep-16 | 775 | 934 | 0 |
| 13-Sep-16 | 695 | 837 | 0 |
| 15-Sep-16 | 680 | 819 | 0 |
| 19-Sep-16 | 543 | 654 | 0 |
| 23-Sep-06 | 510 | 614 | 0 |
| 26-Sep-16 | 729 | 878 | 264 |

**Table 4-5: Aerial Census Data and Estimated Population**

| Observation Date | Aerial Count of Dabbling Ducks (D) | Total Population Adjusted for Turnover (Total = D/0.83) | Population Change |
|---|---|---|---|
| 29-Sep-16 | 344 | 414 | 0 |
| 2-Oct-16 | 473 | 570 | 155 |
| 7-Oct-16 | 368 | 443 | 0 |
| 11-Oct-16 | 233 | 281 | 0 |
| 13-Oct-16 | 265 | 319 | 39 |
| **Total Population for 2016** | | | **1,535** |

Notes:

Total Population Adjusted for Turnover: Assumes that the Aerial Count of Dabblers on a given date accounts for 83 percent of the ducks that have been present in ERF since the previous census.

Population Change: Assumes that an increase in Total Population Adjusted for Turnover over the previous census are "new" individuals visiting ERF.

Total Population for 2016: Total of positive Population Change.

### 4.2.3 Estimation of Mortality Rate

The dabbling duck population estimate is used in conjunction with the compiled dabbling duck mortality data collected from the ground-based transect surveys to estimate a percentage mortality rate for the total fall dabbling duck population of ERF.

Based on the observed number of mortalities (11) and total population (1,535) in 2016, the estimated mortality rate is 0.72 percent. Despite the low total population, the calculated mortality rate remains within the range of other recent monitoring events. Mortality rates since 2004 are shown in Table 4-6. Since 2006, the calculated mortality rates have been below the long-term RAO target of less than 1 percent.

The following uncertainties may be involved when determining a mortality rate:

- Inaccuracies in counting dabbling duck numbers during the aerial census flights
- Variable periodicity of aerial flights, which might miss “peaks or valleys” of dabbling duck population
- Application of an average turnover rate instead of a site- and time-specific turnover rate
- Imprecision in counting WP-poisoned dabbling duck on the ground because of the following:
  - Missing carcasses along a transect
  - A small contaminated area not covered by a transect
  - Dabbling ducks that feed in a known contaminated area (with transects) but manage to fly to and perish in another area without transects (although this is unlikely based on the

physical responses to WP poisoning) or are carried to a nontransect area by a scavenger or predator

– Birds killed by causes other than WP poisoning, but for which no evidence exists to rule out WP poisoning because of post-mortem predation

– Multiple feather piles from the same mortality (distributed by predators) being counted as multiple mortalities

There are no agreed-upon procedures to quantify these uncertainties, and any estimate of uncertainty is likely questionable. However, as a highly conservative measure of uncertainty, a variability analysis is performed to calculate mortality if the fall population of dabbling ducks varies by plus or minus 20 percent of the calculated population, and if the dabbling duck mortality rate were to be 50 percent higher than counted during the ground-based transect mortality surveys.

With the potential errors for total population and mortality applied, the variability analysis indicates that the mortality rate could range from 0.3 to 1.4 percent in 2016 (Table 4-6). This is similar to other calculated ranges since 2006. Figure 4-3 plots mortality rate as a percentage of the total fall dabbling duck population from 1996 through 2016, and shows the upper and lower uncertainty estimates. Figure 4-4 plots the mortality rates alongside the annual populations. Because of the natural population variability and the considerable uncertainties in estimating both population and mortality, the mortality rate will undoubtedly vary slightly from year to year. However, the long-term trend has been a reduction in mortality resulting from WP, and the calculated mortality rate has remained below 1 percent. This reflects the substantial amount of remediation that has occurred over the last 14 years.

**Table 4-6: Estimated Mortality Rates with Uncertainties**

| Year | Fall Population Calculated from Census (using 0.83 turnover) | Fall Population Estimates (±20%) | Mortality (Observed ±50%) | Calculated Mortality Rate | Mortality Rate Range with Uncertainty |
|---|---|---|---|---|---|
| 1996 | 5,413 | 4,330 to 6,496 | 655 to 983 | 12.10% | 10.1 to 22.7% |
| 1997 | 6,063 | 4,850 to 7,276 | 240 to 360 | 4.00% | 3.3 to 7.4% |
| 1998 | 3,772 | 3,018 to 4,526 | 355 to 533 | 9.40% | 7.8 to 17.7% |
| 1999 | 1,334 | 1,067 to 1,601 | 198 to 297 | 14.80% | 12.4 to 27.8% |
| 2001 | 3,628 | 2,902 to 4,354 | 87 to 131 | 2.30% | 2.0 to 4.5% |
| 2002 | 3,112 | 2,490 to 3,734 | 203 to 305 | 6.50% | 5.4 to 12.2% |
| 2004 | 3,659 | 2,927 to 4,391 | 111 to 167 | 3.00% | 2.5 to 5.7% |
| 2005 | 2,130 | 1,704 to 2,556 | 49 to 74 | 2.30% | 1.9 to 4.3% |
| 2006 | 4,479 | 3,583 to 5,375 | 25 to 38 | 0.60% | 0.5 to 1.1% |
| 2007 | 5,279 | 4,223 to 6,335 | 35 to 53 | 0.70% | 0.6 to 1.3% |
| 2008 | 5,895 | 4,716 to 7,074 | 12 to 18 | 0.20% | 0.2 to 0.4% |
| 2009 | 4,760 | 3,808 to 5,712 | 44 to 66 | 0.90% | 0.7 to 1.7% |
| 2010 | 5,245 | 4,196 to 6,294 | 22 to 33 | 0.40% | 0.3 to 0.8% |

**Table 4-6: Estimated Mortality Rates with Uncertainties**

| Year | Fall Population Calculated from Census (using 0.83 turnover) | Fall Population Estimates (±20%) | Mortality (Observed ±50%) | Calculated Mortality Rate | Mortality Rate Range with Uncertainty |
|---|---|---|---|---|---|
| 2011 | 2,695 | 2,156 to 3,234 | 14 to 21 | 0.50% | 0.4 to 0.9% |
| 2012 | 2,239 | 1,791 to 2,687 | 22 to 33 | 0.98% | 0.4 to 1.8% |
| 2016 | 1,535 | 1,228 to 1,842 | 6 to 17 | 0.72% | 0.3 to 1.4% |

## 4.3 Institutional Controls and Other Site Restrictions

During monitoring activities, field personnel did not observe any activities or impacts indicating that the existing ICs (specifically, access control measures) are not effective. The site access gates remained locked, and there were no signs of attempted access at any other locations.

In addition, no signs of new impact craters were observed during the monitoring period from September 1 through final demobilization activities on October 18, 2016.

# 5.0 CONCLUSIONS

This section describes the status of progress toward the achievement of the RAOs based on reduction of dabbling duck mortality (as a percentage of the population), and also discusses the remedial success relative to the reduction in areas with contaminated sediment. The effectiveness of current ICs is also summarized.

## 5.1 Status of Progress toward Achievement of Remedial Action Objectives

As described in Section 1.0, the OUC ROD for XU022 (CH2M HILL, 1998) included two RAOs based on reducing the mortality rate of dabbling ducks attributable to WP. The RAOs included a short-term objective to reduce the mortality rate to less than 50 percent of the 1996 mortalities, estimated at 1,000 individuals, within 5 years (by 2003), and a long-term objective to reduce the mortality rate to less than 1 percent of the migrating population within 20 years (by 2018).

As presented in Table 4-6, Figure 4-3, and Figure 4-4, the mortality rate of dabbling ducks at XU022 indicates that both RAOs have been achieved. Refinement of the mortality model in 2005 reduced the calculated 1996 number of mortalities from 1,000 to 655 dabbling ducks (Bigl and Collins, 2007). Therefore, to meet the short-term RAO, the allowable number of dabbling duck deaths attributable to WP needed to be less than 327 by 2003. As shown in Table 4-4, dabbling duck mortality rates since 1999 have been less than this target number. Based on the mortality data, the short-term RAO was met.

The calculated mortality rate has been below 1 percent since 2006, meeting the long-term RAO within 8 years rather than 20 years as allowed by the RAO. The upper bound of the conservative estimated range also was below 1 percent in 2008, 2010, and 2011. Overall, dabbling duck mortality resulting from WP poisoning has decreased substantially in ERF since remedial activities began.

To ensure the continued success of the remedial actions at XU022, periodic monitoring will continue. The 2011 Memo to Site File (USAF, 2011) states that after 2012, monitoring will be conducted during years preceding 5-year reviews. The 2016 event was conducted in preparation for the 5-year review that is scheduled for February 2018. Mortality monitoring will next be conducted in 2021 in preparation for the February 2023 5-year review (Table 5-1).

## Table 5-1: Modified Remedial Action Schedule, 2016-2022

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| **Monitoring** | | | | | | | |
| M1. Dabbling duck mortality surveys using telemetry (1999 through 2004) and ground-based surveys (2005 through present) | X | | | | | X | |
| M2. Aerial waterfowl surveys | X | | | | | X | |
| M3. WP monitoring of treated ponds | X | | | | | X | |
| M4. WP composite sampling in untreated areas | This element is complete, conducted from 1999 to 2003 to identify areas of WP contamination; could be reinstated if new areas of contamination are suspected. | | | | | | |
| M5. GIS database management | X[a] | X[a] | | | | X[a] | X[a] |
| M6. Pond surveys, ground truthing, limited aerial survey | This element has been removed from the revised schedule. | | | | | | |
| M7. Aerial photography and interpretation | X[b] | | | | | X[b] | |
| M8. Mapping of physical habitat changes and vegetation rebound | X[b] | | | | | X[b] | |
| **Treatment** | | | | | | | |
| T1. Pond pumping treatment (active) | Active pumping occurred through 2007. This element has been discontinued because all identified areas of WP that could be treated with pumping and drying have been successfully remediated. | | | | | | |
| T2. Cap and fill application | | X[c] | | | | | X[c] |
| T3. Cap and fill integrity inspection | X[d] | | | | | X[d] | |
| T4. Hazing (contingency) | This element was intended to deter waterfowl use of WP-contaminated areas prior to remediation, and was discontinued in 1999. | | | | | | |

[a]GIS database management, scheduled for the year following mortality studies and sediment sampling according to the 2011 Memo to Site File (USAF, 2011), actually begins when data collection for mortality and sediment monitoring tasks (under items M1, M2, M3, M4, and T2) occur. As a result, this item is included for both years of each monitoring event.

[b]Based on the 2011 Memo to Site File, item M8 (and therefore associated item M7) was to be discontinued after 2012 unless major land use or habitat changes had occurred. No such changes have occurred since 2012; therefore, these items did not occur in 2016 and are not likely to be required in 2021.

[c]Cap and fill application (T2) will occur the year following sediment sampling activities if the cap and fill integrity inspections (T3) indicate that areas of WP-contaminated sediments are present and pose a threat to dabbling ducks. Results of 2016 cap and fill integrity inspections indicate that caps are currently effectively preventing access to WP-contaminated sediments.

[d]Cap and fill integrity inspection, conducted by sampling cap perimeters to determine whether targeted WP-contaminated sediments had been successfully covered, was scheduled for 2017 (and by extrapolation, 2022) according to the 2011 Memo to Site File, but is completed during the same time period as other sediment sampling. This allows preparation for possible capping operations (if areas of WP contamination are identified) the following winter/spring (February in recent years) when ice cover allows the heavy equipment to access the wetland without damaging the habitat.

## 5.2 White Phosphorus-Contaminated Sediment

Although reduction or elimination of WP-contaminated sediments with concentrations above any specific level is not a specific RAO for this project, the increase of areas considered successfully remediated (where accessible sediment no longer has concentrations of WP capable of causing dabbling duck mortalities) is a positive measure of the success of the response actions. The 1998 ROD identified 57 acres of pond areas as contaminated or potentially contaminated at ERF; Figure 5-1 shows the status of ponds at XU022 at the time of the ROD (CH2M HILL, 1998). Monitoring activities performed since 1999 have indicated that some areas previously thought to be contaminated were not, whereas other areas thought to be uncontaminated were contaminated. The current revised estimate of the total area that had been contaminated by WP (before treatment) is approximately 47 acres. Pumping and draining remediation activities have successfully treated most of those contaminated 47 acres. Smaller hot spots with WP concentrations above the target of 1 µg/g in areas that could not be drained or pumped consisted of approximately 0.5 acre; these areas were remediated through capping. Figure 1-2 shows the current status of ponds at XU022.

In 2016, only one sediment sample, from the perimeter of cap 04DIS97, contained detectable WP. The concentration, 0.0017 µg/g, was below the identified project trigger value. WP was not detected in any of the grid samples from the ponds. Sediment sampling results indicate that previously contaminated pond areas remain uncontaminated, and that the installed caps have been adequately placed to cover the identified areas of sediment with contamination at concentrations capable of causing mortalities in dabbling ducks.

## 5.3 Institutional Controls and Other Site Restrictions

Based on field observations, the current ICs and other site restrictions are continuing to prevent unauthorized access and unnecessary damage to the wetland habitat. During monitoring activities, field personnel did not observe any activities or impacts indicating that the existing ICs (specifically, access control measures) are not effective. The site access gates remained locked, and there were no signs of attempted access at any other locations. ICs will remain in place as long as hazardous substances remain onsite at levels that preclude unrestricted use.

In addition, no signs of new impact craters were observed during the monitoring period from September 1 through final demobilization activities on October 18, 2016. This indicates that restrictions on firing within the range (Army, 2001; Army, 2005) also continue to be effective in protecting the wetland habitat.

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# Figures

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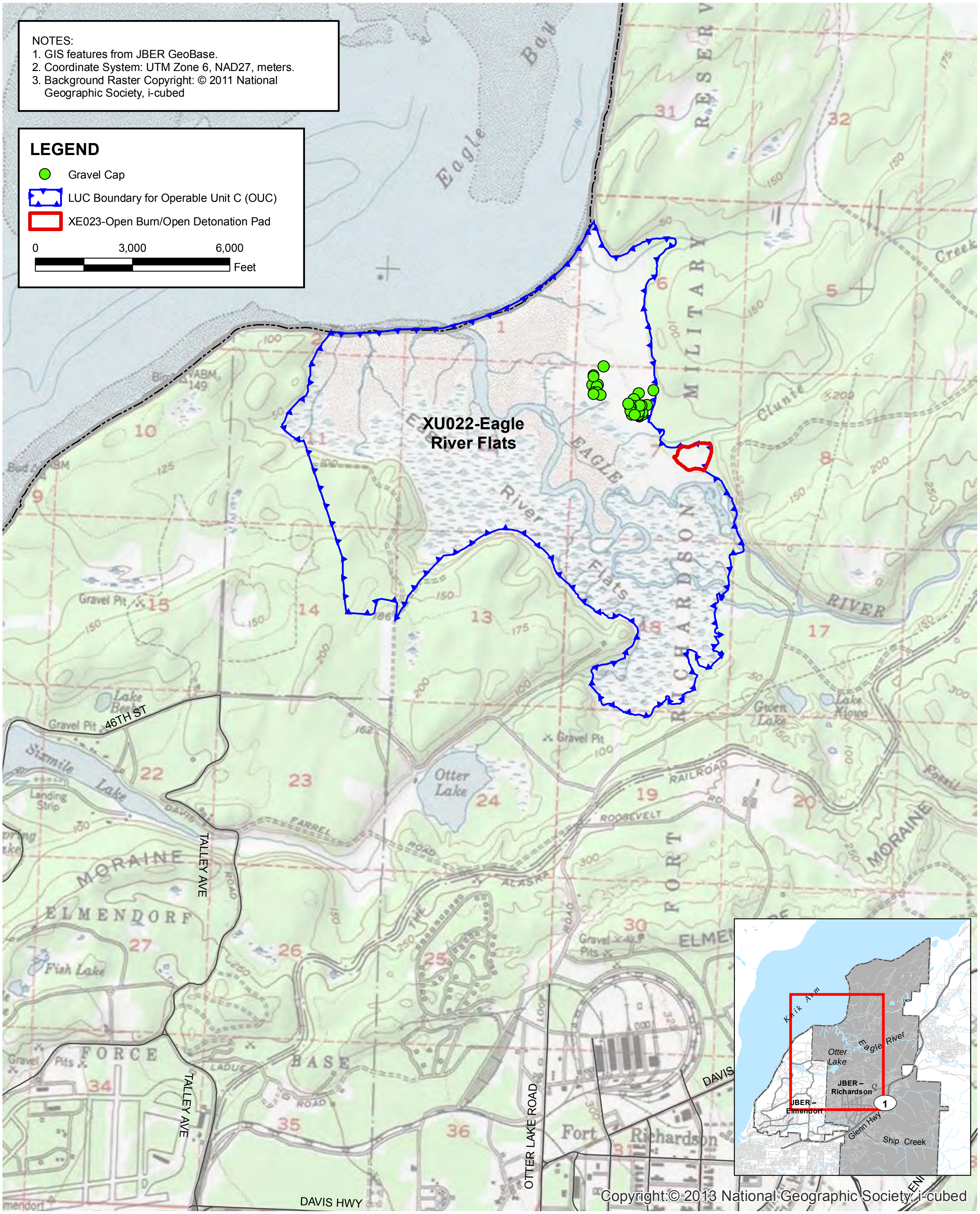


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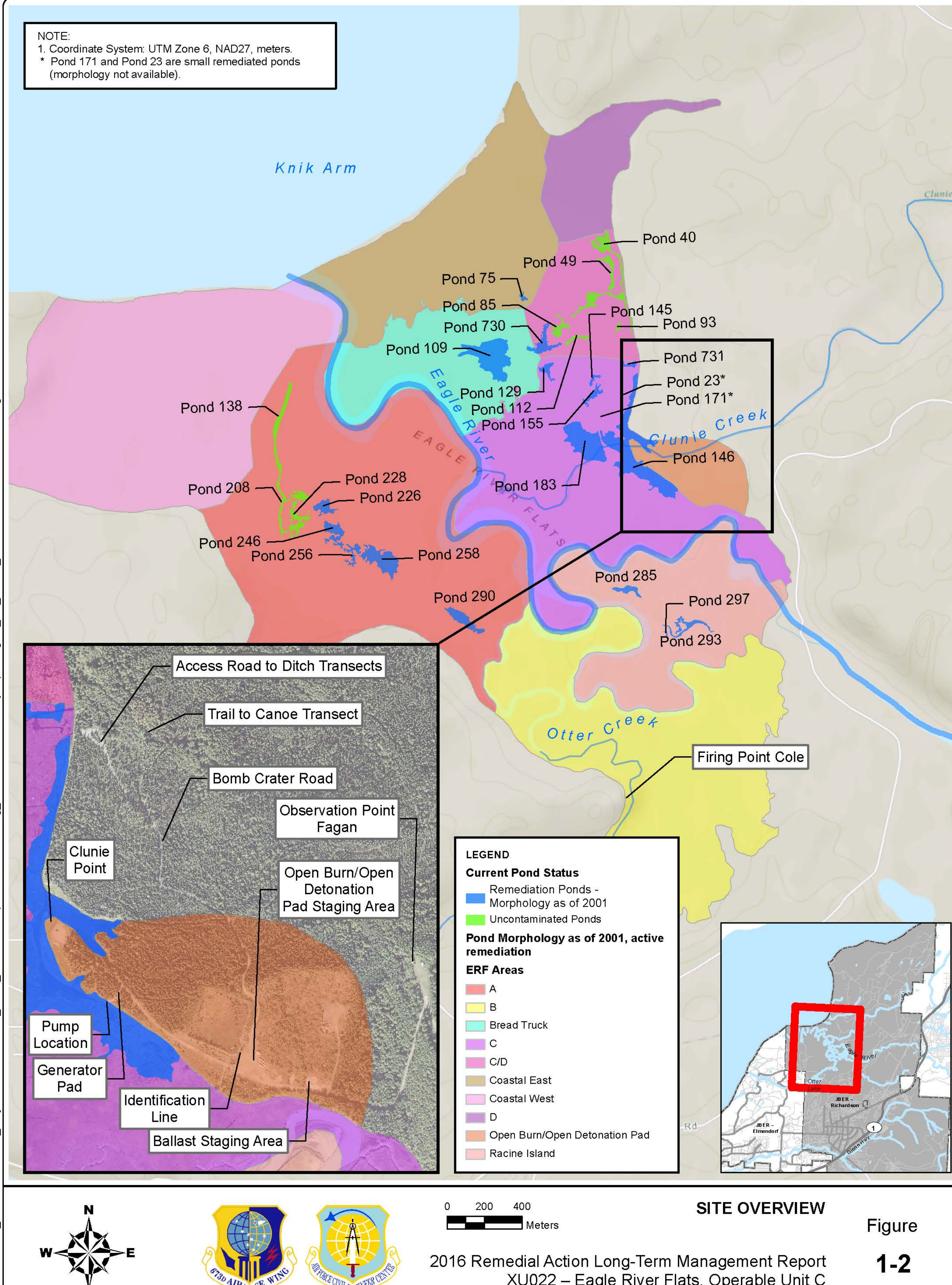
## SITE LOCATION

2016 Remedial Action Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure

**1-1**

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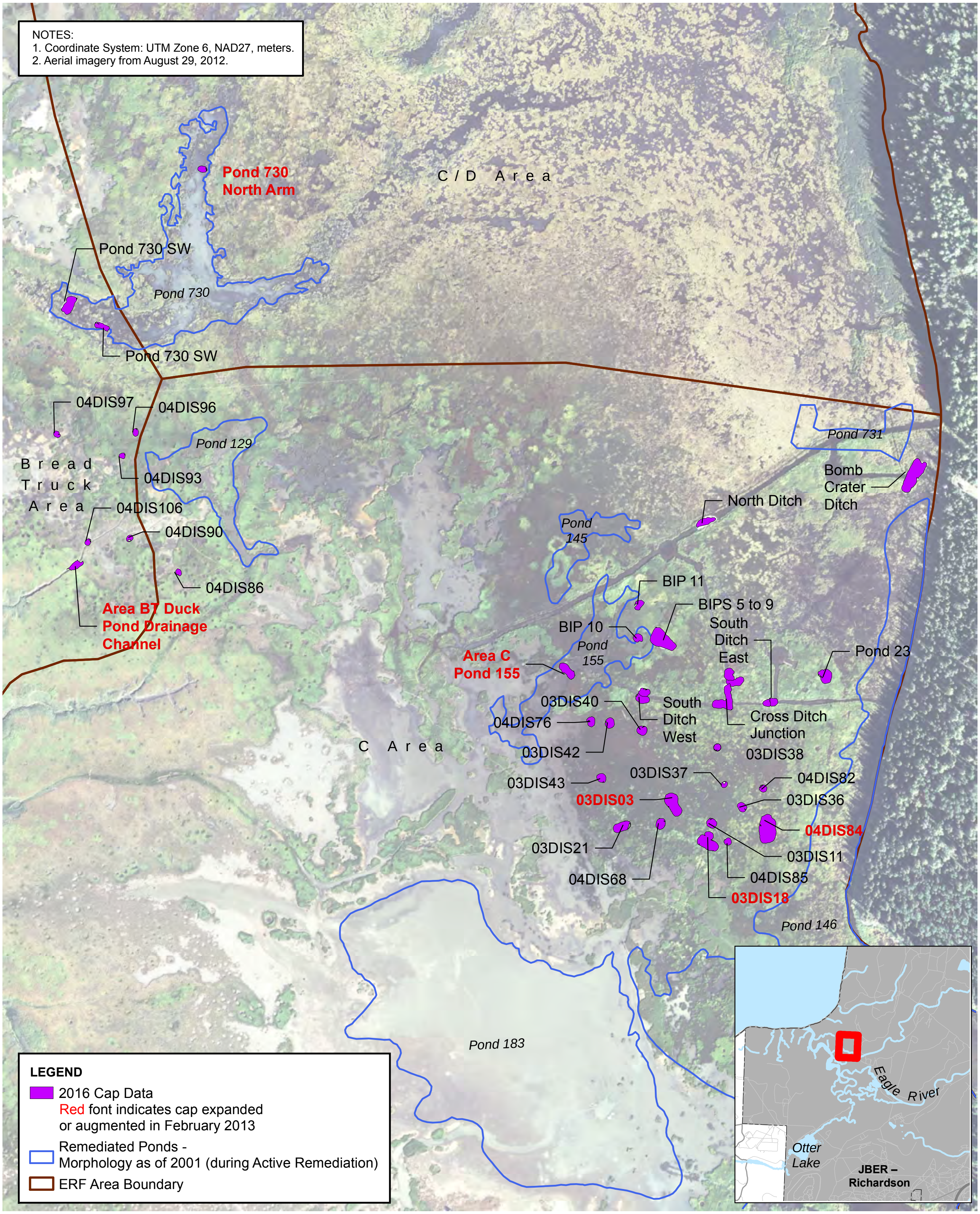
**SITE OVERVIEW**

2016 Remedial Action Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure
**1-2**

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**CAP LOCATIONS**

2016 Remedial Action Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure
**2-1**

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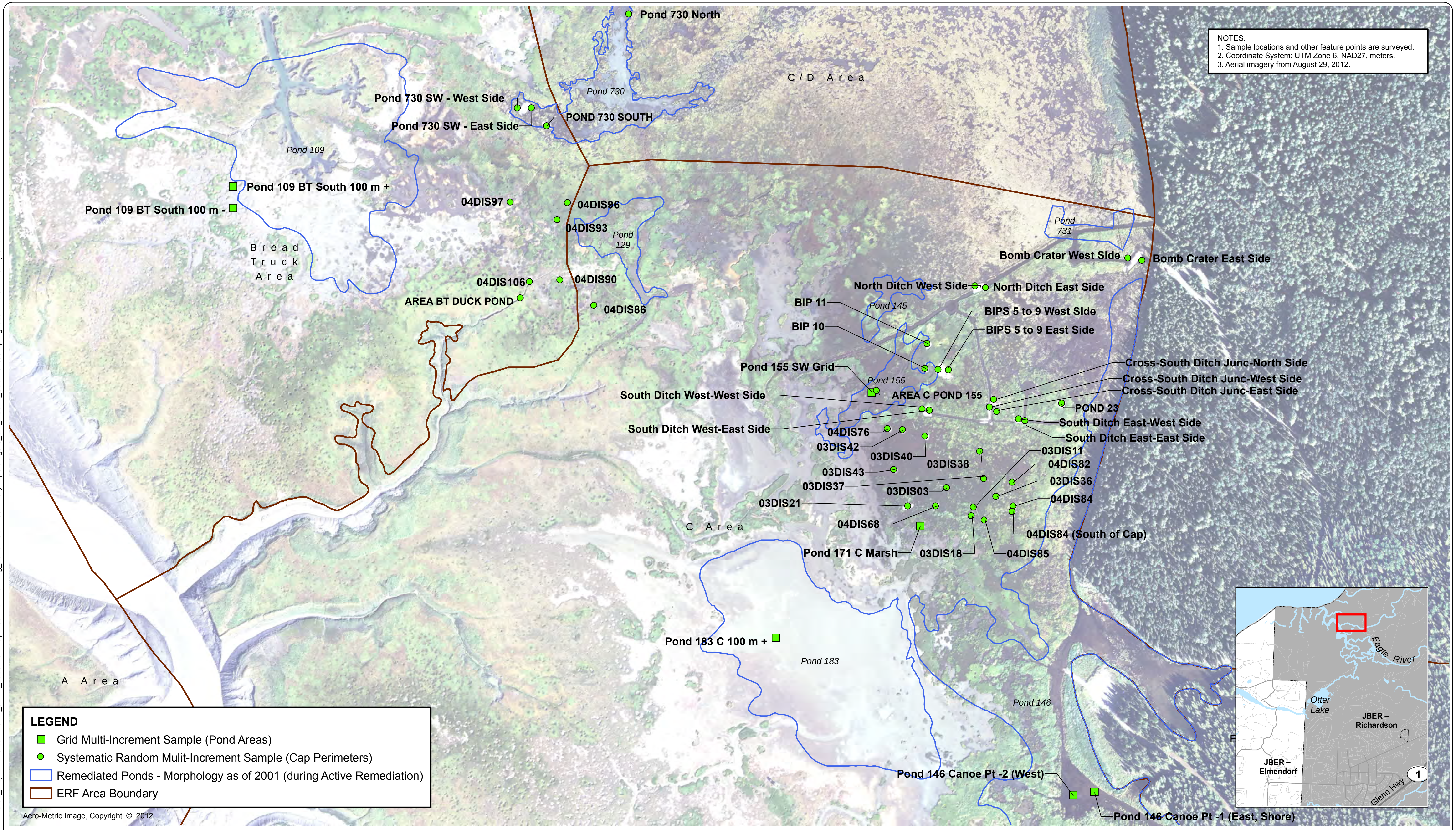


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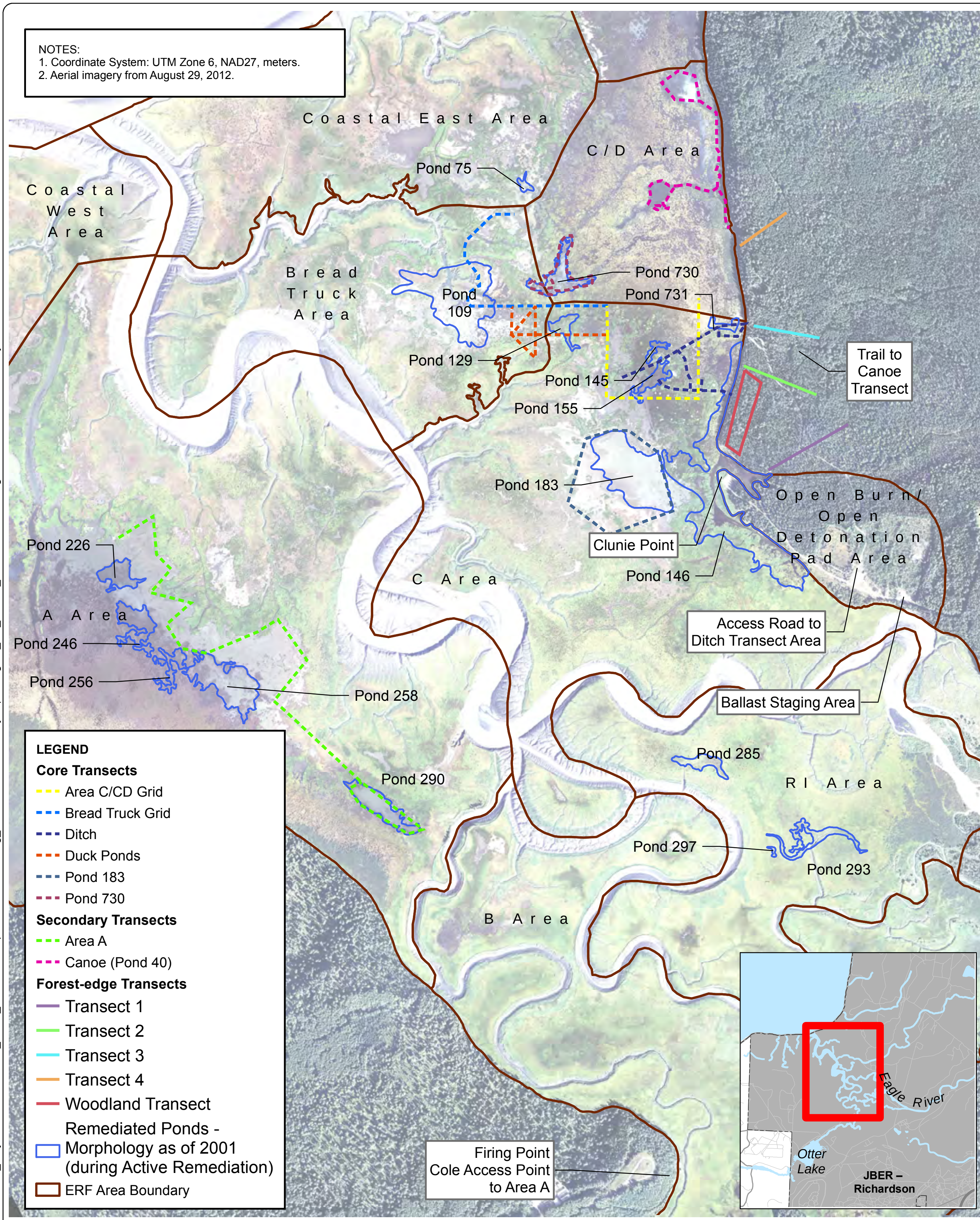
**SEDIMENT SAMPLING LOCATIONS**

2016 Remedial Action Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure
**3-1**

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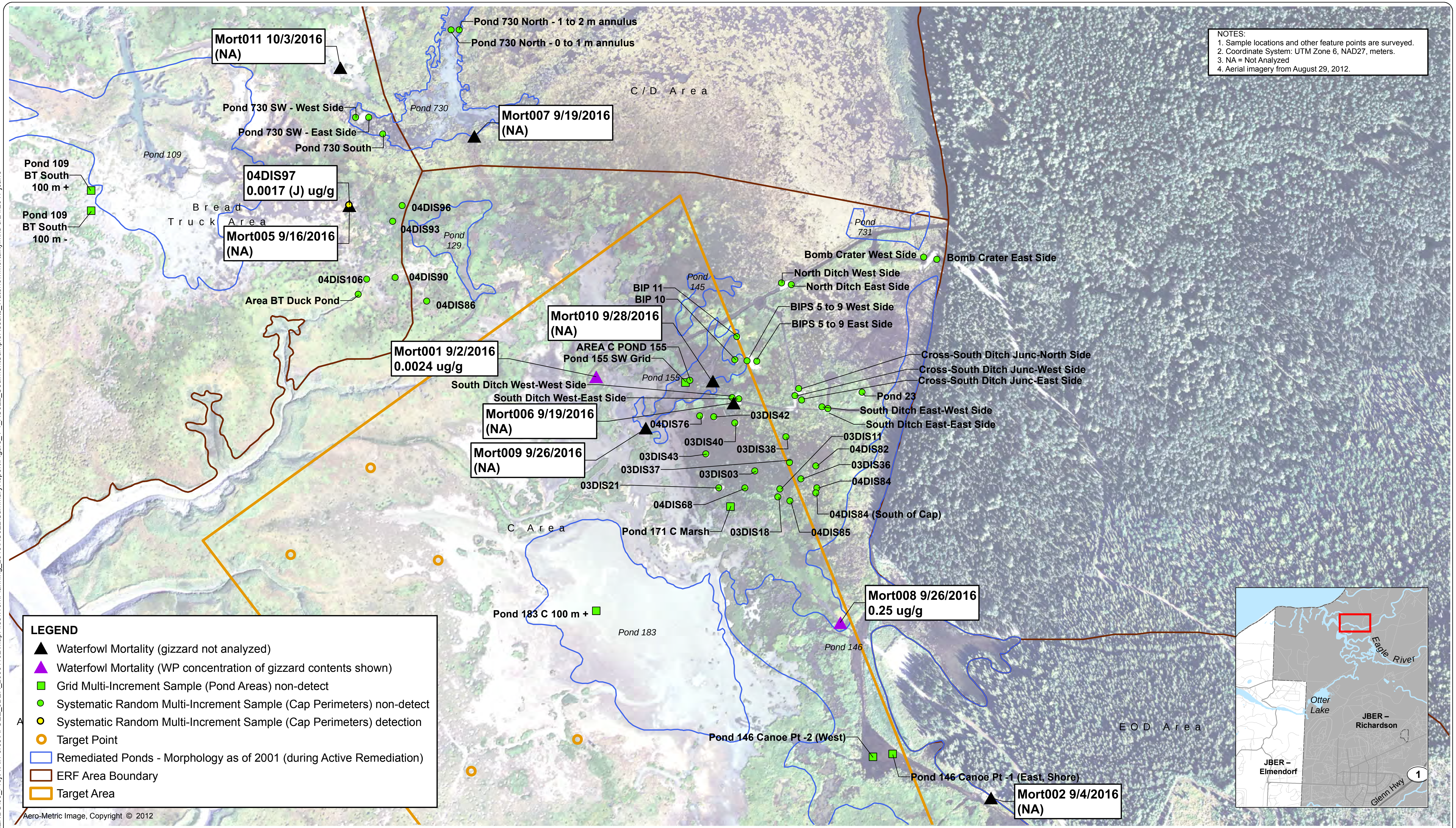
**DABBLING DUCK MONITORING TRANSECT LOCATIONS**

2016 Remedial Action Long -Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure

**3-2**

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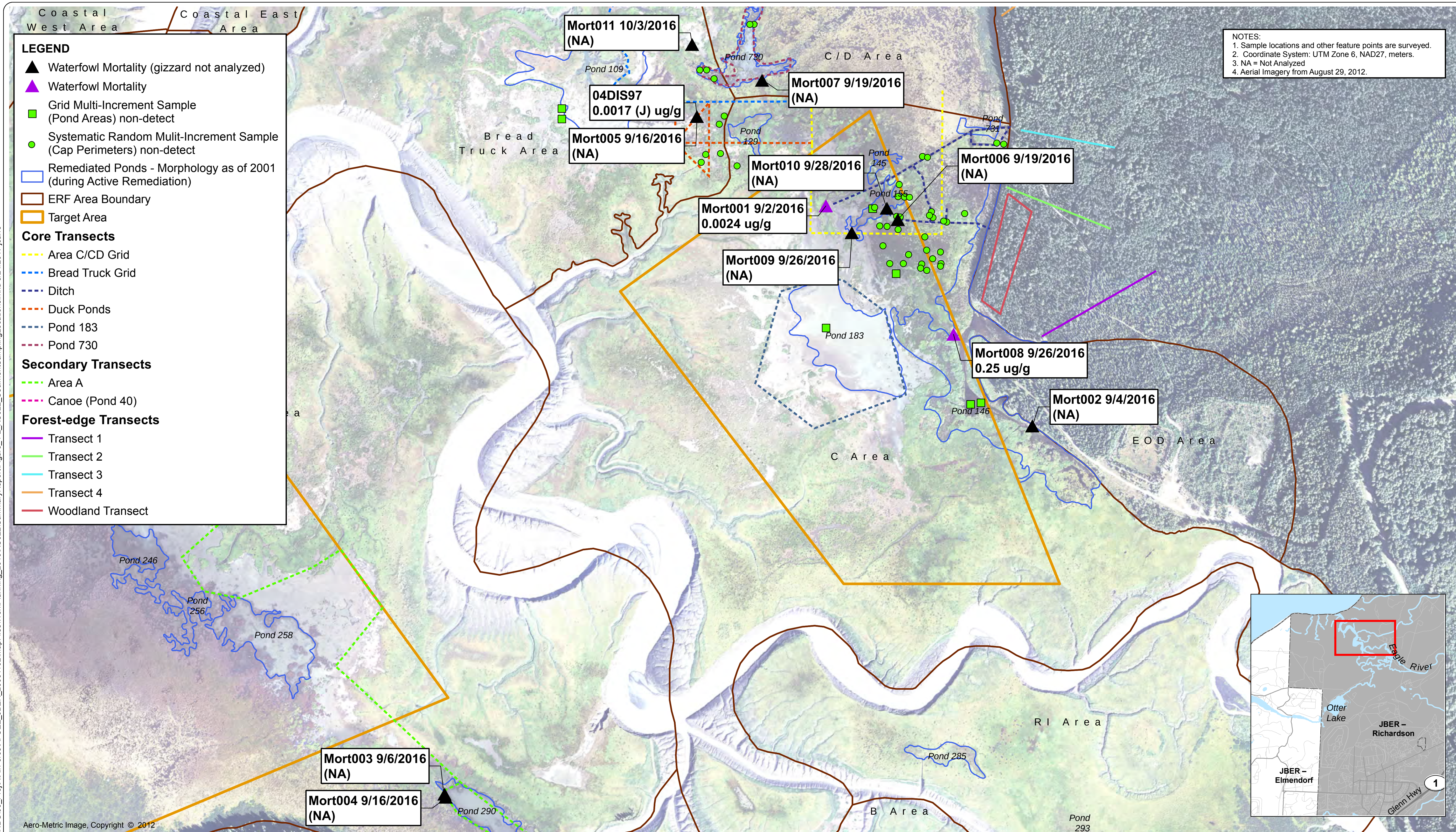
**2016 SEDIMENT SAMPLE LOCATIONS WITH DABBLING DUCK MORTALITY MONITORING RESULTS - AREAS C, C/D, AND BREAD TRUCK**

2016 Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure
**4-1**

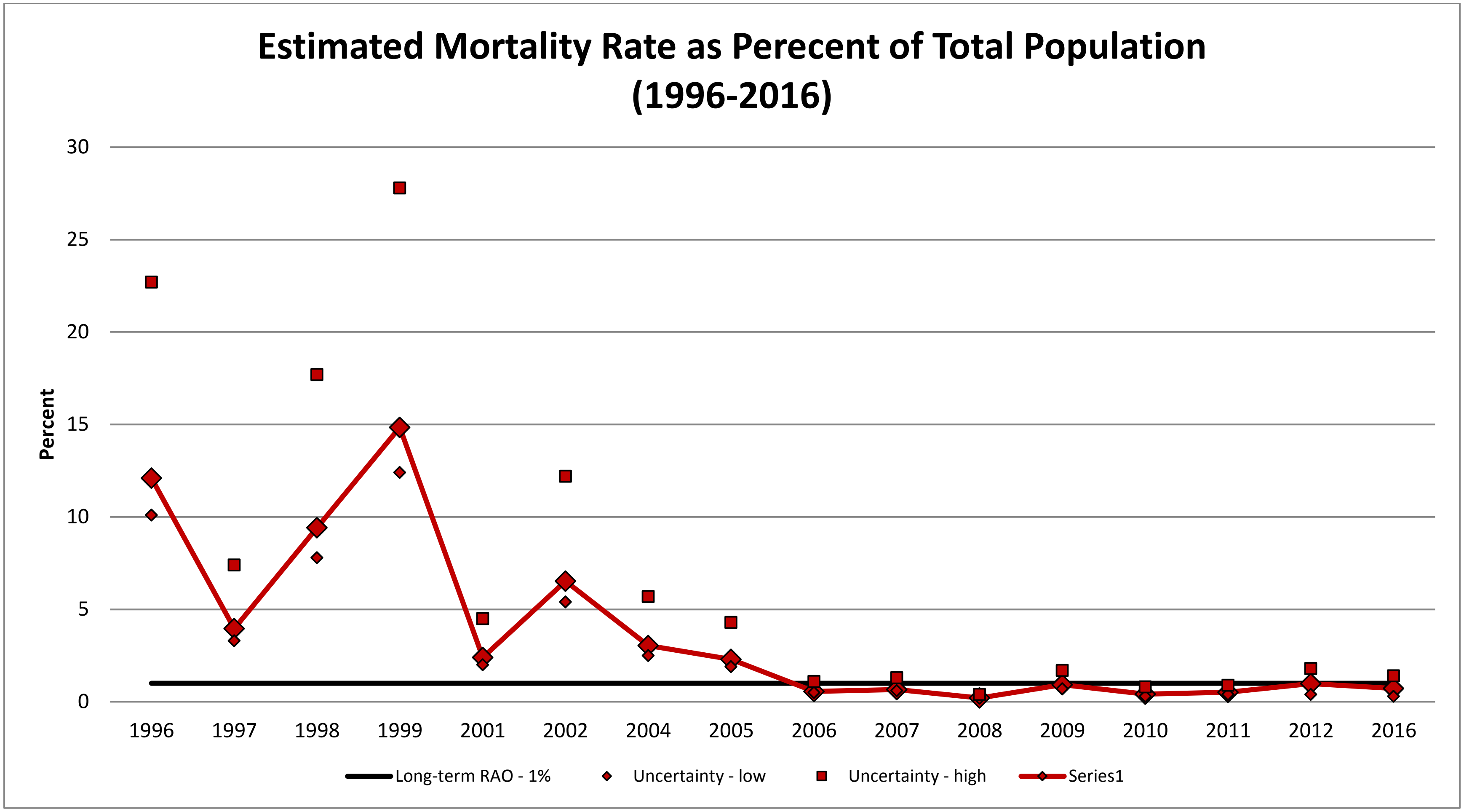



**2016 SEDIMENT SAMPLE LOCATIONS WITH DABBLING DUCK MORTALITY MONITORING RESULTS – SITEWIDE**

2016 Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf-Richardson, Alaska

Figure **4-2**

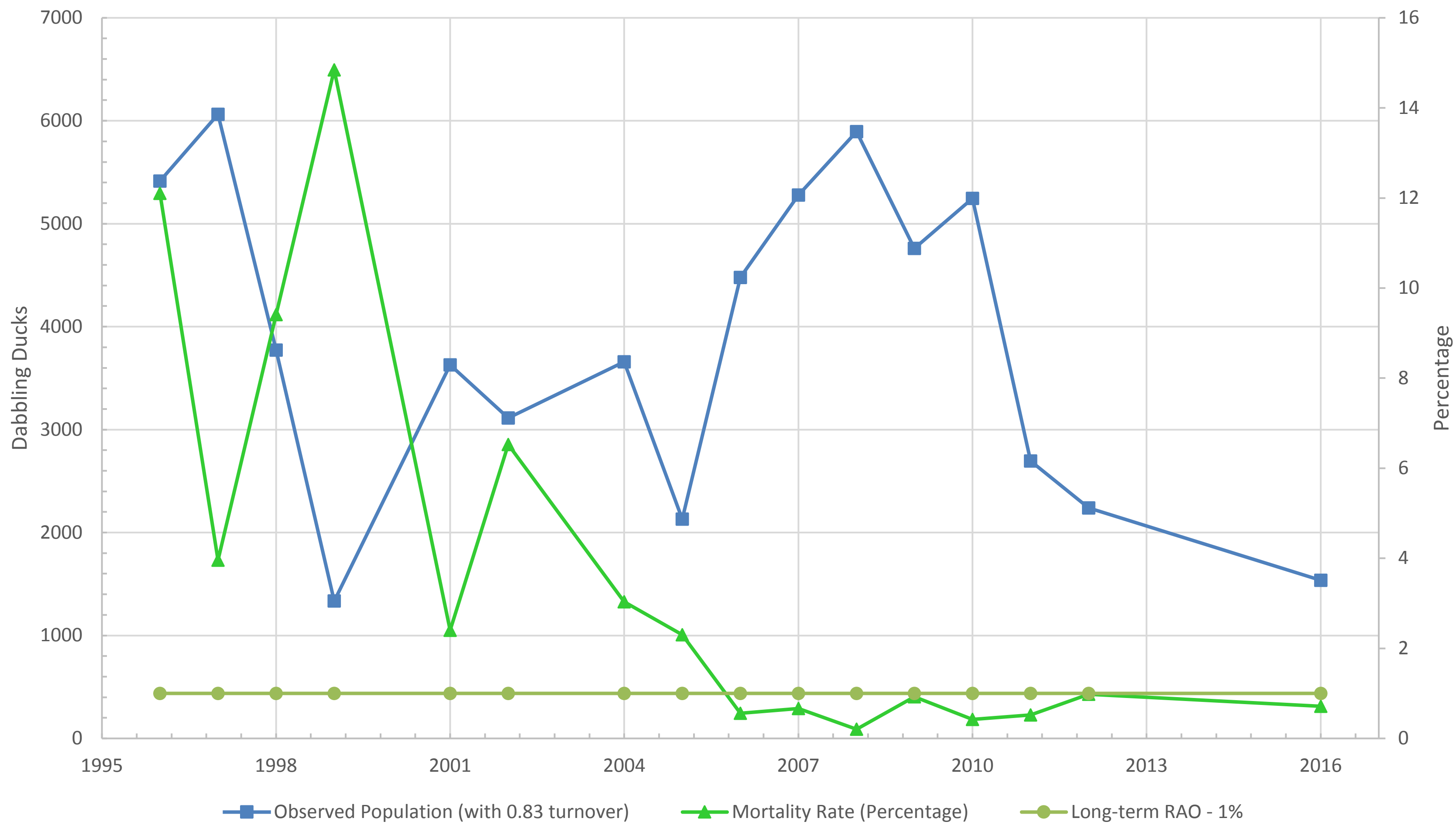
**Figure 4-3: XU022 Mortality Rates Since 1996**

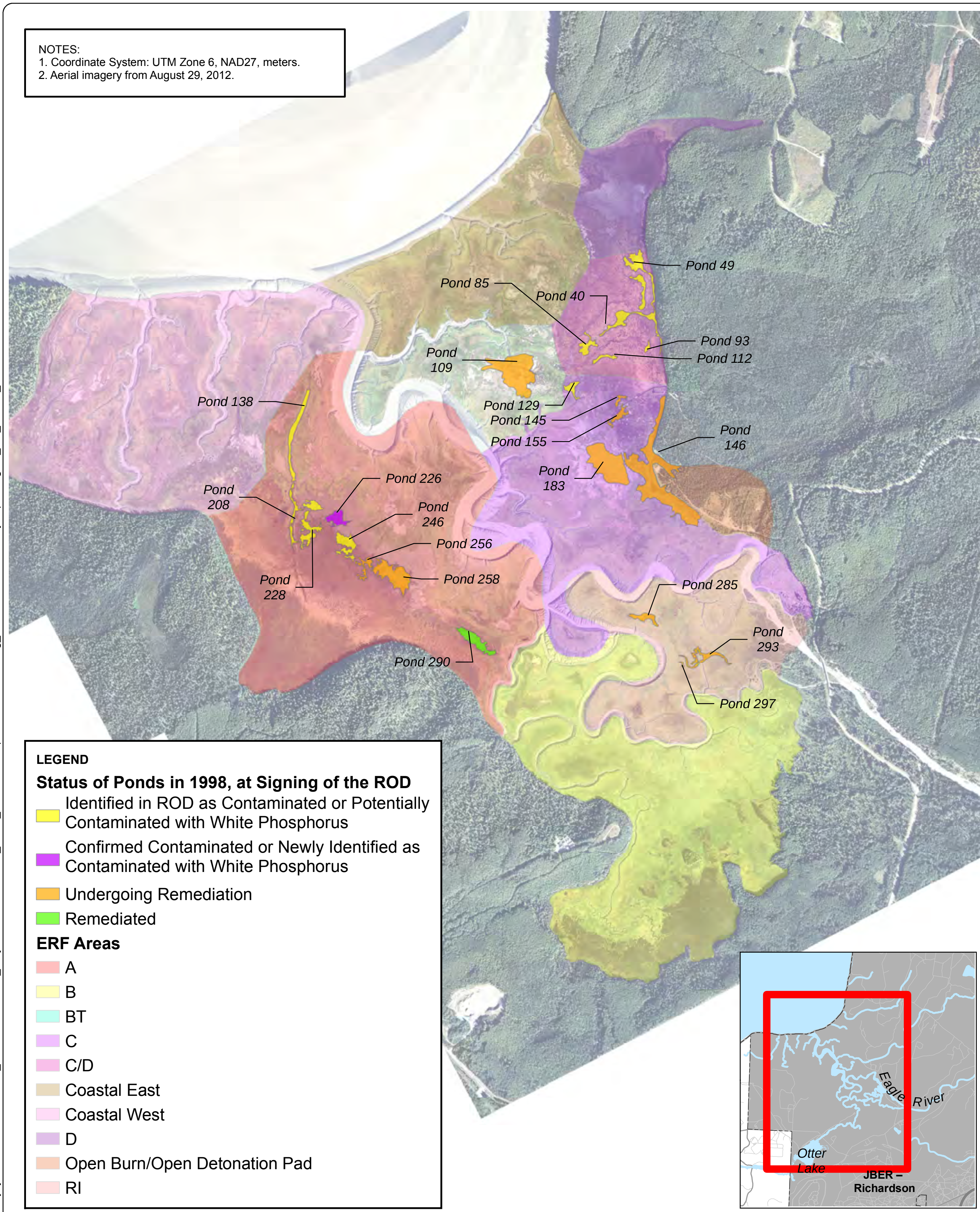



Note:

Mortality monitoring not performed in 2000 and 2003

**Figure 4-4: Comparison of Observed Total Dabbling Duck Populations with Mortality Rates (Percentage) (1996-2016)**






**POND STATUS, 1998**
**(AT SIGNING OF THE ROD)**

2016 Long-Term Management Report
XU022 – Eagle River Flats, Operable Unit C
Joint Base Elmendorf Richardson, Alaska

Figure
**5-1**

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# Appendix A
# Memorandum to the Site File, Operable Unit C – Eagle River Flats Impact Area, 23 November 2011

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**DEPARTMENT OF THE AIR FORCE**
**673D AIR BASE WING**
**JOINT BASE ELMENDORF-RICHARDSON ALASKA**

23 November 2011

**MEMORANDUM TO THE SITE FILE**

**Site Name and Location**

Operable Unit C - Eagle River Flats Impact Area
Joint Base Elmendorf-Richardson

**Statement of Purpose**

The purpose of this Memorandum to the Site File is to present a non-significant or minor change to the Record of Decision (ROD) for Eagle River Flats (ERF) - Operable Unit C (OUC), now part of Joint Base Elmendorf-Richardson (JBER). This site was originally part of Fort Richardson, Alaska but, in October 2010, Fort Richardson was joined with Elmendorf Air Force Base to become Joint Base Elmendorf-Richardson.

This Memorandum to the Site File was prepared in accordance with the *EPA Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (July 1999, Section 7.3.1 and Highlight 7-1),* and will become part of the administrative record for OUC and JBER.

**Regulatory History, Site Description, and Selected Remedy**

**Regulatory History**

Fort Richardson, Alaska was proposed for the National Priorities List (NPL) in June 1993 and placed on the NPL in August 1994. On December 20, 1994, a Federal Facilities Agreement negotiated between the US Army, EPA, and ADEC established the framework and schedule for all CERCLA activities conducted at Fort Richardson. 125 potential source areas were identified at Fort Richardson and 79 of those were selected for No Further Action. The remaining 46 source areas were either grouped into one of four operable units (A-D) or were designated for parallel-track actions pursuant to a Two Party Agreement between the Army and ADEC. OUE, a fifth operable unit, was designated in the OUD ROD signed in 2000. Eagle River Flats Impact Area and the adjoining OB-OD Pad (a RCRA unit) were designated as Operable Unit C.

The ROD for OUC was signed by the US Army, US Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC) on September 30, 1998. It was prepared in accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Chapter 40 of the Code of Federal Regulations (CFR), Section 300.430 of the National Oil and Hazardous Substances Pollution Contingency Plan.

**Site Description**

ERF is an artillery and mortar impact area located at the mouth of Eagle River where it flows into Knik Arm. The ERF is an estuarine salt marsh approximately 2,160 acres in size. ERF has been in use by the US Army since the early 1940's.

Unusually high mortality of dabbling waterfowl at ERF was discovered in the early 1980's, resulting in a series of studies to determine the cause. Initial investigations began around 1982, but it was not until late in 1990 that white phosphorus (WP) was determined to be the causative agent in the death of dabbling waterfowl. WP particles had been dispersed into the impact area during detonation of specific smoke munitions. Dabbling waterfowl, such as teal and mallards that feed mainly on seeds and insects in shallow pond bottom sediments, consumed WP particles while grazing for food, which resulted in mortality.

**Selected Remedy**

The selected remedy outlined in the ROD was to reduce white phosphorus contamination by draining ponds and other water bodies with pumps in an effort to dry out the contaminated sediments causing the WP to sublimate and oxidize.

Two temporal remedial action objectives (RAOs) were established for OUC as follows:

1) Within 5 years of the ROD being signed, reduce the dabbling duck mortality rate attributable to white phosphorus to 50 percent of the 1996 mortality rate attributable to white phosphorus. Radio tracking and aerial surveys suggest that about 1,000 birds died from white phosphorus at ERF in 1996. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 500.

2) Within 20 years of the ROD being signed, reduce the mortality attributable to white phosphorus to no more than 1 percent of the total annual fall population of dabbling ERF ducks. Currently, that population is about 5,000. Therefore, the allowable number of duck deaths from white phosphorus would be approximately 50. This long-term goal could be adjusted based on future population studies conducted during the monitoring program.

The original sequence and schedule for monitoring and maintenance activities that were to be conducted at ERF are presented in Tables 7-1 and 7-2 of the OUC ROD. However, the schedule that was published in the ROD was primarily for cost estimation purposes, and the agencies understood that minor modifications would almost invariably be necessary as active remediation progressed.

Remedial action (active pond pumping/draining) began in 1999. The short-term RAO was achieved after one year of the start of remedial action and the long-term RAO was first achieved in 2006, as well as during subsequent years. The consistent downward trend in mortality since year 2000 is a strong indication of the success of the selected remedy, as well as the strength and reliability of the data. The mortality monitoring data used as a basis for this decision is presented in Table 1. The 2011 data set is not yet complete, but 14 waterfowl mortalities were detected and attributed to white phosphorus. Based on preliminary waterfowl population data, the projected mortality rate for 2011 is 0.3%, less than the long-term RAO.

**Table 1. Dabbling Duck Mortalities - 2004 through 2010**

| ITEM | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Observed Dabbling Duck Population | 3,659 | 2,130 | 4,479 | 5,279 | 5,895 | 4,760 | 5,245 |
| Observed Mortality | 111 | 49 | 25 | 35 | 12 | 44 | 22 |
| Mortality Rate | 3.0% | 2.3% | 0.6% | 0.7% | 0.2% | 0.9% | 0.4% |

**Basis for this Document**

During a meeting in January 2008, the Remedial Project Managers (RPM) agreed that in light of the accelerated achievement of the long-term RAO, as well as previously agreed to modifications to the treatment schedule, the remedial action schedule outlined in the ROD needed to be updated. Based on this agreement, a modified schedule was incorporated into the work plan for the 2008 season and later incorporated in Table 1.1 of the *2009 Long Term Monitoring Work Plan for Operable Unit C - Eagle River Flats*. The following sections discuss the major components of the selected remedy and compare the ROD schedule to the currently proposed LTM schedule (see Table 2).

**Element M1 (Waterfowl telemetry and mortality monitoring):** The initial estimate was that active pond draining would be completed within 5 years of signing the ROD (1999-2003) and that mortality monitoring would be conducted for 3 additional years to ensure the RAOs had been achieved. Subsequent monitoring was to be conducted in years 10, 15, and 20. However, active pond draining was conducted from 1999 through 2007, necessitating continued mortality monitoring. Additionally, as documented in this memorandum, the RPMs agreed that 7 years of mortality monitoring would be necessary to establish a long-term trend. The currently proposed LTM schedule is to conduct annual mortality monitoring through 2012 and then during years preceding 5-year reviews. Mortality data collection is conducted in the fall and the data is generally not processed until the December time frame. Since the follow-on 5-year review date is in February 2018, it will be necessary to conduct monitoring (as well as Elements M2 and M3) in 2016 to ensure the data is available in 2017 for incorporation into the 5-year review.

**Element M2 (Aerial waterfowl surveys):** Since this element is essential to determining waterfowl mortality, the rationale for the change in schedule for this element is the same as discussed for element M1.

**Element M3 (White phosphorus monitoring of treated ponds):** The schedule for this element corresponds to the schedule for element M1 and therefore the rationale for the change in schedule for this element is the same as discussed for element M1.

**Element M4 (White phosphorus composite sampling in untreated areas):** The ROD estimated that sampling to detect WP in untreated areas would be conducted for 5 years (1999-2003). The Army conducted sampling for 6 years, but as remediation continued the amount of untreated area decreased to the point that elements M4 and M3 became essentially the same effort. DOD has met the requirements of ROD by periodically conducting this task.

**Element M5 (GIS database management):** GIS database management has tracked with the schedule for Element M1 as the ROD required this element to be conducted as long as site-specific monitoring data was being collected. GIS database management is also a key component to managing institutional controls at this site and thus the schedule will continue to track with the other data elements.

**Element M6 (Ponds survey, ground truthing, limited aerial survey):** This element was initially incorporated as some means to assess mortality until the long-term RAO was achieved (projected to be 2018). However, the scope of this element is not defined in the ROD and the meaning of the term "limited" is therefore unclear. The long-term RAO has been consistently met since 2006 and monitoring is being conducted under Elements M1, M2, and M3. Therefore this element of the remedy is no longer necessary. Because of redundancy in the schedule between this and other elements and because the long-term RAO was achieved starting in 2006 as opposed to the project 2018 date, this element will be removed from the ROD schedule.

**Element M7 (Aerial photography and interpretation):** The timing for conducting this element has not tracked with the proposed schedule in the ROD (every other year for 10 years) for the same reasons noted for Element M1. However, DOD has met the requirements of ROD by periodically conducting this task. Aerial photography was collected during the initial 6 years of active treatment and then again in 2008 and 2010. The imagery was to be used to assess changes to vegetation and habitat as defined by Element M8. The proposed schedule is to collect imagery again in 2012 and develop updated habitat/vegetation maps under Element M8.

**Element M8 (Mapping of physical habitat changes and vegetation rebound):** The timing for conducting this element has not tracked with the ROD schedule. However, DOD has met the substantive requirements of the ROD by periodically assessing changes and updating the habitat maps. Initial maps were developed in 2000 and updated in 2004 and 2008, with the proposal to update the maps again in 2012. No dramatic or rapid changes to the habitat within ERF have been noted, nor are they expected. Unless changes in land use are implemented, 2012 will be the last time the maps would be updated.

**Element T1 (Pond pumping treatment):** The estimate at the time the ROD was written was that it would take 5 years of dewatering the ERF wetland to remediate WP contamination. Wet conditions (high precipitation and flooding tides) during several years resulted in limited sediment drying, and also previously undetected WP was discovered in the C and C/D areas. These areas were also difficult to drain and sediment drying was slower than anticipated. These factors lead to the decision to extend active pond pumping through the 2007 field season. This decision resulted in subsequent modification to the schedules for almost all other elements of the remedy.

**Element T2 (Cap and fill application):** According to the ROD schedule, cap and fill operations were supposed to take place during the final year (2003) of pond pumping. However, as discussed, pond pumping treatment (T1) was extended through 2007 and capping did not take place until that time. The proposed schedule would extend cap and fill operations through 2012 and then only during years prior to the 5-year reviews, as necessary, to address any newly identified WP-contaminated areas that were not successfully remediated.

**Element T3 (Cap and fill integrity inspection):** The rationale for the change in schedule for this element is the same as discussed for element T2.

**Element T4 (Hazing):** Active hazing was conducted in 1998 and in 1999 using propane cannons, but because observations indicated that equipment and personnel operating within the treatment area had the affect of deterring bird use of the ERF area the process was discontinued.

**Documentation of Minor Modifications to the ROD Schedule**

This memorandum documents the decision by the RPMs to update and the original remedial action schedule outlined in the ROD. These minor modifications were necessary to ensure the full effectiveness of the selected remedy and do not represent a change to the substantive requirements as outline in the ROD. The currently agreed to schedule is presented in Table 2.

The RPMs agree that if the mortality rate is consistently less than the 1% identified in the ROD for seven years ending in 2012, then mortality monitoring will only be conducted at five year intervals after 2012. These five year monitoring events will precede each successive CERCLA Five Year Review. Thus, mortality monitoring will be conducted again in 2016, but not in the intervening years (2013 – 2015). Changes to the monitoring frequency may be initiated by the RPMs if site conditions change or if the protectiveness of the remedy is in question.

This change to the OUC ROD does not significantly change or fundamentally affect the remedy selected in the ROD. Therefore, no public comment is required.

Approved by:

Gary Fink, GS-13
Chief, Restoration Section

30 Nov 11
Date

**Concurrence by:**

**Bill Adams**
**US Environmental Protection Agency, Region 10**

11 - 28 - 11
**Date**

**Concurrence by:**

**Louis Howard**
**Alaska Department of Environmental Conservation**

11-25-2011
**Date**

## Table 2: Comparison of 1998 ROD Schedule to the Currently Proposed LTM Schedule

| Monitoring | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **M1. Waterfowl telemetry and mortality study** | X | X | X | X | X | X | X | X | | X | | | | | X | | | | | X |
| | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | X | | |
| **M2. Aerial waterfowl surveys** | X | X | X | X | X | X | X | X | | X | | | | | X | | | | | X |
| | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | X | | |
| **M3. White phosphorus monitoring of treated ponds** | X | X | X | X | X | | | | | | | | | | | | | | | |
| | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | X | | |
| **M4. White phosphorus composite sampling in untreated areas** | X | X | X | X | X | | | | | | | | | | | | | | | |
| | X | X | X | X | X | X | | | | | | | | | | | | | | |
| **M5. GIS database management** | X | X | X | X | X | X | X | X | | X | | | | | X | | | | | X |
| | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | X | |
| **M6. Ponds survey, ground truthing, limited aerial survey** | **This element has been removed from the revised schedule.** | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| **M7. Aerial photography and interpretation** | X | | X | | X | | X | | X | | | | | | | | | | | |
| | X | X | X | X | X | X | | | | X | | X | | X | | | | | X | |
| **M8. Mapping of physical habitat changes and vegetation rebound** | X | | | X | | | | X | | | | X | | | | X | | | | X |
| | | X | | | | X | | | | X | | | | X | | | | | X | |

| Treatment | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **T1. Pond pumping treatment (active)** | X | X | X | X | X | | | | | | | | | | | | | | | |
| | X | X | X | X | X | X | X | X | X | | | | | | | | | | | |
| **T2. Cap and fill application** | | | | | X | | | | | | | | | | | | | | | |
| | | | | | | | | | X | X | X | X | X | | X | | | | X | |
| **T3. Cap and fill integrity inspection** | | | | | X | X | X | X | | X | | | | | X | | | | | X |
| | | | | | | | | | X | X | X | X | X | | X | | | | X | |
| **T4. Hazing (contingency)** | X | X | X | X | X | | | | | | | | | | | | | | | |
| | X | | | | | | | | | | | | | | | | | | | |

**Legend**

| | |
|---|---|
| **ROD Schedule** | **From 1998 ROD, Table 2. Schedule of Activities for Selected Alternative** |
| **Proposed Schedule** | **Adapted from the 2009 LTMP, Table 1.1. Planned Long-Term Monitoring Activities** |

# Appendix B
# Field Documentation

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# Appendix B-1
# Field Logbooks

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JBER XU022 - Sediment Sampling - Grids

SEPTEMBER 13, 2016 Start: 1040
End: 1130

SAMPLE LOCATION: GRID - Pond146CanoeP1E COORDINATES

NE Northing 6801172.0
Easting 355322.0
Northing
Easting

WATER DEPTH: 3.0' SEDIMENT DEPTH: 0"-4"

SAMPLE COLLECTION METHOD: Hand Auger / push probe

SEDIMENT / SITE CONDITIONS: Submerged, firm bottom

WEATHER CONDITIONS: sunny clear, 57°, wind from SE: 7.9 max; 4.3 ave

PHOTOS: #11 (GRID) DSCN1750.JPG 10:40:11 AM

SAMPLE DESIGNATION: Pond146CanoeP1E_0916R1 → 1145 hrs
POND146CANOEP1E_0916R2 → 1150 hrs

SPL SAMPLE TIME: ~~1135~~

SAMPLE DESCRIPTION (texture, consistence, structure, color): SPL ~~Organic silt~~; firm in place, about 1% fine roots, color: gley 1 chip 2.5/10y - greenish black; organic silty-clay

PHYSICAL SETTING: OPEN WATER MARSH surrounded by emergent sedge marsh / BRACKISH TIDAL MARSH

GRID LAYOUT

| | 4 | 3 | 2 | 1 | | |
|---|---|---|---|---|---|---|
| 12 | . | . | . | . | 20.02 m | 65.68 ft |
| 11 | . | . | . | . | 18.20 m | 59.71 ft |
| 10 | . | . | . | . | 16.38 m | 53.74 ft |
| 9 | . | . | . | . | 14.56 m | 47.77 ft |
| 8 | . | . | . | . | 12.74 m | 41.80 ft |
| 7 | . | . | . | . | 10.92 m | 35.83 ft |
| 6 | . | . | . | . | 9.10 m | 29.86 ft. |
| 5 | . | . | . | . | 7.28 m | 23.88 ft. |
| 4 | . | . | . | . | 5.46 m | 17.91 ft |
| 3 | . | . | . | . | 3.64 m | 11.94 ft |
| 2 | . | . | . | . | 1.82 m | 5.97 ft. |
| 1 | . | . | . | . | 0 m | 0 ft |
| | 5.46 | 3.64 | 1.82 | 0 | | |

No visible white masses observed in any of the subsample locations

Personnel: Stacey Ré/SSC, Steve Long/FTL, Kristen Stevens, Tara Callear, Elan Edgerly - Field Technicians. Don EBersole/BSE/ UXO technician.

Weather overcast, windy, high in mid 60's.

0800 Meet at field trailer.

0815 Mob to site. Set-up for sampling.

0930 enter Pond 146. Set up sample grid

11:30 Complete sampling, back to Clunie. process sample.

(2) SEPTEMBER 13, 2016 START: 1330 END: 1410

NE Northing 6801169.0670
Easting 355302.2876
SE Northing
Easting

SAMPLE LOCATION GRID POND1410 WEST CANOE COORDINATES:

WATER DEPTH 3ft (APPROX) SEDIMENT DEPTH: 0-4"bgs

SAMPLE COLLECTION METHOD: ~~HAND AUGER~~ TC PUSH PROBE

SEDIMENT / SITE CONDITIONS: SUBMERGED; GRASSY BOTTOM; FIRM ORGANIC SILT / CLAY

WEATHER CONDITIONS: sunny, clear, 65°F; 9.1 mph max; 7.1 mph ave

PHOTOS: DSCN1755.JPG 1:32:02 PM

| | SAMPLE TIME |
|---|---|
| SAMPLE DESIGNATION: POND146CANOEP2W_0916R1 | 1435 hrs |
| POND146CANOEP2W_0916R2 | 1440 hrs |

SAMPLE DESCRIPTION: 1% FINES; GLEY 1 CHIP 3/10Y
(texture, color, structure) clay with organic silt, firm in place

PHYSICAL SETTING OPEN WATER MARSH / POND; SURROUNDED BY EMERGENT SEDGE / MARSH ; BRACKISH TIDAL MARSH

TC END 9/13/16

[NOTES BELOW ARE 9/14/16; ACCIDENTLY WRITTEN ON 9/13/16]

~~POND NOTES: GRID (AS IS) WAS ORIENTED SUCH THAT IT OVERLAYS THE CAP AND SEDGES AT POND EDGE. DECISION WAS MADE IN FIELD TO ~~RE-ORIENT~~ SHIFT THE GRID TO FALL WITHIN DUCK HABITAT. NEW GRID COORDINATES WERE ~~LOGGED~~ HEREIN AND POINTS WERE TAKEN WITH TRIMBLE. (Y) NORTHING: (X)EASTING:~~
RELOCATED 37.9 FT W FROM ORIGINAL GRID.

ISS

TC 9/14/16

12:30 S. Rei, K. Stevens and D. Ebersole head to set up Pond 146W grid, remainder of team remains to try to unlock BSE vehicle (keys inside). Set up corners of grid.
13:30 Start sampling.
14:10 Sampling complete, head to clunie to process samples.
16:00 Depart site. End of day.
(15:10 (late entry)) Set up grid for Pond 183C.

Rei

Stevens
9/13/16

SEPTEMBER 14, 2016 START: 945 END: ~~10~~20 ③

SAMPLE LOCATION: GRID POND 183 C COORDINATES NE Northing 6801325.0 Easting 355028.6 SE Northing 6801305.0

WATER DEPTH ~~ft~~ TC 12 in +/- SEDIMENT DEPTH 0-4 in bgs Easting 355028.6

SAMPLE COLLECTION METHOD: PUSH PROBE

SEDIMENT/SITE CONDITIONS: SUBMERGED; Firm bottom; clay; large open pond surrounded by emergent sedge marsh

WEATHER CONDITIONS: 50.5°F, Wind 1.7 max avg 0.9 mostly cloudy

PHOTOS: DSCN 1766.JPG, DSCN 1767.JPG } 9/13/16 3:11:30 PM - presampling staked GRID
DSCN 1768 - 1772.JPG - ACTIVE SAMPLING

SAMPLE TIME 1502 R1, 1507 R2

SAMPLE DESIGNATION

$\boxed{\text{POND183C100NA\_0916R1}}$
$\boxed{\text{POND183C100NA\_0916R2}}$

SAMPLE DESCRIPTION (texture, color, structure, consistence) ORGANIC SILT W/CLAY; GLEY1 5/5GY TRACE VF ROOTS

PHYSICAL SETTING: OPEN WATER MARSH/POND; BRACKISH MARSH; TIDAL
(See water mortality transect log for personnel, weather, etc.)
0840 Head to ERF. Check in with range control.
0920 Head to Pond 183C. Start sampling.
1030 Complete sample, head to Pond 155 SW grid.

[signature]
9/14/16

Rite in the Rain

4

SEPTEMBER 14, 2016

START: 1055
END: 1235

SE ~~NE~~ NORTHING: 815437.30m
SE EASTING: 515586.39m
SW NORTHING: 815424.26m
SW EASTING 515572.68m

SAMPLE LOCATION: POND 155 SW GRID

WATER DEPTH: APPROX ~~1-2 FT~~ 12-18IN SEDIMENT DEPTH: 0-4" BGS

SAMPLE COLLECTION METHOD: HAND AUGER / PUSH PROBE

SEDIMENT / SITE CONDITIONS: SUBMERGED; SEMI-FIRM BOTTOM W/ LAYER OF SOFT SEDIMENT ON TOP; SEDGES PREDOMINATE AT PERIMETER

WEATHER CONDITIONS: OVERCAST; OCCASSIONAL LIGHT RAIN

WIND Ø mph TEMP: 55.5°F

PHOTOS: #44, #43 SE corner; #42, #41, #40 SW corner; #37-39 Pond 155 FROM PAD (BEFORE STAKED)

SAMPLE TIME 1510 R1
1515 R2

SAMPLE DESIGNATION:

(texture, color, consistence; structure)

$\boxed{\text{POND155SWGRID\_0916R1}}$
$\boxed{\text{POND155SWGRID\_0916R2}}$

SAMPLE DESCRIPTION: ORGANIC SILT W/ CLAY; TRACE FINE ROOTS; GLEY 1 3/N

PHYSICAL SETTING: BRACKISH TIDAL MARSH; RELATIVELY SMALL POND OF SHALLOW WATER SURROUNDED BY EMERGENT SEDGE/MARSH; CAP OF COBBLED ESTIMATED 30% COVER

NOTES: ORIGINAL GRID WAS SET SUCH THAT IT CROSSED THE CAP AND SEDGES. FIELD CHANGE WAS MADE TO SHIFT GRID OFF THE CAP. COORDINATES WERE NOTED AND POINTS LOGGED IN TRIMBLE. RELOCATED 37.9 ft W OF ORIGINAL GRID (4Ft OFF PAD) NORTHING:
EASTING:

PHOTO NOTES:
#44 = DSCN 1784.jpg
#43 = DSCN 1783.jpg
#42 = DSCN 1782.jpg
#41 = DSCN 1781.jpg
#40 = DSCN 1780.jpg
#37 = DCSN 1777.jpg
#38 = DCSN 1778.jpg
#39 = DCSN 1779.jpg

1040 Arrive at Pond 155 SW grid, set up grid.
1055 Start sample collection.
1235 End sample collection. Head to Pond 171 C marsh.

[signature] 9/14/16

(5)

SEPTEMBER 14, 2016 START: 1355
END: 1435

SE NORTHING 815318.93m
SE EASTING 515648.32m
SW NORTHING 815312.81m
SW EASTING 515630.83m

SAMPLE LOCATION: POND ~~177~~ 171 C MARSH

WATER DEPTH: 1.5 ft SEDIMENT DEPTH: 0-4" bgs

SAMPLE COLLECTION METHOD: PUSH PROBE

SEDIMENT/SITE CONDITIONS: LOOSE ORGANIC SILT LAYER OVER THICK MARINE CLAY

WEATHER CONDITIONS: LIGHT RAIN MAX WIND - 2.9 mph AVG 2.0 mph TEMP 52.3°F

PHOTOS: DSCN 1786.JPG = VIEW EAST
DSCN 1785.JPG

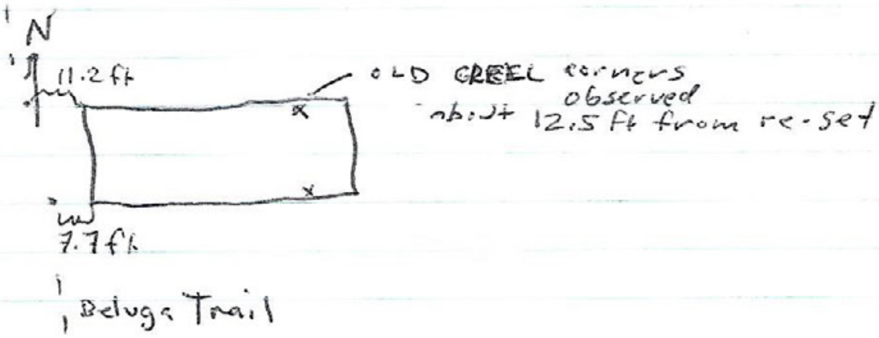
SAMPLE TIME: 1530 R1
1535 R2

SAMPLE DESIGNATION: POND171CMARSH_0916R1
(texture, color, consistence, structure) POND171CMARSH_0916R2

SAMPLE DESCRIPTION: ~~DSCN JPG~~ TC
~~DSCN JPG~~ TC
~~DSCN JPG~~ TC

ORGANIC SILT W/ CLAY; GLEY1 5/N GRAY
TRACE FINE ROOTS

PHYSICAL SETTING: EMERGENT SEDGE ESTIMATED 70% COVER W/ TRACE SUBMERGED/FLOATING GRASSES




SW 7.7 ft
NW 11.2 ft
GRID OFFSETS

NOTE: Grid was shifted as noted above to move the sample grid off the well-travelled Beluga Trail. Offsets noted above are relative to the corner coordinates that were originally laid out in the GPS unit, and which, had some inherent inaccuracy (PDOP).

1255 SR Arrive at Pond 171C Marsh. Set up sample grid. Shift as
~~1355~~ SR 9/14 shown above to move off trail.
13:55 Start sample collection.
14:35 Finish sample collection. Return to Clunie Point. Process Samples.
16:00 End of day

9/14/16

Rite in the Rain

⑥ SEPTEMBER 15, 2016 START: 1050
END: 1125

SAMPLE LOCATION: Pond 109 BTS100mb

WATER DEPTH: 1.0"-4.0" SEDIMENT DEPTH: 0.0"-4.0"
Weather Conditions: 52.7°F temp, Avg. wind 1.4, Max wind 3.4
overcast
SAMPLE COLLECTION METHOD: Push probe

SEDIMENT/SITE CONDITIONS: Exposed mud flat/emerged sedge + grasses
Estimated 20% grass coverage

PHOTOS

| | | SAMPLE TIME |
|---|---|---|
| SAMPLE DESIGNATION: | PONDI09BTS100MB_0916R1 | 1140 |
| Analysis: EPA 7580 | PONDI09BTS100MB_0916R2 | 1145 |
| | PONDI09BTS100MB_0916R2D | 1150 |

SAMPLE DESCRIPTION
(texture, color, consistence, structure)
Clay prodominent with organic silt, color: Gley 1 4/10y

PHYSICAL SETTING: Brackish water; flood tidally influenced,

JBER XU022 - Sediment Sampling - Grids 457958.09.HU.01
Task: Sediment sampling at Pond 109 & Cap sampling.
Personnel: Stacey Ré (CH2M), Kristen Stevens (CH2M Qualified sampler), Tara Callear (CH2M), Steve Long (CH2M), Elan Edgerly (CH2M), Allison Wieland (CH2M), and Don Ebersole (BSE).
Weather Conditions: Am: Fog, light rain, 50°F.

00 Meet at field trailer for tailgate safety briefing. Load equipment and supplies needed for task.
30 Sample Temperature 4°C.
45 Mob to Clunie Point. Check in with Range Control.
00 Stacey & Steve discuss personnel options for sediment sampling and transect monitoring at Area A. S. Ré contacts Corey
Kristen
cont →

SEPTEMBER 15, 2016 START: 1130
END: 1200

SAMPLE LOCATION: Pond 109BTS100ma

WATER DEPTH: 0"- 4" SEDIMENT DEPTH: 0.0"- 4.0"

SAMPLE COLLECTION METHOD: Push probe

SEDIMENT/SITE CONDITIONS: Exposed mud flat/emergent sedges & grasses
Estimated 30% grass coverage
WEATHER CONDITIONS: 52°F temp, Avg. wind 1.4, max wind 3.4
overcast, low cloud
PHOTOS:

SAMPLE TIME:
SAMPLE DESIGNATION: POND109BTS100MA_0916R1 1200
~~(texture, color, consistence, structure)~~ dup POND109BTS100MA_0916R2 1205
Analysis: EPA 7580

SAMPLE DESCRIPTION: Clay prodominent with organic silt, color:
(texture, color, consistence, structure)

PHYSICAL SETTING: Brackish water; flood tidally influenced.

---

0940 C. Schwabenlander decides to reschedule Area A transect to tomorrow to keep personnel on sediment sampling.
0945 Mob to sampling grid at Pond 109.
1030 Arrive at location POND109BTS100mb. Set up Grid using GPS & swing ties.
1050 Start collecting sediment.
1055 Set up grid at Pond109BTS100ma. (Pond 109 BT South 100m +)
1125 End sediment collection.
1140 Collect sample see previous page entry.
1130 *Late entry* Start collecting sediment at Pond 109 BT South 100m+.
1200 End sediment collection.
1210 Sample collection complete at Pond 109. Demob. Mob to Cap Area.
1245 Arrive at Cap location 03DIS38. Collect sediment around cap.
1250 Arrive at cap location 03DIS37. Collect sediment around cap.
1315 Collect 03DIS37_0916 Analysis EPA 7580.
1320 Collect 03DIS37_0916D Analysis EPA 7580.

 [signature] cont →

⑧ JBER PBR-XU022 Sediment Sampling. 9/15/16
PN 457958.09.HU.01 Contract AFCEC FA8903-09-D-8589
Weather: 50°F in AM, upper 50's in PM, calm, rain-scattered
Personnel: Elan Edgerly, Kristen Stevens/SSC, Steve Long/FTL/SME
Don Ebersole/UXO/BSE, Ali field tech

~~0800 Meet at field office.~~ KS

1315 Location Ø3DIS37 description: Organic silt with Clay. Peat.
1325 Location Ø3DIS38 description: Organic silt with Clay. Peat.
Dabble around cap area to collect sample Ø.Ø"-Ø.5". Mostly grass coverage. Collect sample Ø3DIS38_Ø916. Analysis: EPA 758Ø. Collect sample Ø3DIS38_Ø916MS. Collect sample Ø3DIS38_Ø916S
Mob to Ø3DIS36.
133Ø Collect sediment around cap. Emergent marsh area. About 9Ø% vegetation coverage. Water depth aprox. 1.Ø'.
134Ø Collect sample Ø3DIS36_Ø916 Analysis EPA 758Ø. Mob to cap location Ø4DIS84 ~~Ø916~~ KS and location Ø4DIS84SoC.
S. Ré collect GPS cap coordinates after sample is collected.
1355 Collect sample Ø4DIS84_Ø916 Analysis EPA 758Ø.
14ØØ Collect sample Ø4DIS84SOC_Ø916. Analysis EPA 758Ø. Mob to location Ø4DIS82. Location Ø4DIS82; Emergent marsh area, aprox 9Ø% vegetation coverage.
141Ø Collect sample Ø4DIS82_Ø916 Analysis EPA 758Ø. Mob to Ø3DIS11. Second team mob to location Ø3DIS18.
143Ø Collect sample Ø3DIS11_Ø916 Marsh area, organic silt with Clay. Peat.
1435 Collect sample Ø3DIS18_Ø916 organic silt with clay.
144Ø Collect sample Ø3DIS18_Ø916D same as parent. field duplicate moved due to large size of cap Ø3DIS18.
1445 collect sample Ø4DIS85_Ø916 organic silt with clay.
Mob to cap location Ø3DISØ3. 1 team mob to Ø3DIS21.
Second team mob to Ø4DIS68. Start dabbling sediment around cap.
15ØØ Collect sample Ø4DIS68_Ø916 Organic silt w/clay. Peat.
151Ø Collect sample Ø3DIS21_Ø916 organic silt w/clay. Peat.
Stacey collect GPS coordinates around caps.
152Ø Collect sample Ø3DISØ3_Ø916 organic silt w/clay. Peat.
153Ø Mob to Clunie Point.
16ØØ Leave Clunie Point. Check out with Range Control.
161Ø Arrive at field trailer, pack samples. Stacey mob to Range Control to drop off key.
1645 End of day.

Kristen 9/15/16 1645

JBER PBR-XU022 Sediment Sampling 457958.09.HU.01 Ø9/16/16 (9)

Task: Sediment sampling at caps

Personnel: Kristen Stevens (CH2M Qualified sampler), Steve Long (CH2M), Elan Edgerly (CH2M), Don Ebersole (BSE)

Weather: Low 5Ø's, Overcast, Wind gusts Ø.Ø Temp 52.Ø°F, RAIN

Ø8ØØ Meet at field trailer. Stacey Ré conduct safety tailgate briefing. A. Wieland, T. Callear, & S. Ré to walk transect Area A.

Ø845 Leave field trailer. Mob to Clunie Point EOD. S. Ré Check in with Range Control.

Ø9Ø5 Arrive at Clunie Point.

Ø955 Leave Clunie Point Mob to ~~Glen~~ Pond 73Ø

Ø45 Arrive at location Pond 73ØN. Begin Sediment sample around cap. Observe old bird remains on cap. feathers and bones left with green decay.

1ØØ Collect sample $\boxed{\text{Pond 73ØN\_Ø916}}$ Organic silt w/clay. Peat.
Collect sample $\boxed{\text{POND 73ØN\_Ø916MS}}$ same as parent
Collect sample $\boxed{\text{POND73ØN\_Ø916SD}}$ same as parent

1Ø5 Collect sample $\boxed{\text{POND73ØN\_Ø916D}}$ same as parent

11Ø Mob to location Pond 73ØSW.

113Ø Arrive at Pond 73ØSW. Determine need to collect 2 samples, due to large size of cap. Another Cap is located South of Pond730SW, will collect sample & discuss with PM later.

15Ø Collect sample $\boxed{\text{POND73ØSW\_Ø916}}$ organic silt w/clay. Peat.

2ØØ Collect sample $\boxed{\text{POND73ØSWE\_Ø916}}$ organic silt w/clay. Peat

215 Arrive at New cap south of Pond 73ØSW.

220 Name location Pond 73ØS. Collect sample $\boxed{\text{POND73ØS\_Ø916}}$ organic silt w/clay. Peat.
GPS coordinates collected around cap.

245 Arrive at location Ø4DIS97. Observe feathers from duck on cap. Another set of feathers North of cap observed.

3ØØ Collect sample ~~POND~~ $\boxed{\text{Ø4DIS97\_Ø916}}$ organic silt w/clay

315 Arrive at location Ø4DIS96. S. Ré, A. Wieland, and T. Callear meet sample team to assist with sampling and walk transects.

32Ø Collect Sample $\boxed{\text{Ø4DIS96\_Ø916}}$ organic silt w/clay.

33Ø Arrive at Ø4DIS93. S. Ré & A. Wieland walk transects

345 Collect sample $\boxed{\text{Ø4DIS93\_Ø916}}$ organic silt w/clay. Peat.

4ØØ Arrive at location AREABT Duck POND.

[signature]

(10) 9/16/16 JBER PBR-XU022 Sediment Sampling 457958.09.HU.01

~~Collect sample AREABTDUCKPOND_0916~~

1402 Mob to location 04DIS106.

1410 Collect sample $\boxed{04DIS106\_0916}$ organic silt w/clay.

1415 Mob to ~~AREABTDUCKPOND_0916~~ Drainage Ditch Area there is no standing water for dabbling. Stream flow East to West. HAND Auger needed to collect sample.

1430 Collect sample $\boxed{AREABTDUCKPOND\_0916}$. Mob to location 04DIS90.

1450 Collect sample $\boxed{04DIS90\_0916}$ organic silt w/clay. Peat. Used hand auger to collect sample.

1455 Mob to location 04DIS86.

1505 Collect sample $\boxed{04DIS86\_0916}$ Little standing water around cap, 95% vegetation coverage. Used Hand auger to collect sample Mob to Clunie Point.

1540 Arrive at Clunie Point. S. Ré & A. Wieland out walking transects.

1605 Leave Clunie Point. S. Ré check out with Range Control.

1620 Arrive at field trailer to pack samples.

1625 S. Ré & A. Wieland arrive at field trailer.

1700 End of day.

9/16/16

1700

JBER PBR - XU022 Sediment Sampling 457958.09.HU.01 9/19/16 (11)

Task: Sediment sampling at caps

Personnel: Kristen Stevens (CH2M Qualified sampler), Stacey Ré (CH2M FTL)
Tara Callear (CH2M), Allison Wieland (CH2M), Elan Edgerly (CH2M)
Don Ebersole (BSE)

Weather: Low 40°F, sunny, clear

0800 Meet at field trailer, K. Stevens conduct tailgate safety meeting. Stacey will be onsite later.

0815 Sample temperature 2°C.

0845 Leave field trailer. Mob to Clunie Point Ditch transect.

0900 Arrive at Clunie Point gate. Check in with Range Control.

0945 S. Ré arrive onsite. Mob to Ditch transects to sediment sample. High water observed.

1030 Arrive at location Ø4DIS76. Cap is submerged 12.Ø"-16.Ø"
Second team mob to location Ø3DIS42. Cap submerged.

1040 Collect sample Ø3DIS42_Ø916 Organic silt w/clay.

1045 Collect sample Ø4DIS76_Ø916 organic silt w/clay.

1100 Collect sample Ø3DIS40_Ø916 from location Ø3DIS40.

1105 Collect sample Ø3DIS43_Ø916 from location Ø3DIS43. Hand auger used.

1110 Arrive at location SouthditchWE and location SouthditchWW.
Large cap mostly submerged with vegetation coverage around perimeter. Aprox. 12.Ø"-16.Ø" submerged.

1115 S. Ré call aerial survey plane into ERF airspace.

1130 Collect sample SOUTHDITCHWW_Ø916 organic silt w/clay

1135 Collect sample SOUTHDITCHWE_Ø916 organic silt w/clay. Hand auger used.

1140 Collect sample SOUTHDITCHWE_Ø916D same as parent. Hand auger used.
Mob to location SouthditchEE and location SouthditchEW.

1200 Collect sample SOUTHDITCHEW_Ø916 Hand auger used. organic silt w/clay

1205 Collect sample SOUTHDITCHEE_Ø916 Hand auger used. Organic silt w/clay

1225 Collect sample POND23_Ø916 at location Pond 23.
Take a short lunch break. Mob to location CrossditchJE, CrossditchJW and location CrossditchJN. Locations are merged ~~and~~ as one cap location and is very large.

1245 Collect sample CROSSDITCHJE_Ø916 Hand auger used. Organic silt w/clay
Sediment submerged aprox. 14.Ø"-24.Ø". BIP2 not located. Did not collect.

1250 Collect sample CROSSDITCHJN-Ø916 Hand auger used.

1300 Collect sample CROSSDITCHJW_Ø916 Hand auger used.
S. Ré & A. Wieland mob to Area C transect monitoring.

1310 Mob to location BIP5_9East and location BIP5_9West. Location is merged as one cap. 80% of cap is emergent.

1325 Collect sample BIP5_9EAST_Ø916 organic silt w/clay. Peat. Hand auger used. Sediment submerged aprox 8.Ø"-14.Ø"

 cont →

(10) 9/16/16 JBER PBR-XU022 Sediment Sampling 457958.09.HU.01

~~Collect sample $\boxed{\text{AREABTDUCKPOND\_0916}}$~~

1402 Mob to location 04DIS106.

1410 Collect sample $\boxed{\text{04DIS106\_0916}}$ organic silt w/clay.

1415 Mob to ~~AREABTDUCKPOND_0916~~ Drainage Ditch Area there is no standing water for dabbling. Stream flow East to West. HAND Auger needed to collect sample.

1430 Collect sample $\boxed{\text{AREABTDUCKPOND\_0916}}$. Mob to location 04DIS90.

1450 Collect sample $\boxed{\text{04DIS90\_0916}}$ organic silt w/clay. Peat. Used hand auger to collect sample.

1455 Mob to location 04DIS86.

1505 Collect sample $\boxed{\text{04DIS86\_0916}}$ Little standing water around cap, 95% vegetation coverage. Used Hand auger to collect sample Mob to Clunie Point.

1540 Arrive at Clunie Point. S. Ré & A. Wieland out walking transects.

1605 Leave Clunie Point. S.Ré check out with Range Control.

1620 Arrive at field trailer to pack samples.

1625 S.Ré & A. Wieland arrive at field trailer.

1700 End of day.

9/16/16

1700

JBER PBR-XU022 Sediment Sampling 457958.09.HU.01 9/20/16 (13)

Task: Equipment Blank and Shipping Samples.

Weather: Overcast, High 50's °F SE wind gusts 25-40mph

Personnel: Kristen Stevens (CH2M Qualified Sampler), Tara Callear (CH2M), Allison Wieland

1200 Return to field trailer from transect monitoring. Decon sampling equipment, buckets, hand augers, and sediment sampler probes.

1215 Collect EB Field QC EB01_0916 collect from Hand auger.

1220 Collect EB Field QC EB02_0916 collected from 5gal bucket.

1225 Collect EB Field QC EB03_0916 collected from sampler push probe

1235 Collect EB Field QC EB04_0916 collected from Hand auger.

1240 Collect EB Field QC EB05_0916 collected from 5gal bucket.

1245 Collect EB Field QC EB06_0916 collected from sampler push probe.

1250 Collect EB Field QC EB07_0916 collected from Hand Auger.

1255 Collect EB Field QC EB08_0916 Collected from 5gal bucket.

1300 Collect EB Field QC EB09_0916 collected from push probe sampler.

Equipment blank field QC Analysis: EPA 7580, 1 250ml Amber glass, Preservative: 4°C (gel ice).

1305 S. Rē & Gary onsite field trailer to collect gizzard sample.

1310 T. Caller & A. Wieland offsite done for the day.

09:45 Late Entry: Sample temp 2°C.

Stacey R. Rē
9/20/16

JBER PBR - Safety meetings for XU022 - Eagle River Flats 8/31/16 ①
AFCEC contract # FA8903-09-D-8589
Weather: sunny, clear, light breeze/variable, 46 - 66°F

0800 Personell meet at range control Bldg 59004 for range briefing. Attendees included:

Stacey Ré (note taker)/CH2M Hill | Allison Wieland/CH2M Hill
Tara Callear/CH2M Hill | Elan Edgerly/CH2M Hill
Kristen Stevens/CH2M Hill | Mike Landon/CH2M Hill
Morgan Bruno/CH2M Hill | Annika Seay/CH2M Hill
Don Ebersole/Bering Sea Environmental (UXO)

0840 Complete briefing. Stay onsite and go over safety plan with XU022 personnell (all but Annika + Mike). Focus on site-specific hazards: communications, UXO, wildlife slips/trips, weather, white phosphorus, boating.
0930 Head to EOD for briefing.
1000 Briefing start. All personnel above but Annika + Mike, Steve Long ~~1020~~ SR 8/31 joined by phone. Stacey sent photos to him (Steve) of examples of EOD found in JBER area afterwards.
1020 Briefing complete, Stacey shows Don field office, plan to start 0800 in am. Everyone splits to different projects and errands.

8/31/16 SR Ré

Stacey

② JBER PBR XU022 - UXO ~~Clearance~~ SR 9/1 Avoidance 9/01/16
AFCEC Contract FA8903-09-D-8589
Weather, sunny, clear, calm in am 47°F - 70°F
Personnel - Stacey Ré/CH2M FTL/Note taker, Morgan Brand/
CH2M/SCC, ~~Kristen Stevens/CH2M/technician~~, 9/1 SR Don Ebersole/
Bering Sea Environmental/UXO technician. Tara Colleur/CH2M,
Environmental technician.
07:15 Stacey arrives @ range control for radio check,
verify ground-ground radio for CH2M - range communication
Channel C-2.
Discuss call-in procedure for aircraft (see info page at
back of log.
07:45 Head to CH2M field office. Kristen Stevens sick. Tara may
be able to replace her part of day. Conduct safety brief with
Don + Morgan, fill out PTSP. Tara to bring truck with
sled for stakes to the field office.
08:15 Stacey calls Ashley Hovis/ABR Inc to convey additional flight check-in
requirements.
09:30 Tara arrives with truck.
09:40 Stacey, Morgan, Don head to XU022. Stacey calls in w range control
09:55 Start clearing road from OP Fagan to Clunie Point. Observe 2 ducks
Clear road to ditch transects (visual, road clear enough to
see potential UXO. Clear trails on land around ends of ditch.
10:15 Clear canoe trail.
11:00 Return to Clunie point, grab lunch, prep for establishing area
C transects / UXO ~~Clearance~~ Avoidance.
11:25 Tara plans to join at Clunie Point, departs from office. On site
personnel decide to wait for Tara.
11:50 Tara lost, try to redirect but decide to start clearing transects
without her. (Later determine gate where Otter Lake turns left
and we continued straight on Bravo had gate closed for
an exercise with Army National Guard helocopters. Helos were
observed in XU022 area, some distance away (beyond transects)
1200 Start clearing main trail (Beluga). Clear approximately 200 m
of main trail, then head west to clear Pond 183.
Ashley Hovis/ABR calls, Perform air/ground radio check, good
copy. She is heading to Merril Field for survey flight shortly.
1240 Ashley calls to check in, may have left radio at office.
1245 Ashley finds radio.
13:02 Ashley calls to indicate they are flying out of Merril Field & Stacey
radios range control. ~~Radi~~ SR 9/1 Range control requests plane hold
before entering restricted airspace while status of unmanned aerial system

JBER PBR XU022 UXO ~~Cleara~~ Avoidance Survey 9/1/16 ③
1303 Range control opens airspace, advises UAS is finished flying for the day, no further entry notification/detail required, just call when departing. cntd.
1400 Complete ~~clearance~~ avoidance survey of Pond 183. Head to southern east-west leg of C/O grid. Perform avoidance survey.
1430 Perform avoidance survey of southern leg of ditch transect and sump pond. Don Ebersole gets feet tangled and falls in tall grass, he and equipment seem ok, but is sore as a result.
1630 Don indicates done for the day, team follows cleared C/O grid transect back to Beluga trail and out
1700 Back at Clunie Point. Stacey checks out of area with range control.
1722 Back at field office. End of field day.
Stacey calls Corey to discuss day, he will enter near miss for Don's fall and discuss with John Culley/CH2M HSM.

Stacey 9/1/16

(41) JBER PBR XU022 Avoidance Survey (UXO) Area C 9/2/16
AFCEC Contract FA8903-09-D-8589
Weather, sunny, clear, calm - AM temp 48°F, PM - 70's
Personnel - Stacey Ré/CH2M, Tara Callear/CH2M, Morgan Bruno/CH2M-SSC, Don Ebersole/FN, note taker Boring Sea Environmental/UXO technician

07:30 Stacey stops by range control to discuss gate closure at Route Bravo. Range Control indicates it was because of firing at Malamute by gunnery. No danger to us at XU022 or in between gate and site.

07:50 Stacey + crew at field office, conduct safety brief, focus on slips/trips. Discuss plan for day. Will stage at ditch transect, ~~etc~~ finish avoidance surveys at ditch, C/D grid + hopefully Pond 730 and/or duck ponds.

08:40 Stacey calls in to Range Control. Depart for XU022.

09:00 Arrive at ditch transect entry. ~~Clear~~ Conduct avoidance surveys ditch transects on north side. Frequent preening feathers indicate ditches in use - see several pairs of ducks

11:15 Break for lunch

12:15 ~~Clear~~ Conduct avoidance surveys for E side of C/D unable to reach northeast corner; pond areas too deep. Don notes area was surveyed during pumping ops. See flocks of 5-10 ducks.

14:30 Clear duck transects. Lots of waterfowl tracks/droppings, only birds ≈10 yellowlegs.

15:15 Start to return to ditch transect entrance.

15:30, Find duck between ditch transect and Beluga trail
GPS duck ~~Duck~~ Mort 001, Coordinates 815443.22 m N, 515497.69 m E
Collect duck in cloth bag. Photograph

15:45 Continue back to ditch transect entrance. Demob for day.

16:00 Stacey calls out of XU022 with Range Control. Advise no range activities over weekend, so will not need to check in/out (range control will not be manned. Advise call 911 if emergency.
Depart XU022

16:20 Return to trailer and demobe.

16:50 All depart site except Don, who is changing tire on his van outside CH2M office trailer yard. Indicates he is fine and he will call his people for assistance if needed. Stacey confirms they will have base access if they need it.

16:53 End of Day

M. Ré
Stacey
9/2/16

TBER PBR XU022 UXO Avoidance Survey Area C/D and Bread Truck AFCEC Contract FA8903-09-D-8589
PN 457958.09.HU.01

Weather: sunny, clear, light breeze-calm, AM temp 47, PM 67
Personnel - Stacey Re/CH2M (FTL, note taker), Morgan Bruno/CH2M (SSC), Kristen Stevens/CH2M (Environmental Technician, Don Ebersole/Bering Sea Environmental (UXO technician) (BSE)

08:00 Meet at field trailer. Conduct safety briefing. Range control not working today (through Monday), will need to call 911 in case of emergency.
Load canoe on rack on BSE van for transport to XU022.
Stacey checks on duck/freezer. Appears fully frozen.

08:30 Head to XU022.

08:50 Arrive at XU022. Prepare to Mobe to C/D area from ditch transect entrance. Bring lathe/witness posts for additional marking. Evidence of duck activity in ditches observed.

09:30 Mark Pond 730. Evidence of waterfowl activity (preening feathers/droppings) observed. several Small flocks 2-5 observed in area.

11:30 ~~Complete~~ Continue SR 9/13 Pond 730 transect. No mortalities observed. Stacey ~~talks~~ texts to Tara Callear/CH2M; she and Allison Wieland/CH2M are coming out to take canoe to launch for the transect. Stacey tries to let them know that it may be more like 1:30 than ~~11:30~~ 12:00 SR 9/13 11:30 to meet them to help show them canoe trail.

12:00 Complete Pond 730 start west side of Bread Truck. Follow drainage - more signs of duck activity - preening feathers/droppings in drainage - water relatively still. GPS does not always agree with route, area to west just grassy in southern part, ponds in northern. At northwestern corner gps in agreement with path. Head ~~west~~ east SR 9/12, then southeast to avoid deep areas like those found in northern C/D grid. End up at Pond 730.

12:30 Tara texts - have assembled canoe dolly and loaded canoe. Stacey heads back to meet them and show them trail as well as help get canoe up the one big hill. Don, Kristen, Morgan follow.

13:00 Lunch.

13:30, Start forest transects. Morgan departs with Tara + Allison.

16:00 Forest transects complete - accidentally numbered backwards 1-4 n-s rather than s-n. Demob to field trailer.

17:00 Demob complete, end of day.

Stacey K. Re 9/13/16

⑥ JBER PBR XU022 Avoidance Survey - southern portion of east leg of C/D grid, shortcut from Pond 183 to Duck pond, caps in ditch transect area (near established transects 9/14/16

PN 457958.09.HU.01 Contract - AFCEC FA8903-09-D-8589

Weather: overcast, scattered showers. Temp 56° in AM, upper 60's PM. Lt breeze, overcast.

Personnel - Stacey Re/CH2M (FTL/note taker) Kristen Stevens/CH2M (field tech), Morgan Bruno/CH2M (SSC), Don Ebersole/BSE (UXO technician)

09:00 Meet at field office. Hold safety meeting

09:35 Head to XU022

09:55 Arrive - avoidance survey of pump area.

10:00 Find bone pile of duck (rib cage, head, feathers
Mort-002, species/sex unknown
Coordinates N 815041.04 m
E 515911.12 m
Between gravel pads/paths for pump insertion and gen set staging.

10:15 Prep for Avoidance surveys. Stacey's gromits breaking on boots, able to use holes left by gromits, but will need to replace.

10:45 Head out to establish Pond 183 - Duck Ponds Short Cut.
Lots of evidence of ducks, one pair in Clunie Pt. area.

11:15 Complete shortcut, head to ditch transects, finish east leg of C/D grid between N and S ditch. Hit nearby caps (2 additional,

11:45 Head back to Clunie Pt.

12:00 Back at Clunie Pt. Lunch.

12:30 Morgan departs site. Kristen, Stacey, and Don conduct avoidance survey for Woodland transect. Observe very old swan carcass, already flagged, mossy, on southern part of ~~SE~~ SRA eastern N-S leg.

14:00 Complete Woodland transect. Don departs site. Stacey and Kristen conduct waterfowl survey at Area C/D Canoe transect. Large flock of ≈50 ducks observed, evidence of waterfowl activity. Area near shore has thick mats of floating algae/vegetation.

15:00 Return to vehicle, demobe

16:00 Stacey + Kristen off site. End of day.

Stacey Re
9/14/16

JBER PBR XU022 Avoidance Survey Area A 9/6/16

Weather: 52° F, lightly raining, windy

PN: 457958.09.HU.01 Contract: AFCEC FA8903-09-D-8589

Personnel: Don Ebersole/BSE

Morgan Bruno/ANC; T Cullear/ANC; K Stevens/ANC

0730 Meet @ field office, H&S tailgate meeting - slips, trips, + falls, wildlife, brush, hydration.

0800 Mobe to Area A. K Stevens radios in to range control.

0830 Begin avoidance survey - start w/ east side of Pond 290, then work up main stem of Area A transect.

0950 Find Mort003. Coordinates = N 814253.04 m
E 514949.87 m

Mort003 appears to be very old - only spine + feathers remain. Location flagged w/ pin flag; carcass not collected.

1050 Reach end of main Area A transect.

1100 Begin avoidance survey of shortcut route from end of Area A transect to top of pond 290.

1215 Avoidance survey of west side of pond 290

1245 Arrive back at vehicles, depart Area A. K Stevens radios Range control to check out.

1255 Arrive back @ field office.

1300 K Stevens departs to return Area A key to Range control. D. Ebersole departs site. Scan + upload field docs.

1708 Ashley/ABR texts to notify that Bird Count 1 is ~10 minutes out from restricted air space. Radio in ~~other~~ to Range control. Range control requests altitude + pattern. Text Ashley/ABR to get info.

1711 Ashley responds - 100 to 300 ft agl, working west to east along north-south transects. Radio info to Range control.

1714 Range control provides clearance to enter. Text Ashley.

1715 Bird Count 1 enters restricted air space, radio Range control to notify.

1858 Ashley/ABR texts - plane leaving restricted air space. Radio Range control to notify them we are clear of restricted air space.

1900 Finished for day, depart site.

M 9/6/16

Rite in the Rain

(8) JBER PBR Radar Area C Transects 9/7/16

Weather: ~ 51 °F, overcast, calm

PN: 457958.09.H4.01 Contract AFCEC FA8903-09-D-8589

Personnel: M Bruno/ANC + K Stevens/ANC, S. Ré/ANC

0800 Meet @ field office. H+S tailgate meeting - slips, trips, falls; hydration

0815 Mobe to ERF Area ~~A~~ C SR 9/19 K Stevens radios in to Range Control.

0850 Begin walking Area ~~A~~ C SR 9/19 transects. Divide Pond 183 - M Bruno walks southern half, K Stevens walks northern half. No duck activity observed.

0920 Meet @ top of Pond 183, take shortcut to Duck Pond transect. M Bruno walks triangle portion of Duck pond, then western side of Bread truck. K Stevens mobes to walk Pond 730.

0955 M Bruno takes shortcut from N end of Breadtruck to Pond 730, met up w/ K Stevens. N side of Pond 730 not clearly marked - need additional stakes to make route more clear.

1015 Walk North edge of duckpond.

1020 M Bruno walks west side of C-D transect, K Stevens walks South edge of duckpond.

1050 K Stevens walks Northern Ditch + east side of C-D transect North until water got prohibitively deep. Lots of duck activity ~25 ducks flew from northern ditch. M Bruno walks south edge of C-D transect, then north to southern ditch on C-D east side. M Bruno walks southern ditch, + south-north ditch connector. K Stevens walks C-D transect east side from north ditch to South ditch.

1150 Finished walking transects, return to truck.

1215 Depart Clunie Point, M. Bruno radios range control + checks us out.

1230 Return to field office, finished for the day. (For transects)

14:15 Stacey Meets Alaska Pump and supply guys for taking measurements/Photos of trash pump, gen set, and fuel tank. Kevin go to see pump at XU022. Photograph

~~1500~~ SR and collect measurements, record serial numbers, stats.

1500 Return to pump yard on Circle Drive. Take measurements, stats, photos of additional pumps, gen sets, fuel tank.

1620 Return Kevin and to their vehicle at JBER-Richardson gate, they will determine price to refurbish pump.

End of Day

Stacey R. Ré 9/7/16

JBER XU022 Area C Transect Mortality Survey 9/9/16 (9)

PN 457958.09.HU.01 Contract AFCEC FA8903-09-D-8589

Weather 46-65 degrees 5-10mph breeze 00 S, low clouds early, partly cloudy later.

Personnel: Stacey Ré/CH2M, Kristen Stevens/CH2M

09:300 Meet K. Stevens at Field Trailer. Have safety inbrief. Try not to leave too much distance between personell during transect monitoring in case ~~of a~~ SR 9/9 assistance is needed.

10:00 Call in to Range Control, depart for XU022.

10:30 Start Mortality transect monitoring. Observe large flocks of ~~a couple~~ 25-50 ducks during start. Start a couple with ditch transect and C/O transects.

11:30 Complete ditch transects. Waterfowl activity observed. Head to Pond 730. Add more stakes to west branch of pond to better define transect. Additional flocks (2-3) observed to north ~~12:30~~ SR 9/9 25-50 ducks.

12:30 Complete Pond 730, head back to Duck Ponds, Kristen conducts Duck Ponds while Stacey conducts Bread Truck. Several ducks observed, One flock of ≈dozen shorebirds.

13:15 Start Pond 183 transect. Kristen takes west side, and Stacey takes east

13:45 Complete Pond 183 Transect. Waterfowl activity observed.

14:00 Return to Clunie Point.

14:20 Stacey calls out of XU022. Depart site.

14:40 Return to Field Office + Demobe

K. Ré

Stevens

9/9/16

JBER-PBR XU022 - Area C Transects, Sediment Sampling Prep 9/12/16 10
PN 457958.09.HO.01 Contract - AFCEC FA8903-09-D-8589
Weather: 60°F, overcast, windy
~~Personal~~ Personnel: Stacey Ré/~~CH2M~~ CAN/FTL, Kristen Stevens/SSC,
Steve Long/SME, Elan Edgerly/field technician, Allison Wieland.

0900 Meet Allison Wieland at field office trailer.
0930 Leave field trailer. Mob to Eagle River Flats.
0945 Call in to Range Control. Check in at Clunie Point gate.
1000 Mob to Ditch transects from Clunie Point.
1030 A. Wieland to walk southern C/CD grid and dictch transects. K. Stevens walk northern C/CD grid.
1115 Ditch + Area C/CD grid transects complete. No mort. ducks found. Large flock of 40 ducks observed in area. Mob to Pond 730.
1120 Ashley/ABR contacted via cell phone to ask for weather report. Decided too turbulent will try to survey later today or Tuesday 9am-11am.
1140 Start Pond 730. A. Wieland to complete transect Pond 730. K. Stevens does not complete Pond 730 and takes Bread Truck grid route.
1230 A. Wieland meet K. Stevens on Bread Truck route.
1250 Mob to duck pond transects. A. Wieland take shortcut to Pond 183. K. Stevens walk duck pond transects.
1300 A. Wieland take western side of Pond 183. K. Stevens walk Eastern transect around Pond 183.
1330 Pond 183 complete. Mob to Clunie Point.
1350 Arrive at Clunie Point. No dead ducks found.
1400 Leave Clunie Point. Check out of ERF with Range Control. A. Wieland + K. Stevens done with transect monitoring for the day. Mob to field trailer.
1415 Stacey RÉ, Elan Edgerly, + Steve Long arrive at field trailer. Prep for sediment sampling.
1500 Mob to Clunie Point to test sample equipment.
1545 Leave Clunie Point. Mob to field trailer.
1600 End of day.

[signature] 9/12/16 1700

JBER-PBR-XU022 Area C and Canoe transects 9/14/16 (11)
PN 457958.09.HU.01 Contract AFCEC FA8903-09-D-8589
Weather: 47° in AM, 60's in PM, calm, mostly cloudy
Personnel: Mortality transects - Stacey Re/CH2M/FTL, Allison Wieland/CH2M/Field Tech
Sediment sampling. CH2M - Elan Edgerly, Tara Callear - Field techs, Kristen Stevens - SSC, Steve Long - SME

0800 Meet at field office. Conduct safety brief. Remember to wear sunscreen.

0840 Mobe to Eagle River Flats. Call in to range control.

0920 Head out for Area C transects

0940 Start ditch transects and C/D grid (south and east legs) light duck activity observed. One pair of ducks seen.

1045 Complete area, head to Pond 730.

1050 On access trail from Duck Ponds to Pond 730 find feather pile from shorebird (feathers appear too small/narrow to be a duck.

11:40 Complete Pond 730. Saw several pairs of ducks, light waterfowl activity in area. Head to Bread Truck west.

11:50 Pause for snack, the complete Bread Truck West.

12:00 Start Duck Pond transect. Light to moderate evidence of waterfowl activity. No ducks observed.

12:20 Duck Ponds complete, head to Pond ~~on~~ SR 9/14 183. Moderate evidence of waterfowl activity. Several shorebirds, but no ducks observed except a single ~~one~~ duck SR 9/14 in flight (likely female malard) leaving the area. Pick up extra stakes from ~~samp~~ sampling.

12:55 Start back to Clunie Point.

13:05 ~~Complete~~ SR 9/14 Area C surveys complete.

13:25 Head to ~~Area C~~ SR 9/14 Canoe transect.

13:30 Begin walk in to canoe transect. Conduct survey. Heavy use by waterfowl, evidenced by disturbed areas/sediments, preening feathers (Swan and duck). 50 or 75 ducks observed.

14:20 Head back to Clunie Pt.

14:35 Arrive at Clunie Pt. Assist sediment sampling team.

16:00 Off site. End of day.

Stacey [signature]
9/14/16

(12) JBER PBR-XU022 Area A transects 9/15/16
PN 457958.09.HU.01 Contract AFCEC FA8903-09-D-8589
Weather: 50°F in AM upper 50's in PM. calm, overcast/scattered showers. Safety moment: staying warm, clothing, eat.
Personnel: Stacey Ré/FTL, Tara Callear/field tech, Allison Wieland/Field tech
0800 Meet at field trailer. safety inbrief.
0830 Head to XU022. Kristen checks us in to both Firing Point Cole and EOD Pad.
0850 Arrive at site. Discuss whether Ok to just have 2 people conduct Area surveys. Discuss with Corey, evaluate options to also ~~f~~ SR 9/15 add additional staff. Determine no additional staff available, will forgo Area A survey for the day and conduct Friday along with Area C.
0950 Head out to complete grid sampling and start on composite random sampling. See Sediment notebook for remainder of day's notes.

Stacey Ré
9/15/16

PN 457958.09.HU.01 AFCEC contract FA8903-09-D-8589
Weather: 48° F in AM, mostly cloudy, calm, 50's in PM.
Safety moment: Situational awareness and housekeeping.
08:00 meet at field trailer, conduct safety brief. Focus on situational awareness and housekeeping.
08:30 Stacey Re/FTL, Tara Callear + Allison Wieland/Field technicians head to Area A for mortality transect monitoring. Steve Long/SME, Kristen Stevens/SSC, Elan Edgerly/Field technician and Don Ebersole (BSE)/UXO technician will continue sediment sampling around caps. (See Sediment sampling log.) Call Range Control
08:45 Arrive at Firing Point Cole, drive down to transect start. Determine Stacey left wading boots at trailer. Sediment crew brings them to junction of Otter Lake and Rt. Bravo for pickup. Rental car has difficulty on wet road, layer of mud on top of gravel on hill down to access point. Will park at top of hill.
09:00 Return to start of transect access trail, gear up.
09:20 Start hike to Area A ponds.
09:50 Arrive at Pond 290, ~~m~~ walk northeast side, procede to Ponds 258/246/226. Small flocks of shorebirds observed, light evidence of waterfowl activity at Pond 290 (occasional preening feathers).
10:15 Start Pond 258 transect. Evidence of goose activity and flock of 25-30 geese observed to north. Flocks of 5-7 long-billed dowitchers observed feeding in area. Old shorebird feather pile by lake observed.
11:00 Arrive at end of Area A transect. Return to NW end of Pond 290 via shortcut.
11:15 Start SW side of Pond 290.
Observe feather pile at a trail flag, appears to be shorebird based on smaller 3-4" feathers ~~Calls~~ sp. etc. also more narrow than duck. Approximately 30 yards away on trail find second feather pile, includes larger feathers including irradescent green, unknown duck species. ~~mort 004.~~

$\boxed{\text{Mort 004}}$ N 6800567
E 354185

12:10 Arrive back at vehicle. Grab lunch at OP Fagan.
13:00 Arrive at Clunie Point. Tara to join sediment sample team while Stacey and Allison complete Area C surveys. Kristen calls Stacey to inform that a feather pile was found on one of the caps in the duck pond area.
13:20 Meet ~~up~~ with sediment sampling team and go see feather pile.

$\boxed{\text{Mort 005}}$ N 6801724
E 354780

(14) Area C transects 9/16/16 cont'd.

14:00 Complete duck pond transects. Kristen indicates most of Pond 730 transect has been walked alread during sediment sampling activityes. Stacey and Allison complete transect by walking southern edge and around east "wing" to junction with northern wing. Light water fowl activity observed.

14:20 Head to bread truck transect. Light evidence of waterfowl activity observed. Two shorebirds observed.

14:35 Return to Beluga trail to go back to monitor ditch transect. ~~Evidence~~ SR 9/16 Swans observed flying towards canoe transect

15:00 Start ditch transects. Allison takes north ditch and northern part of C/D east. Stacey takes South and cross ditch as well as southern part of C/D transect. Light waterfowl activity observed (evidence of).

15:40 Complete ditch transects, start Pond 183. Little evidence of waterfowl activity observed.

16:00 Return to Clunie Point. Sediment sampling team departs.

16:05 Stacey and Allison depart XU022. Stacey calls full team out of site with range control.

16:25 Return to field office.

17:00 End of day.

Stacey M. Rui
9/16/16

JBER PBR XU022 Waterfowl Mortality Transects 9/19/16 (15)

Area C.

PN: 457958.09.HU.01 AFCEC Contract FA8903-09-D-8589

Weather: Partly cloudy, low 40's in AM, mid 50's in PM, light breeze oo NW.

Personnel: Stacey Ré/FTL, Kristen Stevens/SSC, Allison Wieland/field tech note taker, Elan Edgerly/field tech, Tam Calleur/field tech, Don Ebersol/UXO

08:00 meet at trailer. Stacey forgot waders had to go home to retrieve.

10:00 Stacey returns joins sediment sample team for AM

11:30 Mort 006 found at East South Ditch.

815 423.33 m N

515636.14 m E

Unknown species, feather pile/no carcass.

12:50 ~~Tam~~ Allison + Stacey depart sediment sampling team to perform Area C transects

Late Entry 11:31 Aerial survey team arrives at XU022 (Ashley Havis/ABR + pilot/Spernak)

12:19 Aerial Survey team departs XU022.

13:10 Start Pond 183 survey. Large flock of 50-75 ducks observed north of Pond 183. Three swans observed in Pond 183 earlier. Evidence of duck activity (preening feathers) observed. Water ≈12"-18" deeper than normal

13:40 Head to duck pond transects via shortcut at north end of pond 183.

13:55 Completed duck pond survey ~~no~~ SR 9/19 little duck activity (evidence) in area. Large flock of 75-100 observed to northwest.

1400 Head to Pond 730.

Feather pile found by tripod (and more to east) on south side of Pond 730. Species/sex unknown.

Mort 007 Nad27 UTM Grid

354899 N

6801799 E

1410 Continue Pond 730. Find dead dowitcher along trail. Evidence of preening/duck activity in area.

1450 Complete Pond 730. Head to bread truck area. Determine water too deep to perform survey safely: transects based on following morphology of deep drainages, and they are all under water/not visible.

1500 Head back to assist Sediment sampling team. Elect not to conduct survey of east side of c/d grid because of water depth. Ditches have been survey during cap sampling.

1610 Depart XU022 for field office

1630 Arrive at field office. End of day.

Stacey Re 9/19/16

(16) 9/20/16 JBER PBR XU022 Waterfowl Transects 457958.09.HU.Ø1

Task: Waterfowl Mortality transect monitoring - Area A.

Personnel: Kristen Stevens (CH2M SSC/Qualified sampler), Tara Callear (CH2M), Allison Wieland (CH2M) Stacey Ré (CH2M/FTL) Gary Santolo (CH2M/SME)

Weather: 55°F SE wind 25-4Ømph, overcast

Safety moment: High tide, high winds.

Ø730 Safety standdown call w/ John Culley

Ø9ØØ Pick up Cole Point Gate Key from Range Control. Range Control stated they will be firing in Area, we will be in safe distance from firing and out of range.

Ø930 Meet at field trailer. K. Stevens conduct safety tailgate meeting.

~~1000~~ KS Ø945 Mob to Cole Point Area A.

1ØØØ Arrive at Gate Cole Point. Check in with Range Control. Range Control asks for location and activity for the day. Told us to "Standby" for delivery of "Fort Richardson Military Installation Map."

1Ø45 Two personnel arrive to drop off military grade map and discuss transect route. Determine ~~out~~ KS Area A transect will be restricted today due to firing training. No one allowed West of line 54 on military grade map. Stop work for the day.

111Ø Leave Cole Point gate area. Mob to Range Control.

112Ø Arrive at Range Control to return key. Grab extra military grade maps. Lessons learned: When checking in with Range Control use transect map and military grade to determine exact location when entering impact area.

1145 Arrive at field trailer. Check in with Stacey, will not be monitoring transects today.

12ØØ End of day. (See following page for gizzard extraction in PM).

9/20/16 12ØØ

JBERPBRXV022 - Gizzard Extraction 9/20/16 (17)

1230 Arrive at ~~For~~ SR 9/20 JBER-Richardson gate and pick up Gary's pass.

12:40 Arrive at field trailer, set up for necropsy/gizzard extraction. Duck is male mallard in non-breeding plumage. Organs appear normal.

13:25 Collect sample Gizzard01_091916. See form (Necropsy Form) for details.

13:30 Clean up/disinfect. Stacey will dispose of duck carcass at municipal landfill on the way home.

13:50 Off site. End of day.

Stacey [signature]
9/20/16

Rite in the Rain

(18) 9/21/16 JBER PBR ERF XVO22 Waterfowl transects 457958.09.HU.01
Task: Waterfowl transect monitoring - Area C & Woodland Forest transects.
Personnel: Kristen Stevens (CH2M SSC/Qualified sampler), Allison Wieland (CH2M)
Weather: High 50° - Low 60°F Partly sunny.
Safety moment: Watch for debris from high winds yesterday.

1200 Meet at field trailer. Load truck.
1245 Mob to Clunie Point Area C.
1255 Check in with Range Control.
1300 Some trees fallen over in road path. Clear trees from area.
1305 Park at Ditch transect area.
1320 Mob to transects.
1350 Start Pond 730.
1430 Pond 730 Complete. Mob to Bread truck transect.
1445 Bread truck transect route under water, risk for tripping. Do not walk bread truck transect. Mob to Duck Pond.
1500 Duck Pond Transect complete. Mob to Pond 183.
1520 Pond 183 complete. Mob to Ditch transects.
1550 Ditch transects complete. Mob back to truck.
1600 Arrive at truck.
1620 Mob to Forrest Transect 4.
1640 Walk Transect 4.
~~1640~~ KS 1650 Mob to Transect 3. Walk transect 3.
1700 Mob to Woodland Transect. Walk Woodland Transect.
1720 ~~Mob~~ KS Woodland Transect Complete. Mob to Transect 2.
1730 Transect 2 complete. Mob to Transect 1.
1740 Transect 1 complete. Mob to truck.
1745 Arrive at truck. Demob. Did not find Duck mortalities.
1750 Check out with Range Control. Mob to field trailer.
1805 Arrive at field trailer. Demob.
1825 End of the day.

[signature] 9/21/16 1830

9/22/16 JBER PBR ERF/XUO22 Waterfowl Transects - Area C
PN-457958.09.HU.01. Contract FA8903-09-D-8589
Task: Area C and Canoe transect monitoring
Personnel: Stacey Ré/FTL, Kristen Stevens/SSC
Health and Safety Moment: use headlights especially in inclement weather.
Weather: overcast, rain, 50's.

12:00 Meet at field trailer, hold safety meeting
12:30 Stacey calls in to range control to enter Eagle River Flats/XUO22.
12:50 Arrive on site, water level is high. Decide to conduct canoe survey first, and use canoe on some of the other transects afterwards. Swans (three) observed in Pond 183.
13:10 Start canoe transect. 25-30 swans observed, large flock of 50-75 ducks, then several addition small groups of 1-3.
13:40 Head to Pond 730 via canoe.
13:55 Arrive at Pond 730, conduct survey from canoe, no ducks observed.
14:05 Walk canoe to Bread Truck, conduct survey by canoe to Bread truck dike. No ducks observed.
14:15 Return to duck pond + divide up transects to walk on foot. Several small groups of 1-3 ducks observed.
14:35 Conduct Pond 183 survey by canoe. Seven swans observed near Clunie Point.
15:05 Head to ditch transects, conduct by canoe. Few ducks.
15:45 Complete ditch survey and paddle back to Canoe transect east of usual C/D east leg.
16:15 Arrive at canoe staging area, head back to truck.
16:30 Stacey calls range control, checks out of XUO22.
16:50 Arrive at Field trailer.
17:20 Off site, end of day.

Stacey Ré
9/22/16

JBER PBR ERF XU022 Water fowl Transect Monitoring 9/23/16 (20)
PN 457958.09.HU.01 Contract FA8903-09-D-8589
Task: Area A transect monitoring
Personnel: Kristen Stevens/FTL, note taker, Tara Callear/Field tech, Allison Wieland/Field tech.
Safety Moment: Potential high tides and obscured trail, watch for debris from high winds.
Weather: Overcast
0930 Pick up key from Range Control for Area A. Check in aerial survey aircraft with Range Control.
0945 Meet T. Callear & A. Wieland at field trailer.
1000 Mob to Area A Cole Point site.
1010 Check in with Range Control.
1015 Arrive at Cole Point.
1030 Mob to transects - Area A.
1040 Call Range Control to check out aerial survey aircraft from airspace.
1110 Begin walking transects.
1200 Complete transects. Take break.
1215. Mob back to truck using shortcut.
1240 Complete transect. Mob back to Cole Point. 12 swans observed, 17 ducks observed, and 15 shore birds observed while walking transects.
1325 Arrive at truck at Cole Point.
1345 Mob to field trailer. Check out with Range Control.
1400 Return key to Range Control.
1415 End of day.

KStevens 9/23/16 1430

JBER PBR ERF Waterfowl Transect Monitoring XU022 9/26/16 (21)
PN 457958.09.HU.01 Contract FA8903-09-D-8589
Task: Area C transect monitoring.
Personnel: Kristen Stevens and Stacey Re / FTL / note taker.
qualified sampler
Safety Moment: For allergy ~~season~~, ~~take~~ preventative medicine or honey.
Weather: mostly cloudy - partly cloudy, 40's to low 50's.
09:30 Meet at field trailer. Paperwork, safety moment.
10:00 Head to XU022 Kristen calls in to Range Control.
10:30 Begin Area C transects.
10:35 Find Mort 008 Green-wing teal, on Beluga trail east of south end of Pond 183. Carcass intact, slight translucent growth on head
N ~~6894551.22~~ SR 9/26 6801317.717
E ~~1313520.372~~ SR 9/26 355261.141
Return to truck to drop off carcass.
10:50 Start to ditch transects again, find what appears to be another duck carcass ≈ 25 ft north of southern C/D grid, not far from Mort 001 (50-75 ft). Too far from cleared path for a good look.
Mort 009
N 6801508.507 (actual ≈ 25 ft N)
E 355079.600 ~~03~~ SR 9/26
11:00 Start ditch transects and East leg of C/D grid. 20 swans observed in canoe area. 25-50 ducks off of Clunie point. Light evidence of waterfowl activity in evidence.
12:00 Head to Pond 730, Stacey + Kristen conduct together.
12:30 Kristen takes short cut to Bread Truck transect. Stacey starts duck ponds. Light-moderate evidence of waterfowl activity.
12:55 Duck ponds complete, several singles/pairs ducks observed in area. Bread truck also complete. Some areas remain under water
13:10 Start Pond 183, Stacey takes west side, Kristen east.
13:45 Return to truck. I identify duck as green-winged teal.
14:00 Kristen calls range control to check out, depart site.
14:20 Return to field trailer. End field day.

Stacey Re
9/26/16

JBER PBR ERF XU022 Waterfowl Transect Monitoring 9/28/16
PN 457958.09.HU.01 Contract FA8903-09-D-8589
Task: Area C transect monitoring
Personnel: Stacey Ré, Allison Wieland (FTL, Field tech)
SR note taker.
Safety moment: Wear sunglasses in bright sun.
Weather: mostly sunny 37° - mid 40s, calm.
0915 Meet at field trailer
0930 Head to ERF. Call in to Range Control
0950 Arrive at Clunie Pt. Observe 3 bald eagles in Pond 183 area. 6 ducks fly up from ponds by Clunie Pt. (mallards.)
1000 Start ditch transects
1045 Find carcass of mallard, bones + wings near west end of north ditch, on south side. Predated. Photo taken.
N 680157.92 NAD 27 UTM Grid m
E 355070.65 Mort 010
12:10 Complete ditch transects, head to Pond 730 on w leg of C/D grid.
12:20 Start Pond 730. High concentrations of waterfowl activity evidence - lots of preening feathers.
12:50 Stacey takes short cut to bread truck transect, Allison surveys duck ponds. Lower evidence of waterfowl activity observed in these area with exception of evidence of goose activity in southern (and south of) duck ponds (goose poop, trampled areas, larger footprints.)
13:15 Start to Pond 183.
Allison surveys west side, Stacey survey east side. High evidence of water fowl goose, duck, and swan activity in area.
13:30 Return to Clunie Pt., Allison checks out with Range Control.
13:50 Back at field trailer. Demob.
14:00 End of field day

Stacey Ré
9/28/16

JBER PBR ERF XU022 Waterfowl Transect Monitoring 9/29/16
PN 457958.09.HV.01 Contract FA8903-09-D-8589
Task: Area A Waterfowl transect monitoring.
Personnel: Stacey Ré/FTL, Kristen Stevens/SSC, Tara Calleur/ Field tech.
Safety moment: Slips and trips, be aware of hidden hazards in high grass or underwater, move at moderate pace, use walking sticks.
Weather - Sunny, upper 40's to low 50's, calm.
12:30 Stacey + Kristen meet at field trailer.
12:45 Stacey checks duck freezer - still on and duck (Mort 008) is frozen.
12:55 Tara arrives at field trailer. Conduct safety brief.
13:10 Depart for firing point Cole.
13:30 Arrive at Firing Point Cole, mob to Area A transects
13:50 Start Pond 290, east side. Observe several ducks, occasional preening feathers.
14:20 Depart Pond 290 for Ponds 246/256/226 complex.
Observe several shorebirds in 246. Large flocks of geese observed to north and southeast (50-75 each.)
1500 Complete Ponds 246/256/226 Complex. Head back to Pond 290 by shortcut. Light evidence of waterfowl use observed, occasional preening feathers.
1515 Begin Pond 290, west side.
1545 Complete Pond 290, west side. Start back to Firing Point Cole.
1605 Aerial survey plane inbound. Stacey calls in to Range Control. Range Control indicates plane must be clear by 1900 (not an issue since survey are just an hour.
1630 Arrive at field trailer. Stacey does paperwork while waiting on completion of aerial survey.
17:10 Aerial survey complete. Stacey calls survey plane out with Range Control.

Stacey Ré
9/29/16

(26) JBER PBR ERF XU022 Waterfowl Transect 10/13/16
Monitoring
Task: Area C transect monitoring.
Personnell: Stacey Ré/FTL, Kristen Stevens/SSC
Weather 37°F in AM, low 50's in PM, partly cloudy, foggy.
Safety Moment: Prepare cars for winter: add icescrapers, cold weather.
09:30 Meet at field trailer. Conduct safety moment.
09:50 Head to XU022. Stacey calls in to range control
10:10 Arrive at Eagle River Flats/XU022, Mobe.
10:30 Start dith transects. Moderate evidence waterfowl activity.
11:30 Complete ditch transects. Head to Pond 730. Kristen takes w, Stacey e.
11:50 Complete Pond 730, head to bread truck by Shortcut from Pond 730. Moderate evidence of water fowl activity observed.
11:55 ~~Mort 010~~ SR 10/13 Mort 011 observed 15 ft west of bread truck shortcut. N 6801891.13 m
E 354793.40 m
Species unknown, possibly mallard, too far off avoidance cleared transect for close inspection, one blue green feather visible, and bones large enough to be duck. Three shorebirds also present.
12:20 Complete bread truck transects, light to moderate waterfowl activity in area.
12:45 Start duck pond transect, Stacey takes east/south leg, Kristen takes the triangle to west. Moderate waterfowl activity evidence.
13:05 Complete duck ponds, quick snack break. Head to Pond 183. Stacey takes west, Kristen takes east. Seven swans, two adults, five cignets in Pond 183. Moderate evidence of waterfowl activity present.
13:25 Return to Clunie Point.
13:48 Depart XU022, Kristen calls out with range control
14:00 Return to field office. Demobe.
14:30 Depart office. End of field day.

K. Ré
Stacey
10/13/16

JBER PBR ERF XU022 Waterfowl Transect Monitoring 10/4/16 (27)
Task: Area A transect monitoring PN 457958.09.HV.01
AFCEC contract FA8903-09-D-8589
Personnel: Stacey Ré/FTL, Kristen Stevens/SSC, Allison Wieland/field technician. (SR-note taker).
Weather: upper 40's to low 50's
Safety Moment: Bear observed in field trailer dumpster. Remember to separate food waste for disposal in bear-safe containers. Make noise when coming into field office yard to make bear aware of your presence.
11:25 SR picks up key to Firing Point Cole from Range Control. They indicate we should be able to access the area as planned, possibly a little early. SR heads to field trailer, starts paperwork.
12:00 KS and AW arrive at trailer. Hold safety brief, mobe to Firing Point Cole.
12:15 Arrive at gate to Firing Point Cole; Air National Guard is departing from area (2 trucks).
12:30 Arrive at staging area, head to Area A transects.
13:05 Arrive at Pond 290, survey west side of pond. Light evidence of water fowl activity.
13:30 Complete west side of Pond 290, head to Pond 226/246/256. Light to moderate evidence of waterfowl usage ~~at~~ SR 10/4 present, with greater evidence of usage in north western ~~half~~. Three swans, flock of approximately 25 ducks, 7 shorebirds, and several other pairs of ducks observed. Large flocks of hundreds of geese observed to the north.
14:45 Complete transect. Break for snack/water.
15:15 Arrive back at Pond 290, survey east side.
15:30 Surveys Complete. Head back to truck.

16:00 Arrive back at truck. ~~Kristen~~ SR 10/4
16:15 Depart Firing Point Cole. Kristen calls out.
16:30 Back at field trailer. Stacey returns key to Firing Point Cole on way home. End of day.

Stacey Ré
10/4/16

(28) JBER PBR ERF XU022 Waterfowl Transect Monitoring 10/5/16
PN 457958.09.HU.01 AFCE Contract FA8903-09-D-8584
Task: Waterfowl transect monitoring, Area C + Canoe.
Personnel: Stacey Ré + Kristen Stevens.
Health + Safety Moment: Be particularly careful of moose this time of year/rut.
Weather: mostly sunny, 39°F in AM, reaching mid 50's in PM.
10:00 Meet at field trailer, conduct safety moment.
10:15 Head to XU022. Kristen calls into Range Control
10:30 Arrive at Clunie Point. Observe additional personnel in area, truck with Central Environmental Management near EOD Pad.
10:40 Head to ditch transects. Kristen takes east portion of South + north ditch, + southeast legs of C/D. Stacey takes western portion of south ditch, cross ditch, and northeast leg of C/D.
11:40 Ditch transects complete. Light waterfowl activity evidence observed. Thin patches of ice on eastern portions of transects, small groups of 1-3 ducks observed.
Head to Pond 730 via C/D grid/Beluga. Three swans observed.
12:05 Kristen takes east portion Pond 730, Stacey takes west, light evidence of waterfowl activity observed. Several shorebirds present.
Stacey starts duck pond transects while Kristen does bread truck. Heavy waterfowl activity evidence (feathers, droppings) observed on bread truck. Light activity evidence in duck pond area.
12:27 Complete duck ponds/bread truck. Head to Pond 183. Kristen takes west, Stacey takes east. Lots of swan feathers observed.
13:00 Return to truck, break before heading to canoe transect.
13:15 Begin walk to canoe transect.
13:25 Start canoe transect. Observe approximately 20 swans and 8 ducks in northernmost open pond area.
Nine swans and three ducks observed in western open pond.
14:05 Transect complete. Evidence of waterfowl (mostly swan) activity high (preening feathers).
14:15 Return to vehicle, Kristen calls out with Range Control
14:45 Arrive at field trailer. End field day

Stacey Ré
10/5/16

JBER PBR ERF XU022 Waterfowl Transect Monitoring 10/7/16 (29)
PN 457958.09.HU.01 AFCEC Contract FA8903-09-D-8589
Task: Waterfowl transect monitoring, Area C
Personnel: Stacey Ré + Kristen Stevens
Health + Safety Moment: Protection from spiders: gloves + long sleeves

09:20 Kristen arrives at field trailer to coordinate aerial survey.
09:30 Ashley Hovis /ABR calls to notify survey team en route. Kristen calls in to range control.
09:45 Stacey arrives at field trailer. Conduct safety moment.
10:00 Head to XU022, Kristen calls in with range control.
10:15 Arrive at XU022. Ice present - 1/4" thick at edge of Clunie Point. Decide to try to break a path out a little ways to see if ice thins/peters out once we get away from shore, but some ice visible (60%) ~~in~~ of SR 10/7 Pond 183.
10:25 Attempt to break path in ice; still present 1/4 - 1/3" thick 50-75 yards down main (Beluga) trail. Decide to abort for now.
10:35 Return to Clunie Point. Plan to return around 13:00 to see if ice has melted enough to survey.
13:15 Stacey and Kristen return to Clunie Point. Check ice thickness. Although ice has retreated ≈ 40% in Pond 183, still 1/4" at edge of Clunie Point and visible down main/Beluga trail. (See photos). Decide to abort Area C surveys for day.

K. Ré
Stacey
10/7/16

Rite in the Rain.

(30) 10/10/16 JBER PBR ERF XU022 Waterfowl Transect Monitoring
PN 457958.09.HU.01 AFCEC Contract FA8903-09-D-8584
Task: Waterfowl transect monitoring, Area C
Personnel: Stacey Ré + Kristen Stevens
Health + Safety moment: Put truck in park while unlocking gate to XU022.
Weather: low of 32 overnight, 36 on arrival at field office. Partly cloudy.
~~10:~~ SR 10/10 09:45 SR arrives at field office. Radio for range coordination was not charged/is dead. Place on charger. Ashley Hovis/ABR calls + indicates not able to reach range control by phone this morning. Requests we try by radio. No response. Pilot/Spernak proposes coordinating with Elmendorf tower. Ashley recalls being told they need to be out of airspace by 11:00. Stacey indicates she will try driving to Range Control to see if anyone is there.
10:00 Kristen arrives, works on safety paperwork.
10:06 Stacey heads to range control.
10:15 Gate closed to frontage road to range control office. Stacey notifies Corey Schwabenlander/CH2M assistant PM of situation. He indicates ok to coordinate access with Elmendorf tower. Stacey informs Ashley.
10:25 Stacey arrives back at trailer. Ashley calls, indicates Elmendorf tower expects range to go hot, but does not know when, so cannot grant access.
10:41 Corey + Stacey discuss - aerial survey cancelled for day. Stacey + Kristen to wait till 11:00 and try to contact range control then (since Ashley thought activities would be starting then that required them to be out of the area).
11:02 Range radio on, no contact. Kristen calls range control, scheduler, manager (all available numbers) no response. Decide to try calling at 13:00 (or shortly before, for 1300 start)
12:45 Call range control + range scheduler - still no answer. Will survey Area C on Tuesday 10/11/16

K. Ré
Stacey
10/10/16

(30) 10/10/16 JBER PBR ERF XU022 Waterfowl Transect Monitoring
PN 457958.09.HU.01 AFCEC contract FA8903-09-D-8589
Task: Waterfowl transect monitoring, Area C
Personnel: Stacey Ré + Kristen Stevens
Health + Safety moment: Put truck in park while unlocking gate to XU022.
Weather: low of 32 overnight, 36 on arrival at field office. Partly cloudy.

~~10:15~~ SR 10/10 09:45 SR arrives at field office. Radio for range coordination was not charged/is dead. Place on charger. Ashley Hovis/ABR calls + indicates not able to reach range control by phone this morning. Requests we try by radio. No response. Pilot/Spernak proposes coordinating with Elmendorf tower. Ashley recalls being told they need to be out of airspace by 11:00. Stacey indicates she will try driving to Range Control to see if anyone is there.

10:00 Kristen arrives, works on safety paperwork.

10:06 Stacey heads to range control.

10:15 Gate closed to frontage road to range control office. Stacey notifies Corey Schwabenlander/CH2M assistant PM of situation. He indicates ok to coordinate access with Elmendorf tower. Stacey informs Ashley.

10:25 Stacey arrives back at trailer. Ashley calls, indicates Elmendorf tower expects range to go hot, but does not know when, so cannot grant access.

10:41 Corey + Stacey discuss - aerial survey cancelled for day. Stacey + Kristen to wait till 11:00 and try to contact range control then (since Ashley thought activities would be starting then that required them to be out of the area).

11:02 Range radio on, no contact. Kristen calls range control, scheduler, manager (all available numbers) no response. Decide to try calling at 13:00 (or shortly before, for 1300 start)

12:45 Call range control + range scheduler - still no answer. Will survey Area C on Tuesday 10/11/16

K. Ré
Stacey
10/10/16

(32) JBER PBR ERF XU022 Waterfowl Transect Monitoring 10/12/16
PN 457958.09.HU.01 AFCEC Contract FA8903-09-D-8589
Task: Waterfowl Transect Monitoring, Area C if ice permits + canoe transect (also ice permitting) overnight temps in mid-20's, ice likely.
Personnel: Stacey Ré + Kristen Stevens
Health and safety moment: When hiking in woods, keep enough distance from person in front of you to avoid being whipped by branches as they swing back in place. Wear eye protection.
10:45 Stacey arrives at field trailer. Begins daily paperwork.
11:00 Kristen arrives at field trailer. Hold safety moment. Work on fixing canoe dolly.
11:30 ~~Depart~~ SR 10/12 field office for XU022.
11:40 Prepare to depart field office. Kristen calls in to Range Control.
11:55 Arrive at XU022, drive by Clunie Point: Pond 183 completely ice covered. No waterfowl visible from point. One eagle present.
Head to canoe transect
12:20 Arrive at canoe transect. Ice approximately 1/4" thick. Decide to attempt to launch and see if we can break through to open areas (though none are visible from the launch except to the south where a small seep empties into the flats.
12:30 Abandon efforts to canoe. Ice not breaking easily enough for canoe to be used. Stage canoe + depart.
~~13:00~~ 12:48 Return to vehicle. Head to ditch access to check ice thickness. Ice is ≈ 3/4" thick (see photo).
12:55 Arrive at Clunie Point and measure ice thickness - ice is 3/4 - 4/5" thick (see photo).
13:05 Depart XU022, Kristen checks out with range control.
13:25 Return to field trailer.
13:40 Depart field office. End of day.

Stacey Ré
10/12/16

JBER PBRERF XU022 Retrieval of Canoe/Demob 10/18/16 (33)
PN 457958.09.HU.01 Contract AFCEC - FA8903-09-D-8589
Task: Retrieve canoe, return radio, begin demob of equipment.
Personnel: Stacey Ré/FTL-note taker, Kristen Stevens/SSC, Elan Edgerly/field technician
Health + Safety moment: for canoe retrieval - slips + trips, pinch points, over exertion, communication, caution on hills (avoid working directly down hill)
13:00 Meet at field trailer, conduct safety brief, collect gear for retrieving and transporting canoe (by hand through wooded area and on top of truck.)
13:15 Head to XU022, Kristen calls in to range control.
13:30 Arrive at XU022, stop at Clunie Point to observe conditions. Flood tide evident. (Photos taken). Ice off Clunie point still too thick for monitoring - 1/3 - 1/2" thick, with thin sheets of ice at edges of where flood tide reached. Open water evident in Pond 183, 50-75 ducks present there + in duck ponds, Area east (ditches) appears frozen.
13:40 Hike in to canoe. Flood tide had reached canoe staging point, but all gear (life jackets/paddles) present. Transport canoe using canoe dolly and "manpower" back to truck.
14:35 Arrive back at truck. Secure canoe to top of truck with tie-down cargo straps and foam blocks to prevent contact with roof.
14:50 Kristen calls out with range control.
On hill up to OP Fagan encounter excavator being used to perform vegetation clearance. Gate open. Stop outside gate to re-tighten straps.
Head to shop at skeet range for base wildlife and return canoe.
15:20 Return to field office.
15:30 Team offsite. Stacey calls Cynthia Tomlinson/AFCEC to indicate we can return radio to base wildlife. Cynthia instructs to return only to Jesse Johnson, Chris Donner, or herself. Stacey delivers radio to Jesse, who will close paperwork loop with Cynthia.
16:00 End of day

Stacey Ré
10/18/16

Rite in the Rain

(34) JBER PBR ERF XU022 Waterfowl Transect Monitoring 10/24/16
PN 457958.09.MU.01 AFCEC Contract FA8903-09-D-8589
Task - Gizzard extraction
Safety Moment: Cold temps. Too cold to perform extraction in connex (6° in am, up to 30 in pm). Conduct in field trailer with "secondary containment" to maintain clean area and avoid contaminating office trailer.
Weather 6°-30°F, clear, calm. Personnel - Stacey Ré + Gary Santolo
08:30 Stacey arrives at field trailer. Duck frozen. Stacey places in office trailer in cooler with warm water in front of heater.
09:00 Stacey heads to main office, meets with Gary. Plan to head back to office in a couple hours.
12:00 Return to field trailer, duck still too frozen for extraction.
12:15 Head to lunch, leave duck on tray by heater (with enough distance to prevent contact/fire hazard.
13:25 Return to trail, conduct gizzard extraction. Gary observes several physical indications of potentially unhealthy tissues; mottled coloring on liver, irritation in esophagus and intestines (lower). (See necropsy form.)
13:45 Collect sample GIZZARD02_102416.
14:15 Return to office to package sample, prepare for shipping. Will send out 10/25 in am, will not make Fed Ex cutoff today.

Stacey Ré
10/24/16

# Appendix B-2
# Photo Logs

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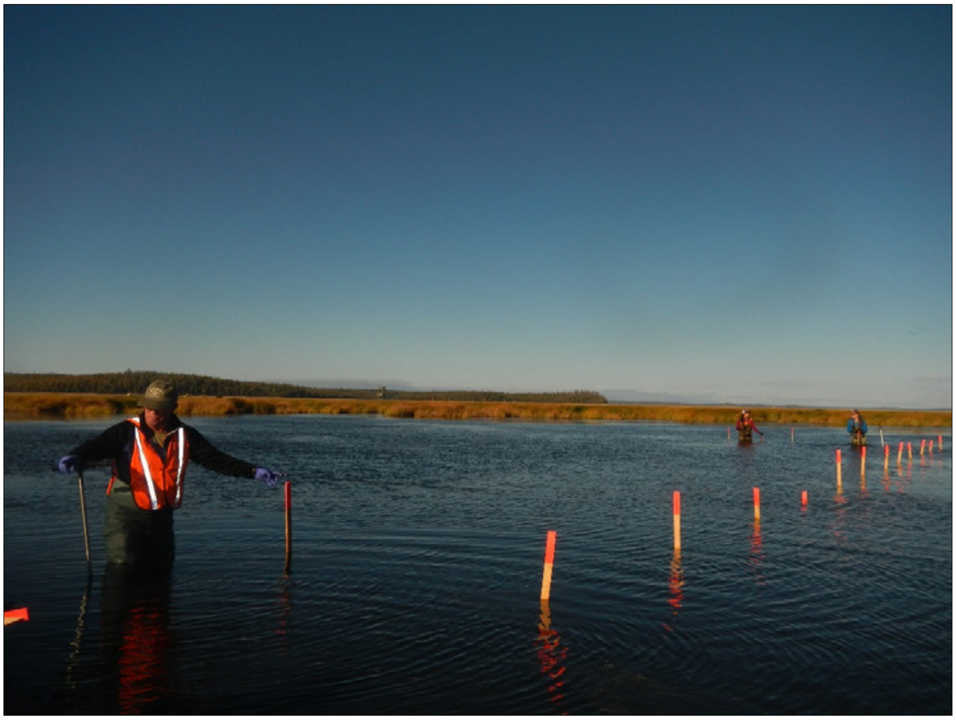
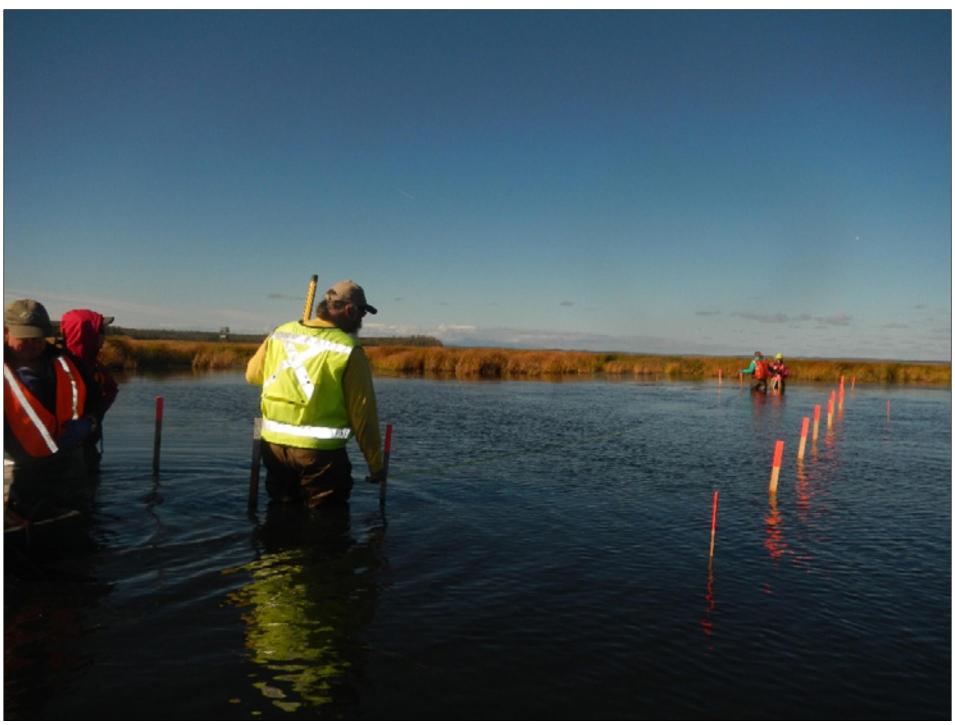


**Photograph 01/DSCN1750: Pond 146 CanoeP1E. Grid, presampling, northwest direction. September 13, 2016**

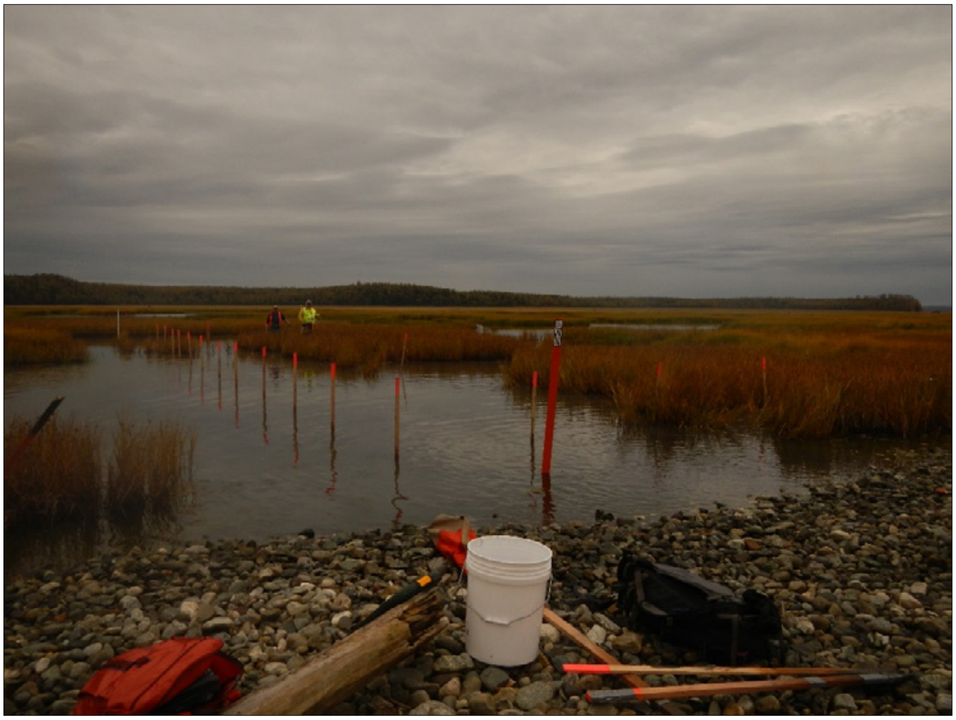


**Photograph 02/DSCN1755: Pond 146 CanoeP2W. Grid, presampling, northwest direction. September 13, 2016**

**Photograph 03/DSCN1766: Pond 183 C. Grid, presampling, northwest direction. September 13, 2016**

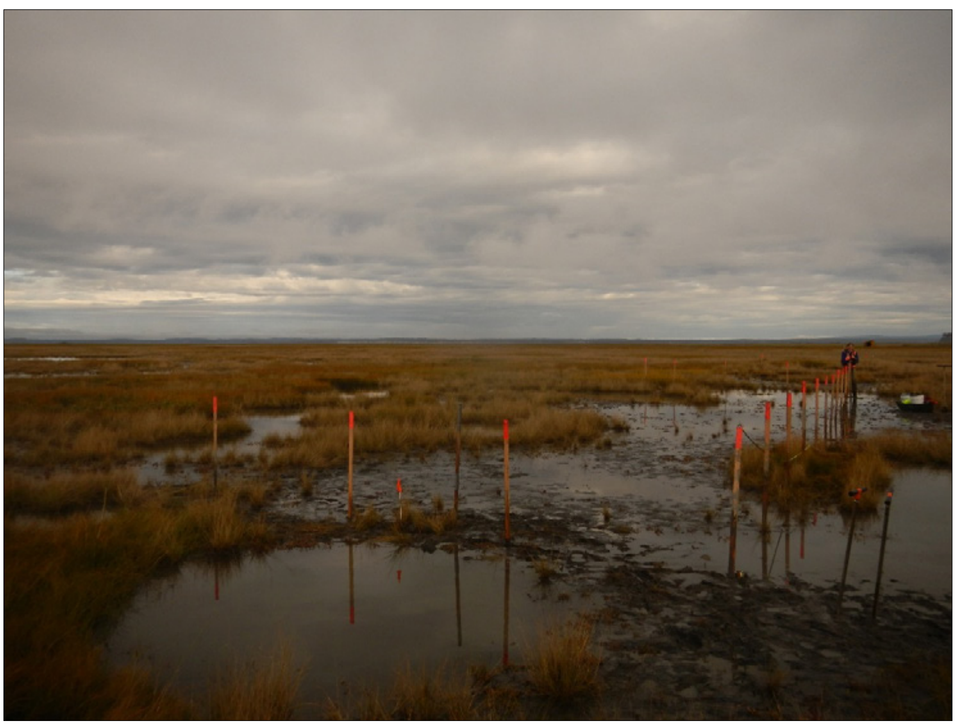

**Photograph 04/DSCN1769: Pond 183 C. Grid, multi-increment composite sediment sampling with use of sediment corer, south direction. September 14, 2016**

**Photograph 05/DSCN1780: Pond 155 SW.**
**Grid, presampling, northeast direction.**
**September 14, 2016**



**Photograph 06/DSCN1783: Pond 155 SW. Grid, presampling, west direction.**
**September 14, 2016**

**Photograph 07/DSCN1785: Pond 171 C. Grid, presampling, east direction.**
**September 14, 2016**

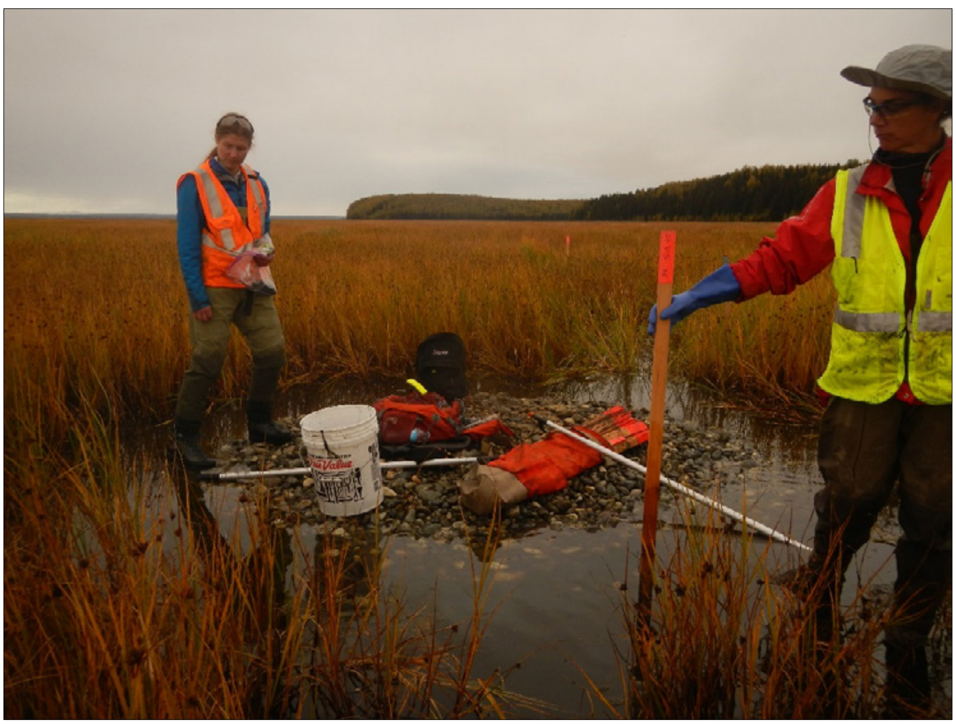


**Photograph 08/DSCN1789: Pond 109 BTS 100mb. Grid, presampling, north direction.**
**September 15, 2016**

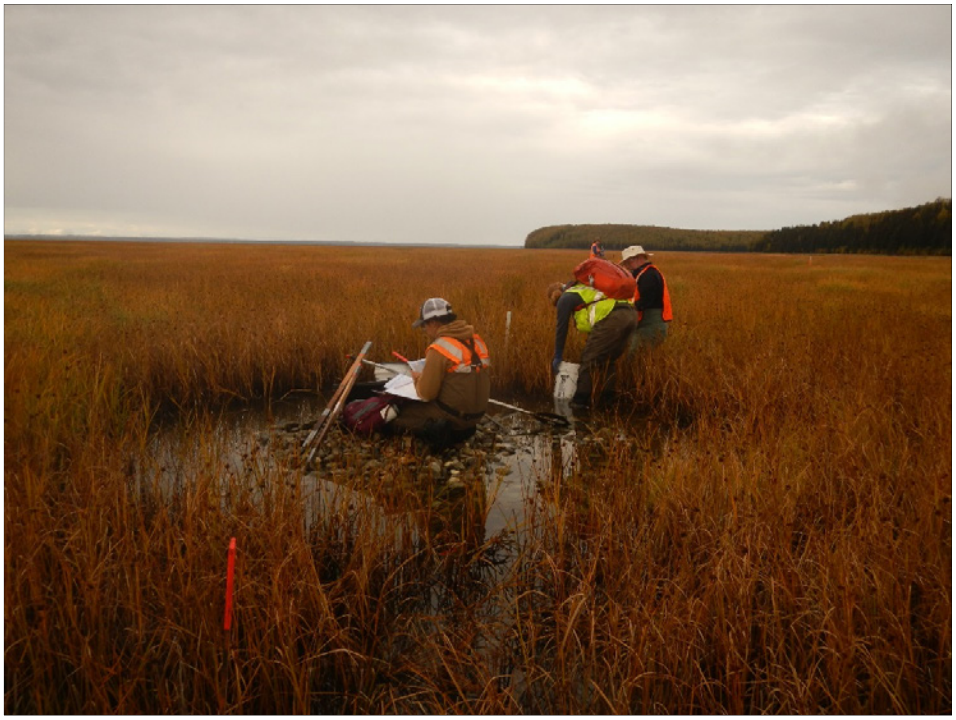
**Photograph 09/DSCN1791: Pond 109 BTS 100mb.
Corner marker from previous site assessment, north direction.
September 15, 2016**

**Photograph 10/DSCN1792: Pond 109 BTS 100ma. Grid, presampling, north direction.
September 15, 2016**

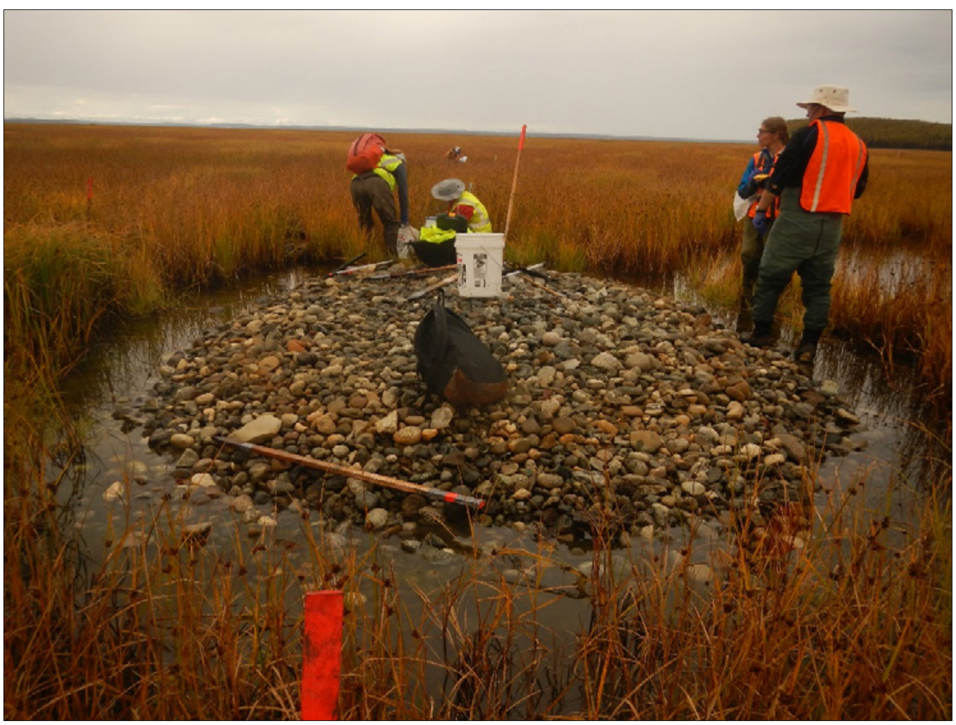
**Photograph 11/DSCN1794: Pond 109 BTS 100ma. Bomb crater, north direction. September 15, 2016**



**Photograph 12/DSCN1799: 03_DIS_38. Cap, north direction. Systematic-random multi-increment composite sampling around cap perimeter. September 15, 2016**



**Photograph 13/DSCN1801: 03_DIS_37. Cap, north direction. September 15, 2016**



**Photograph 14/DSCN1803: 03_DIS_36. Cap, north direction. September 15, 2016**

**Photograph 15/DSCN1805: 04_DIS_84_SOC. Cap, north direction.**
**September 15, 2016**

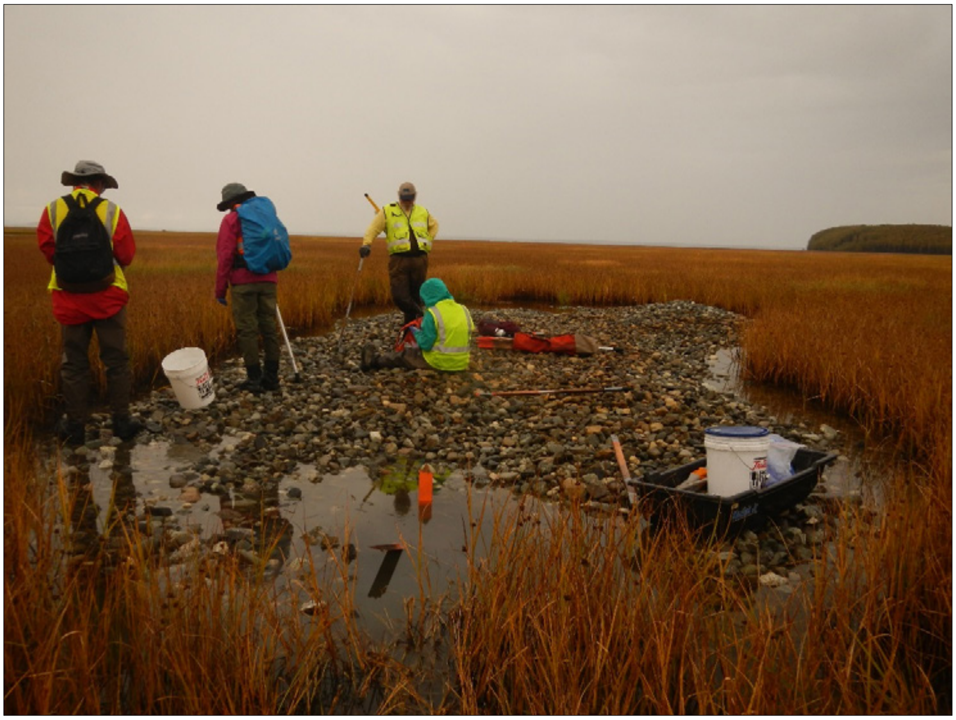
**Photograph 16/DSCN1807: 04_DIS_84. Cap, north direction.**
**September 15, 2016**

**Photograph 17/DSCN1811: 04_DIS_82. Cap, north direction.
September 15, 2016**

**Photograph 18/DSCN1813: 03_DIS_11. Cap, north direction.
September 15, 2016**

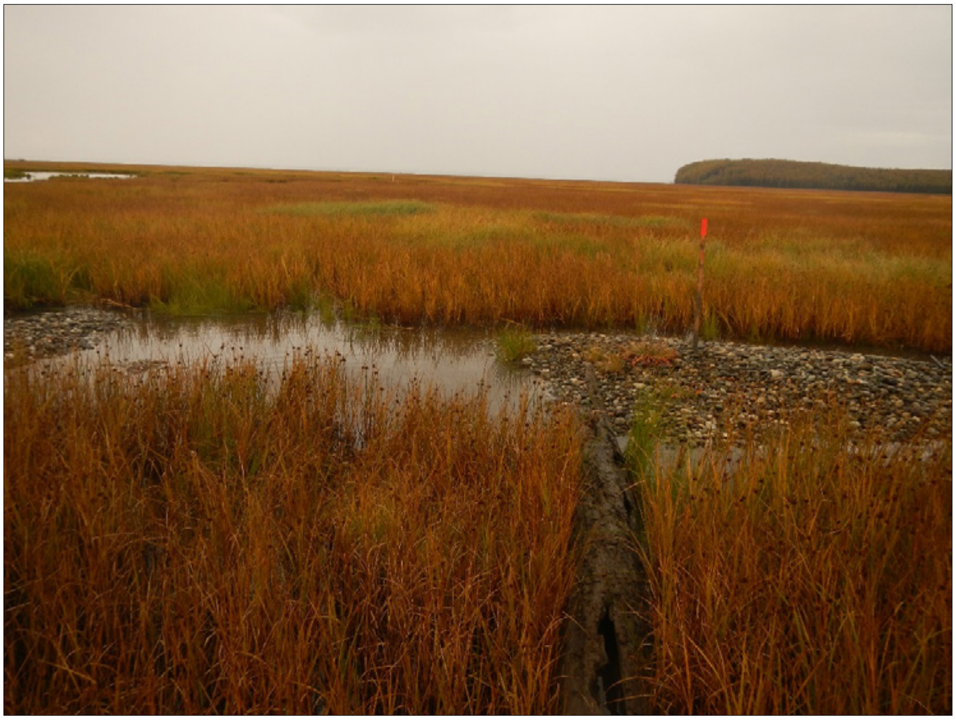
**Photograph 19/DSCN1815: 03_DIS_18. Cap, north direction.**
**September 15, 2016**

**Photograph 20/DSCN1817: 04_DIS_85. Cap, north direction.**
**September 15, 2016**



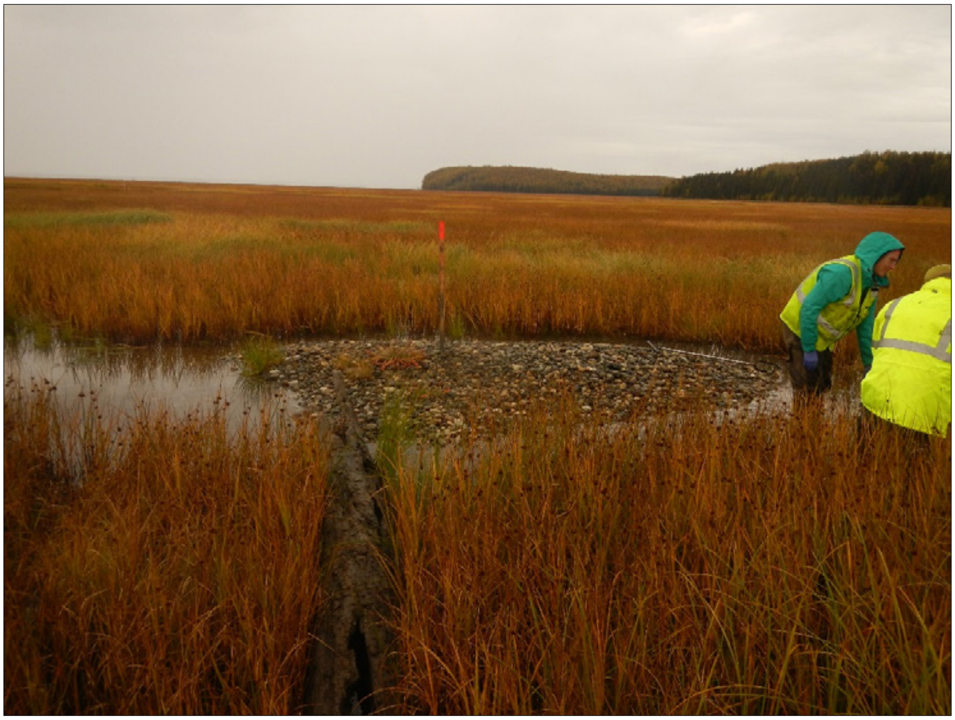
**Photograph 21/DSCN1819: 03_DIS_03. Cap, north direction.
September 15, 2016**

**Photograph 22/DSCN1822: 04_DIS_68. Cap, north direction.
September 15, 2016**



**Photograph 23/DSCN1824: 03_DIS_21. Cap, north direction.
September 15, 2016**

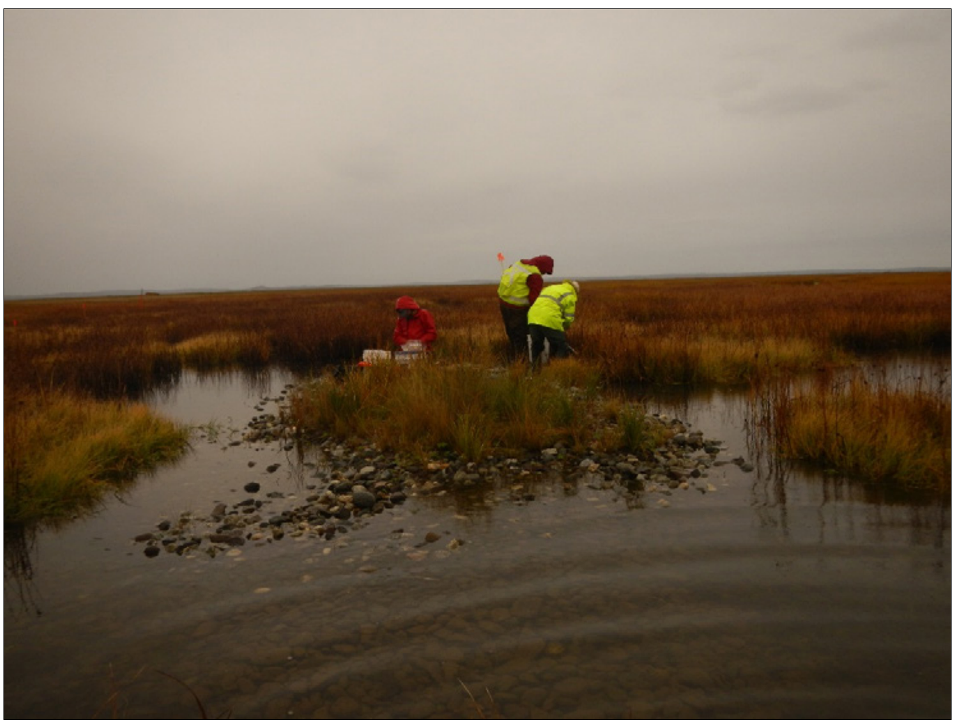
**Photograph 24/DSCN1825: 03_DIS_21. Cap, north direction.
September 15, 2016**



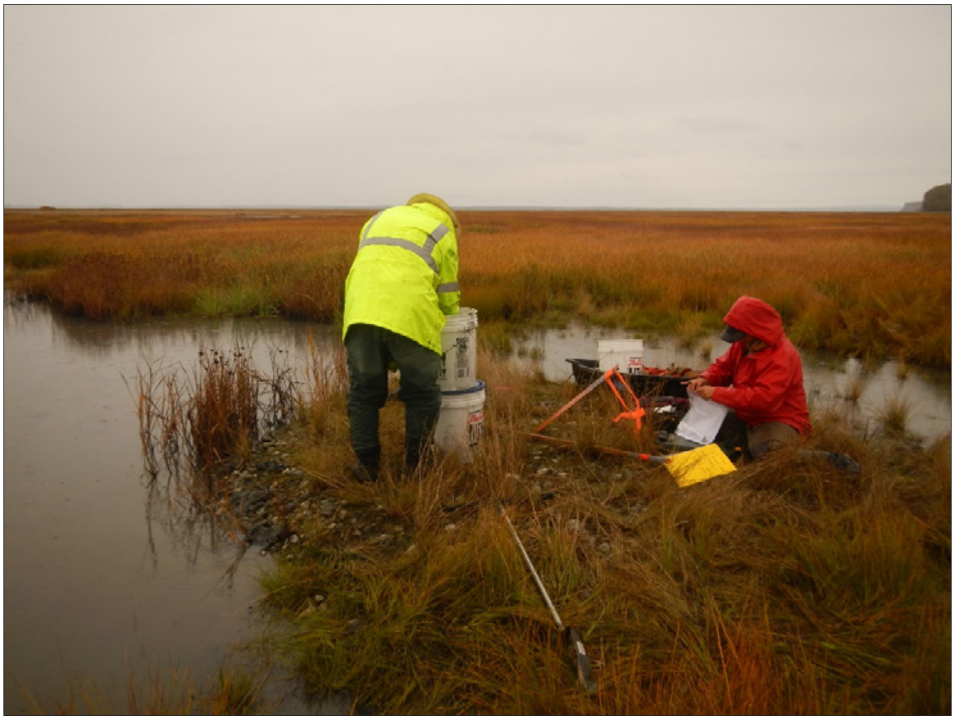
**Photograph 25/DSCN1826: 03_DIS_21. Cap, north direction.**
**September 15, 2016**

**Photograph 26/DSCN1833: Pond 730 North. Cap, north direction.**
**September 16, 2016**

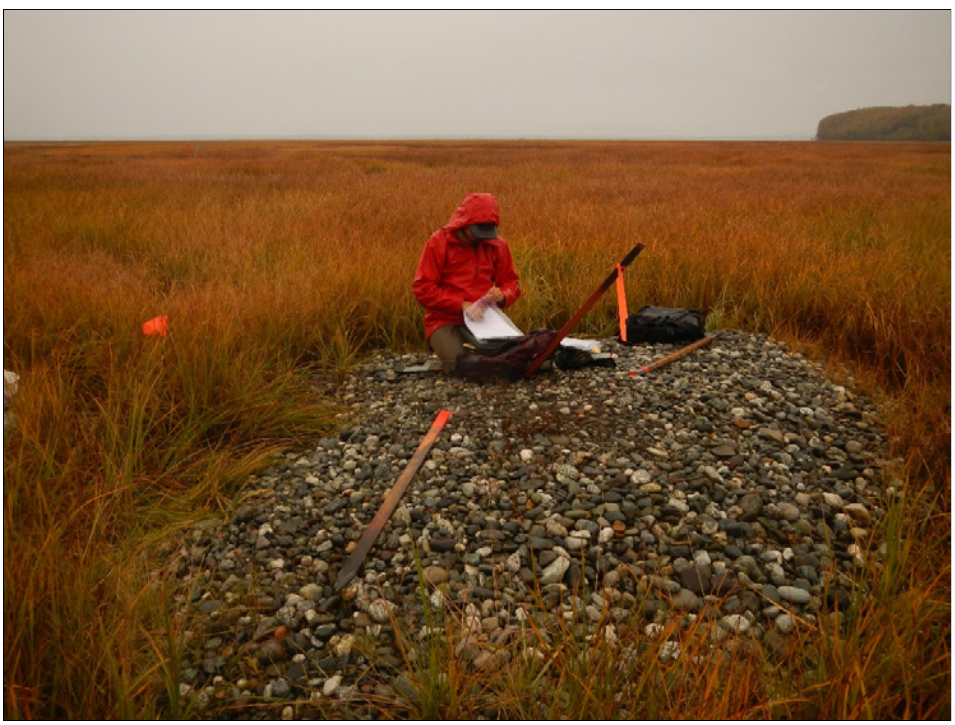
**Photograph 27/DSCN1835: Pond 730 Southwest. Cap, north direction.
September 16, 2016**



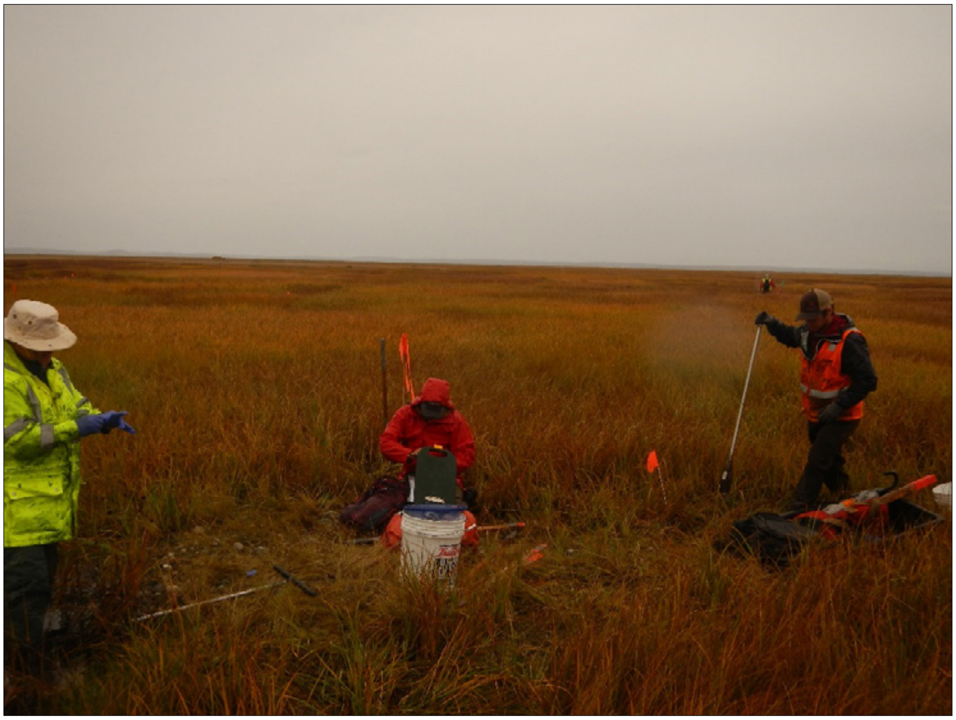
**Photograph 28/DSCN1837: Pond 730 South. Cap, north direction.
September 16, 2016**



**Photograph 29/DSCN1839: 04_DIS_97. Cap, north direction. September 16, 2016**



**Photograph 30/DSCN1841: 04_DIS_96. Cap, north direction. September 16, 2016**



**Photograph 31/DSCN1843: 04_DIS_93. Cap, north direction.**
**September 16, 2016**

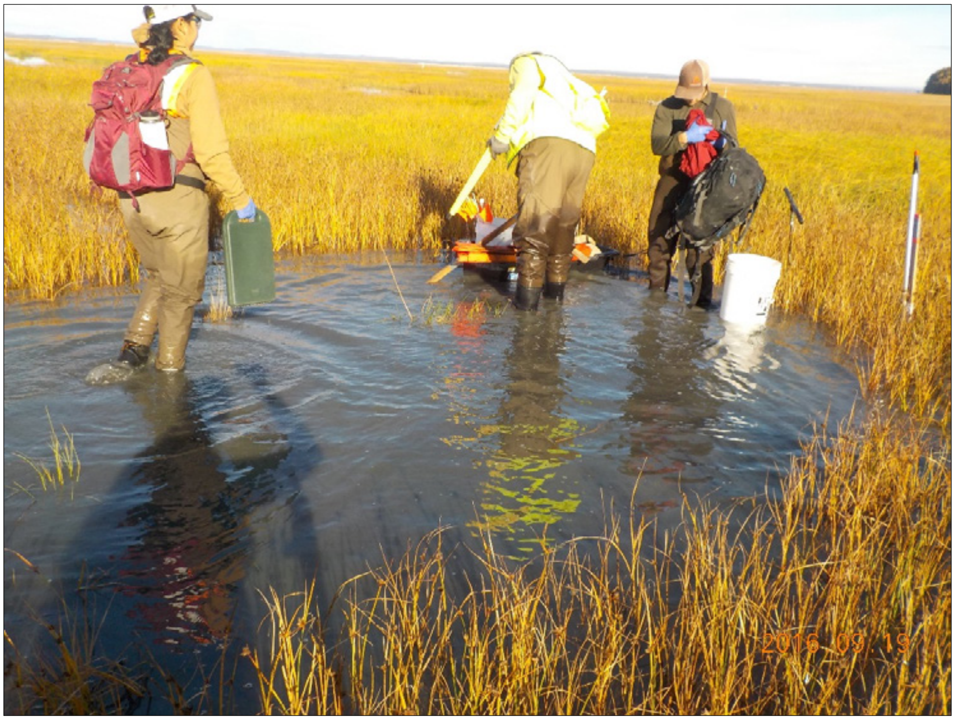
**Photograph 32/DSCN1845: 04_DIS_106. Cap, north direction.**
**September 16, 2016**

**Photograph 33/DSCN1848: Area BT Duck Pond. Cap, northwest direction. September 16, 2016**

**Photograph 34/DSCN1850: 04_DIS_90. Cap, north direction. September 16, 2016**

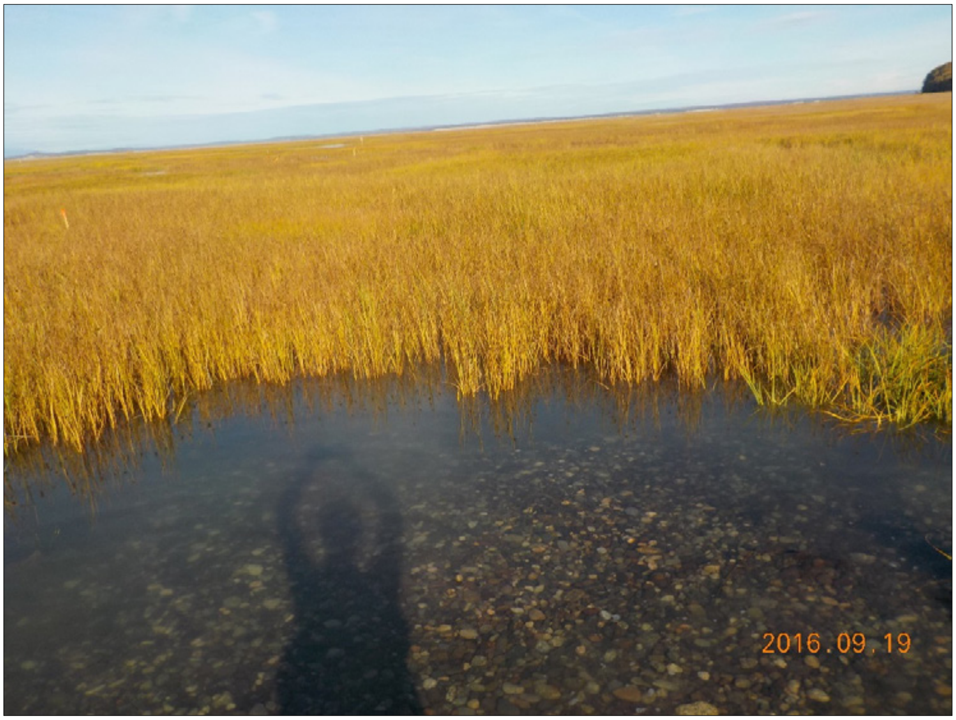
**Photograph 35/DSCN1852: 04_DIS_86. Cap, north direction.**
**September 16, 2016**

**Photograph 36/DSCN1853: 04_DIS_86. Sample processing of systematic-random multi increment composite sampling around cap perimeter.**
**September 16, 2016**




**Photograph 37/DSCN0022: 04_DIS_76. Cap, north direction.
September 19, 2016**


**Photograph 38/DSCN0024: 03_DIS_42. Cap, north direction.
September 19, 2016**




**Photograph 39/DSCN0026: 03_DIS_40. Cap, north direction.
September 19, 2016**


**Photograph 40/DSCN0029: 03_DIS_43. Cap, north direction.
September 19, 2016**


**Photograph 41/DSCN0030: South Ditch WW. Cap, north direction.
September 19, 2016**


**Photograph 42/DSCN0034: South Ditch WE. Cap, north direction.
September 19, 2016**

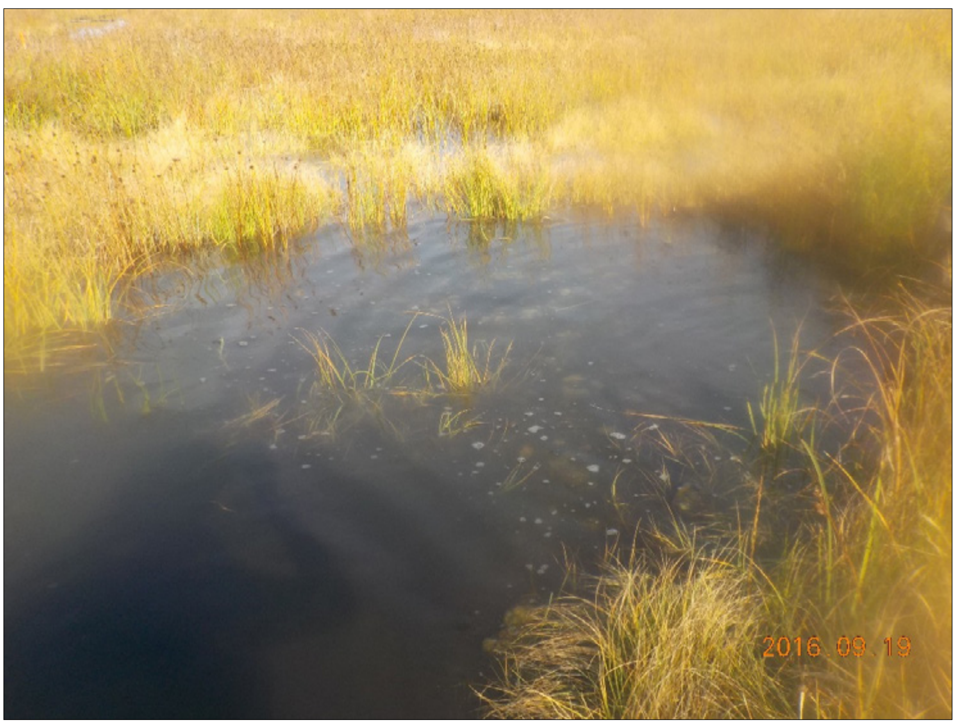

**Photograph 43/DSCN0038: South Ditch EE. Cap, north direction. September 19, 2016**


**Photograph 44/DSCN0040: South Ditch EW. Cap, north direction. September 19, 2016**


**Photograph 45/DSCN0042: Pond 23. Cap, north direction.**
**September 19, 2016**


**Photograph 46/DSCN0044: Cross Ditch JN. Cap, northeast direction.**
**September 19, 2016**


**Photograph 47/DSCN0046: Cross Ditch JW. Cap, northeast direction.**
**September 19, 2016**




**Photograph 48/DSCN0048: Cross Ditch JE. Cap, northeast direction.**
**September 19, 2016**

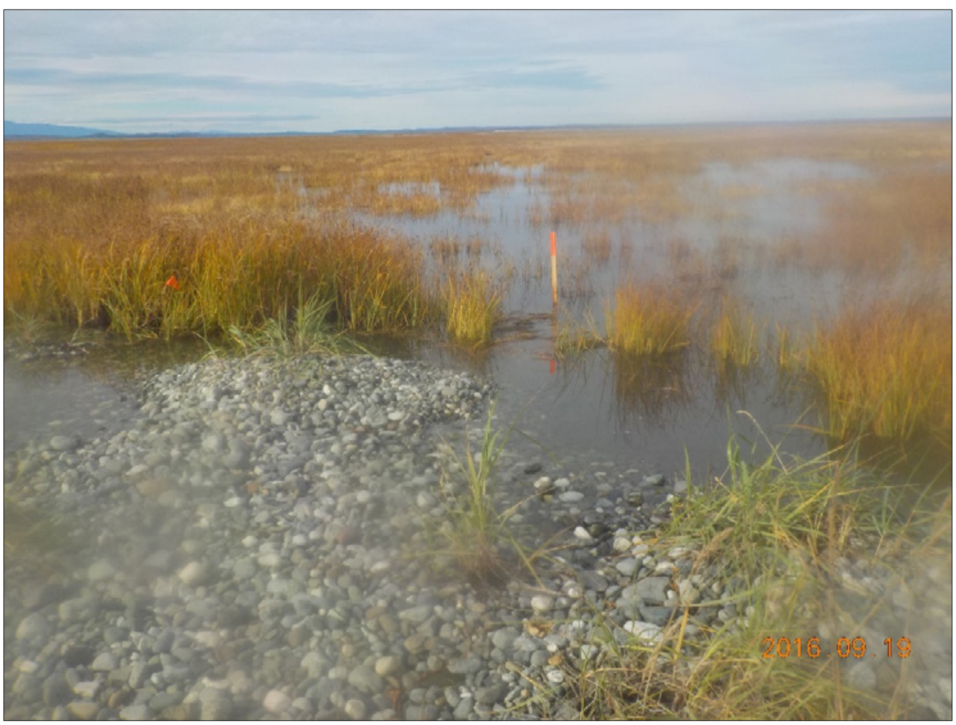

**Photograph 49/DSCN0050: BIP59 East. Cap, northwest direction. September 19, 2016**


**Photograph 50/DSCN0052: BIP59 West. Cap, northwest direction. September 19, 2016**

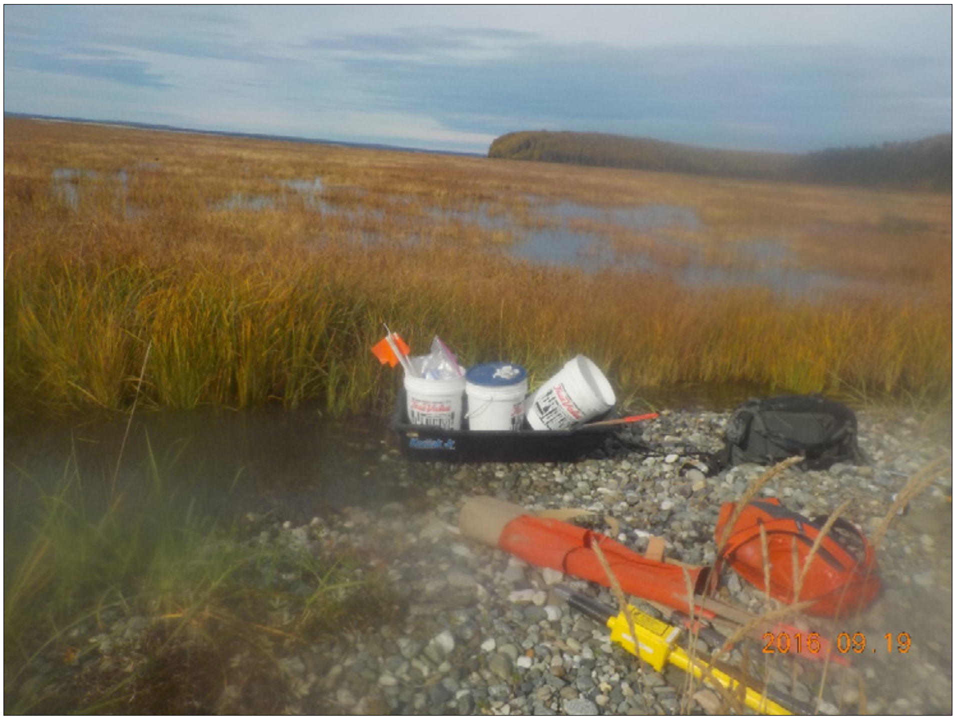

**Photograph 51/DSCN0054: BIP11. Cap, north direction.
September 19, 2016**


**Photograph 52/DSCN0057: BIP10. Cap, north direction.
September 19, 2016**


**Photograph 53/DSCN0059: Area C Pond 155. Cap, northeast direction.**
**September 19, 2016**




**Photograph 54/DSCN0062: North Ditch E. Cap, north direction.**
**September 19, 2016**




**Photograph 55/DSCN0065: North Ditch W. Cap, northeast direction. September 19, 2016**


**Photograph 56/DSCN0068: Bomb Crater W. Cap, northeast direction. September 19, 2016**


**Photograph 57/DSCN0071: Bomb Crater E. Cap, northwest direction. September 19, 2016**

**Photograph 01/DSCN0001: Area C from Clunie Point, northwest direction.**
**September 1, 2016**

**Photograph 02/DSCN0002: Area C from Clunie Point, northwest direction.**
**September 1, 2016**

**Photograph 03/DSCN0003: C/D North Area, north direction.
September 2, 2016**


**Photograph 04/DSCN0004: C/D North Area with staged witness post, northwest direction.
September 2, 2016**


**Photograph 05/DSCN0005: Area C. Ditch transect, Mort001, belly. September 2, 2016**


**Photograph 06/DSCN0006: Area C. Ditch transect, Mort001, back. September 2, 2016**


**Photograph 07/DSCN0007: Outer boundary. XU022 access gate to Area C, Clunie Point, warning sign, north direction.**
**September 2, 2016**

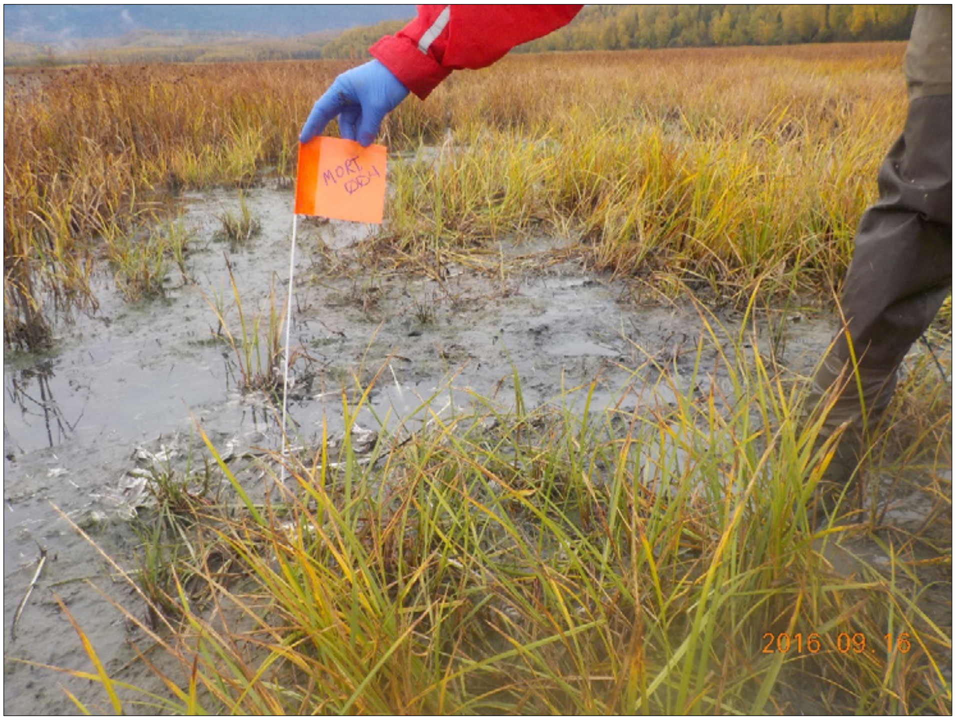

**Photograph 08/DSCN0008: Outer boundary. XU022 warning sign, west direction.**
**September 2, 2016**


**Photograph 09/DSCN0009: Clunie Point Pump Area. Mort002, feather pile.
September 4, 2016**

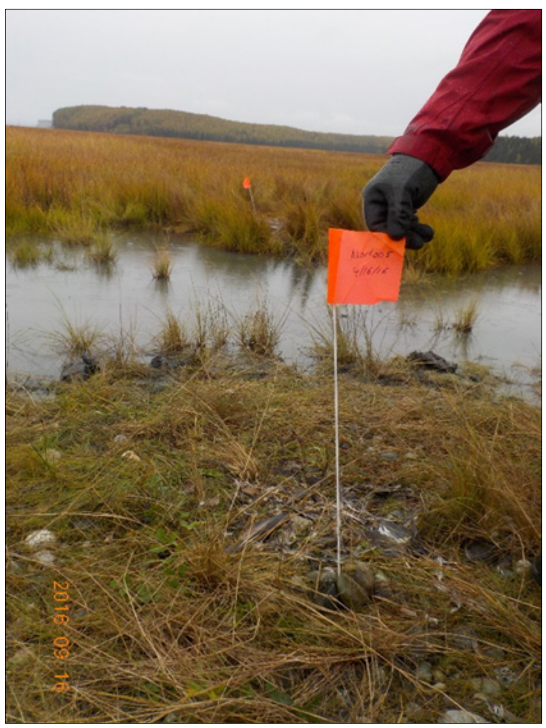

**Photograph 10/DSCN0011: South of Pond 730. Feather pile of shorebird on trail to Pond 730.
September 14, 2016**


**Photograph 11/DSCN0013: Area A Pond 258, southeast direction.**
**September 16, 2016**


**Photograph 12/DSCN0014: Area A Pond 258, northwest direction.**
**September 16, 2016**




**Photograph 13/DSCN0016: Area A. Mort004 feather pile.**
**September 16, 2016**




**Photograph 14/DSCN0018: Area C duck ponds. Mort 005 feather pile.**
**September 16, 2016**


**Photograph 15/DSCN0019: Area C duck ponds. Mort005 feather pile 1. September 16, 2016**


**Photograph 16/DSCN0020: Area C duck ponds. Mort005 feather pile 2. September 16, 2016**


**Photograph 17/DSCN0035: Area C ditch transect area. Mort006 feather pile. September 19, 2016**


**Photograph 18/DSCN0036: Area C ditch transect area. Mort006 feather pile. September 19, 2016**

**Photograph 19: Area C near Clunie Point. Transect monitoring during high tide with canoe, east direction.**
**September 22, 2016**


**Photograph 20/DSCN0073: Beluga trail near Clunie Point. Mort008 green-winged teal.**
**September 26, 2016**


**Photograph 21/DSCN0074: C/D grid, south. Mort 009, unknown species, north direction. September 26, 2016**


**Photograph 22/DSCN0075: C/D grid, south. Mort009, unknown species, north direction. September 26, 2016**


**Photograph 23/DSCN0076: Area C ditch transect area.
Mort006 feather pile, retaken with flag marker, north.
September 26, 2016**


**Photograph 24/IMG_4140: Area C ditch transect area. Mort010.
September 28, 2016**

**Photograph 25/ERF: Area A Pond 226/246/256.
Pond 226/246/256 Area, northeast direction.
September 29, 2016**

**Photograph 26/ERF Area A 2: Area A Pond 226/246/256 Area, southeast direction.
September 29, 2016**

**Photograph 27/IMG_4243: Canoe Transect. Dead tundra swan, west direction.
September 30, 2016**


**Photograph 28/DSCN0077: Area A Pond 226/246/256, northwest direction.
October 4, 2016**

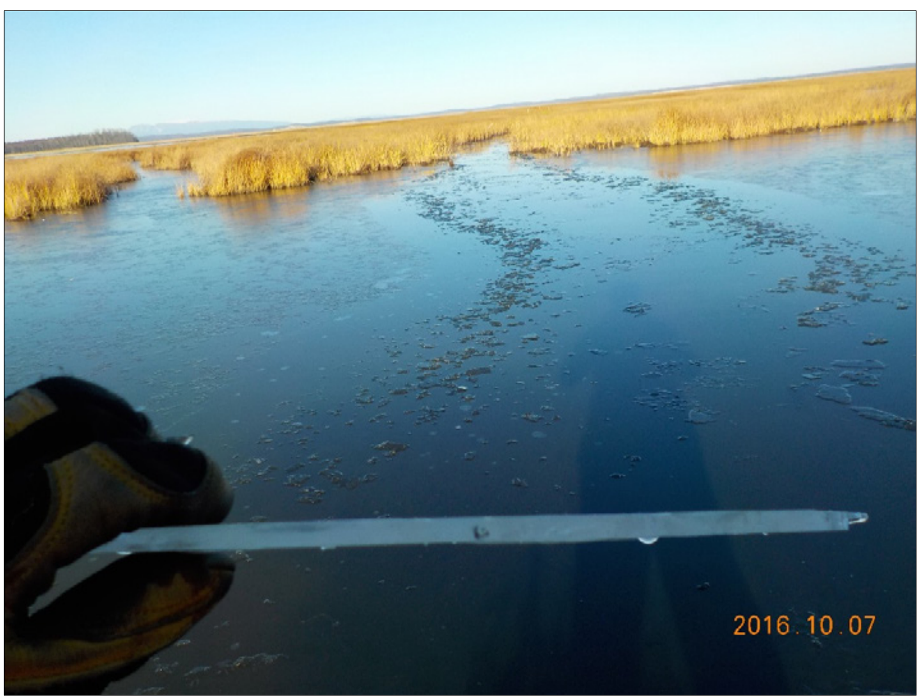

**Photograph 29/DSCN0078: Area A Pond 226/246/256, southeast direction.
October 4, 2016**

**Photograph 30/IMG_4212: Clunie Point. Swans over Area C, north-northwest direction.
October 5, 2016**

**Photograph 31/IMG_4225: Canoe Transect. Swan family in Canoe Area, west direction.
October 5, 2016**

**Photograph 32/IMG_4241: Clunie Point. Breaking ice off Clunie Point,
northwest direction.
October 7, 2016**

**Photograph 33/IMG_4242: Clunie Point. Ice on Beluga Trail, northwest direction. October 7, 2016**




**Photograph 34/DSCN0081: Clunie Point. Ice on Beluga trail, northwest direction. October 7, 2016**

**Photograph 35/IMG_4235: Area A. Aerial survey plane, east direction.**
**October 11, 2016**

**Photograph 36/IMG_4239: Area C ditch transect. Ice thickness at ditch transect, west direction.**
**October 11, 2016**

**Photograph 37/IMG_4240: Clunie Point. Ice thickness at Clunie Point. October 11, 2016**


**Photograph 38/DSCN0082: Canoe transect. Ice at canoe transect, northwest direction. October 12, 2016**


**Photograph 39/DSCN0083: Area C ditch transect. Ice at ditch transect, west direction. October 12, 2016**


**Photograph 40/DSCN0084: Clunie Point. Ice from Clunie Point, north direction. October 12, 2016**


**Photograph 41/DSCN0085: Clunie Point. Ice from Clunie Point, north-northwest direction. October 12, 2016**


**Photograph 42/DSCN0086: Clunie Point. Ice measured at Clunie Point. October 12, 2016**


**Photograph 01/DSCN0005: (Photo 05 in Waterfowl Transect Monitoring Photo Log): Area C. Ditch transect, Mort001, belly. September 2, 2016**


**Photograph 02/DSCN0006: (Photo 06 in Waterfowl Transect Monitoring Photo Log) Area C. Ditch transect, Mort001, back. September 2, 2016**

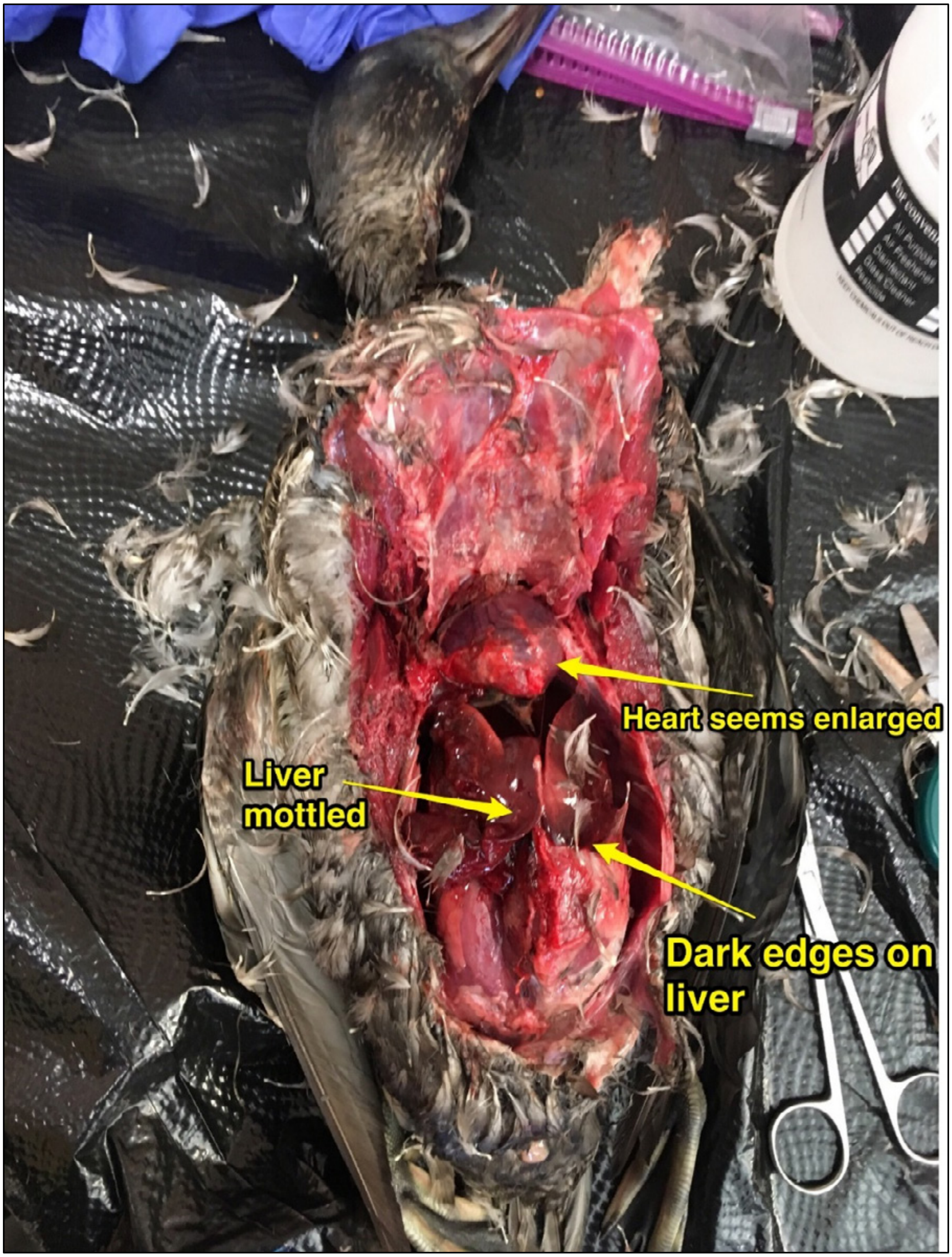

**Photograph 03/MALL-01a-Gizzard: JBER Field Trailer. Mort001 gizzard lining. September 20, 2016**


**Photograph 04/MALL-01b-Gizzard: JBER Field Trailer. Mort001 gizzard contents. September 20, 2016**

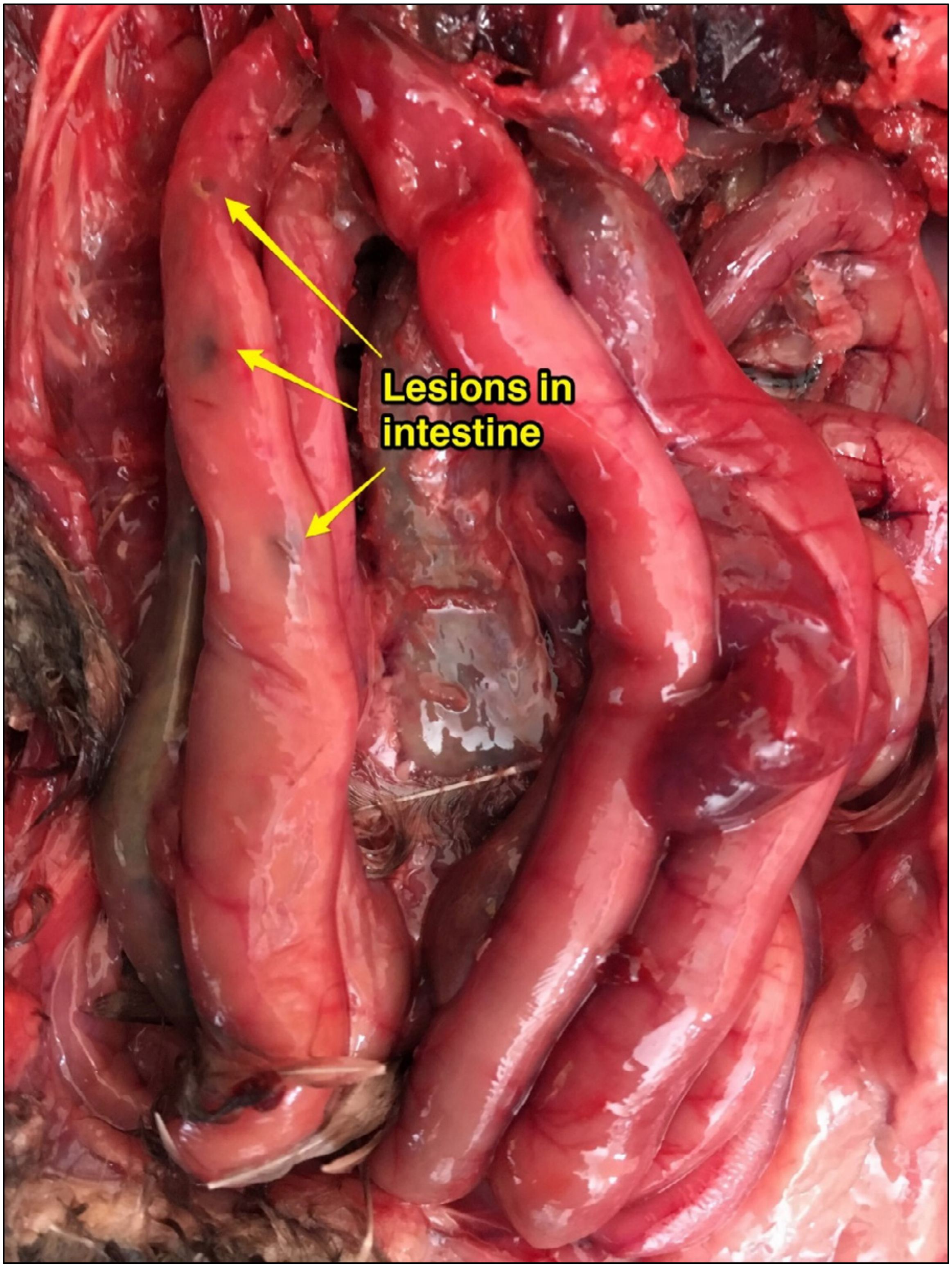

**Photograph 05/MALL01c-Organs: JBER Field Trailer. Mort001 organ detail.
September 20, 2016**


**Photograph 06/DSCN0073 (Photo20 in Waterfowl Transect Monitoring Photo Log): Beluga trail near Clunie Point. Mort008 green-winged teal.
September 26, 2016**

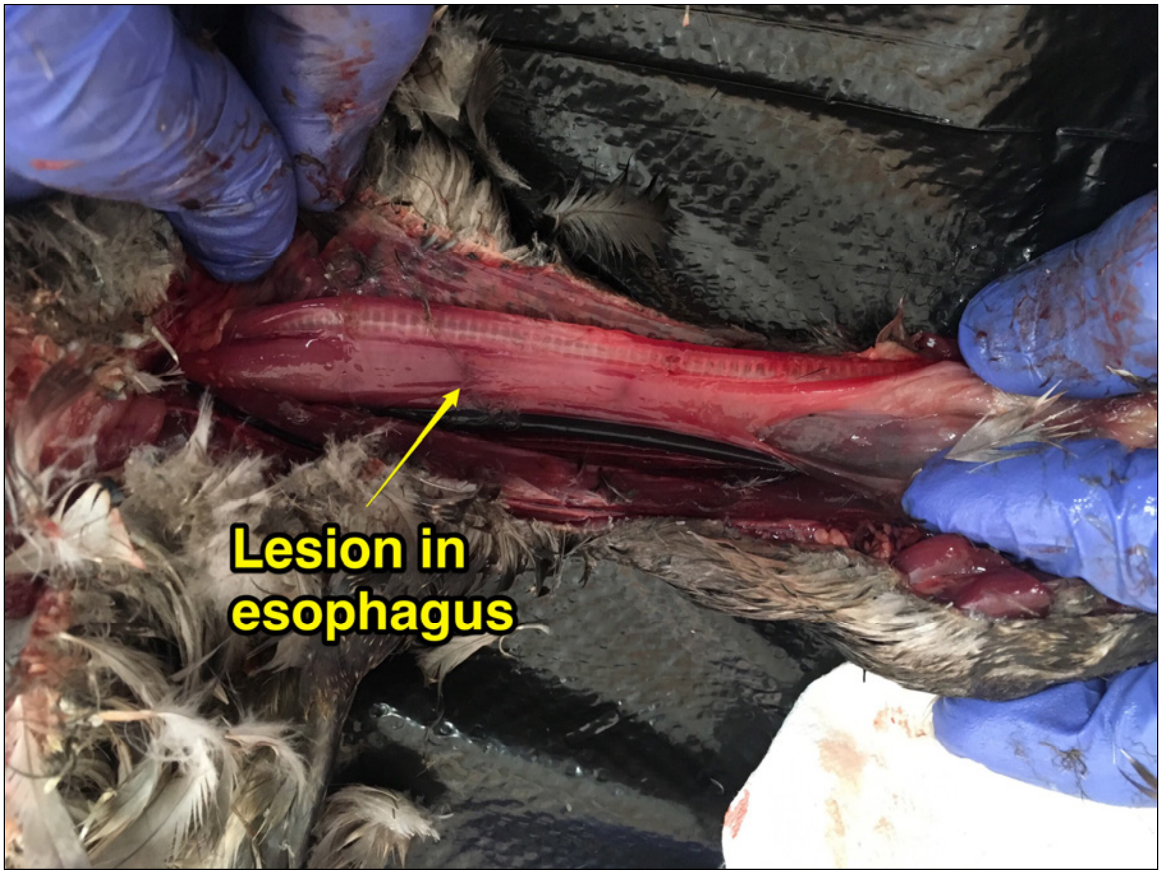
**Photograph 07: JBER Field Trailer. Mort008 green-winged teal (belly, just prior to necropsy; no external injuries noted). October 24, 2016**



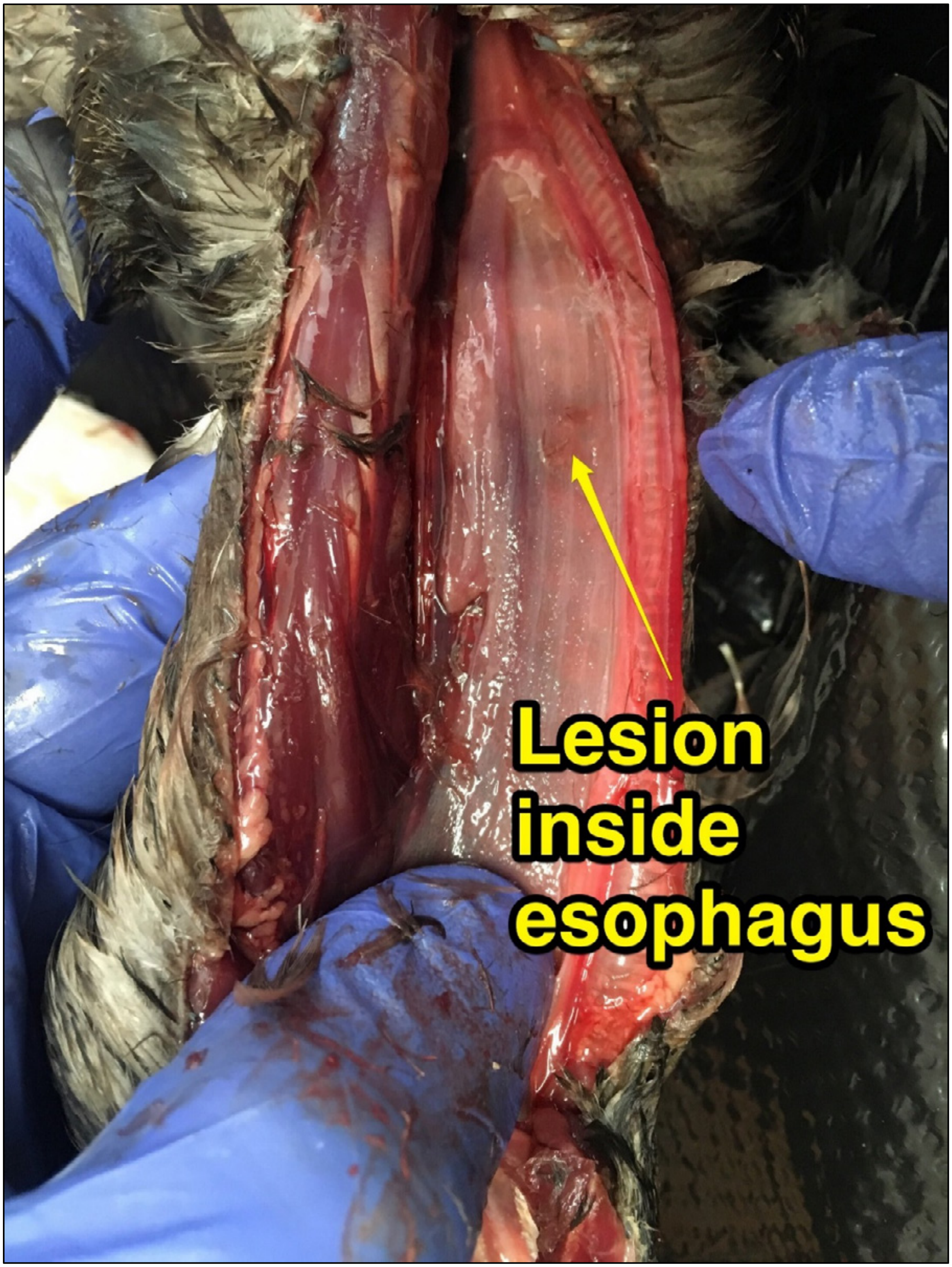

**Photograph 08: JBER Field Trailer. Mort008 green-winged teal – necropsy, organs. October 24, 2016**




**Photograph 09: JBER Field Trailer. Mort008 green-winged teal – necropsy, intestines. October 24, 2016**




**Photograph 10: JBER Field Trailer. Mort008 green-winged teal – necropsy, esophagus (exterior).**
**October 24, 2016**




**Photograph 11: JBER Field Trailer. Mort008 green-winged teal – necropsy, esophagus (interior).**
**October 24, 2016**


**Photograph 12: JBER Field Trailer. Mort008 green-winged teal – necropsy, gizzard. October 24, 2016**

# Appendix B-3
# Chains of Custody

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# CHAIN OF CUSTODY



RTI LABORATORIES

**Environmental Sciences Division**
31628 Glendale Street
Livonia MI, 48150

**Materials Testing Division**
33080 Industrial Road
Livonia, MI 48150

PHONE: (734) 422-8000
FAX: (734) 422-5342
www.rtilab.com

**RTI WORK ORDER NO:**

*Please Include Email Address of Report Recipient !!!*

| | | |
|---|---|---|
| SUBMITTING COMPANY: CH2M | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBR ERF / PROJECT #: 457958.09.HU.01 / QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): AK | ADDRESS: bernice.kidd@ch2m.com | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | CITY, STATE, ZIP | CITY, STATE, ZIP |
| | PHONE: 530-229-3203 / EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HU.01 |
| SAMPLER'S PRINTED NAME: K. Stevens | SAMPLER'S SIGNATURE: [signature] | |

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | TESTS REQUESTED: EPA 7580 | | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 04DIS106_0916 | 9/16/16 | 1410 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 2 | AREABTDUCKPOND_0916 | 9/16/16 | 1430 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 3 | 04DIS90_0916 | 9/16/16 | 1450 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 4 | 04DIS86_0916 | 9/16/16 | 1505 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 5 | 03DIS42_0916 | 9/19/16 | 1040 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 6 | 04DIS76_0916 | 9/19/16 | 1045 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 7 | 03DIS40_0916 | 9/19/16 | 1100 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 8 | 03DIS43_0916 | 9/19/16 | 1105 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 9 | SOUTHDITCHWE_0916 | 9/19/16 | 1135 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 10 | SOUTHDITCHWE_0916D | 9/19/16 | 1140 | S | 1 | X | | | | | | | X | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~21/16 | ~~1800~~ 1200 KO | | | |
| | | | | | |
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**REPORT TRANSMITTAL DESIRED:**

☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

ALL REPORTING IS VIA THE RTI "FLASHPOINT" ONLINE SYSTEM UNLESS OTHERWISE SPECIFIED

**FOR LAB USE ONLY**

Temp of samples ______ °C On Wet Ice ? ______

Comments: ______

**TURNAROUND DESIRED:** Standard ☒ **RUSH:** Next BD ☐ 2nd BD ☐ 3rd BD ☐

**Note: RUSH requests will incur surcharges!**

Distribution: White - Lab; Pink - Field

**See reverse side for Laboratory Terms and Conditions of Service**

**MATRIX CODES:** A = AIR, SD = SOLID, DW = DRINKING WATER, SL = SLUDGE, GW = GROUNDWATER, SV = SOLVENT WASTE, L = LIQUID, W = WATER, O = OIL, WP = WIPE, WW = WASTE WATER, SW = SURFACE WATER, S = SOIL

#2

RTI

RTI LABORATORIES

# CHAIN OF CUSTODY

Environmental Sciences Division
31628 Glendale Street
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Materials Testing Division
33080 Industrial Road
Livonia, MI 48150

PHONE: (734) 422-8000
FAX: (734) 422-5342
www.rtilab.com

RTI WORK ORDER NO: ______

*Please Include Email Address of Report Recipient !!!*

SUBMITTING COMPANY: CH2M

PROJECT NAME: JBER PBR ERF
PROJECT #: 457958.09.HU.01
QUOTE #:

SAMPLING LOCATION (STATE or COUNTRY): AK

SPECIAL INSTRUCTIONS / COMMENTS:

REPORT TO (Name): Berney Kidd
COMPANY: CH2M
ADDRESS: bernice.kidd@ch2m.com
CITY, STATE, ZIP:
PHONE: 530-229-3203
EMAIL (OR FAX IF NO EMAIL AVAILABLE):

BILL TO:
COMPANY: CH2M
ADDRESS:
CITY, STATE, ZIP:
P.O NUMBER: 457958.09.HU.01

SAMPLER'S PRINTED NAME: K. Stevens
SAMPLER'S SIGNATURE: [signature]

TESTS REQUESTED

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | HNO3 | H2SO4 | NaOH | Methanol | OTHER | EPA 7580 | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SOUTHDITCHEW_0916 | 9/19/16 | 1200 | S | 1 | X | | | | | | | X | | | | | | | | |
| 2 | SOUTHDITCHEE_0916 | 9/19/16 | 1205 | S | 1 | X | | | | | | | X | | | | | | | | |
| 3 | POND23_0916 | 9/19/16 | 1225 | S | 1 | X | | | | | | | X | | | | | | | | |
| 4 | CROSSDITCHSE_0916 | 9/19/16 | 1245 | S | 1 | X | | | | | | | X | | | | | | | | |
| 5 | CROSSDITCHSN_0916 | 9/19/16 | 1250 | S | 1 | X | | | | | | | X | | | | | | | | |
| 6 | CROSSDITCHSW_0916 | 9/19/16 | 1300 | S | 1 | X | | | | | | | X | | | | | | | | |
| 7 | BIP5_9EAST_0916 | 9/19/16 | 1325 | S | 1 | X | | | | | | | X | | | | | | | | |
| 8 | BIP5_9EAST_0916D | 9/19/16 | 1330 | S | 1 | X | | | | | | | X | | | | | | | | |
| 9 | BIP5_9WEST_0916 | 9/19/16 | 1335 | S | 1 | X | | | | | | | X | | | | | | | | |
| 10 | BIP11_0916 | 9/19/16 | 1350 | S | 1 | X | | | | | | | X | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~21/19 | ~~1800~~ 1200 KS | | | |
| | | | | | |
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REPORT TRANSMITTAL DESIRED:

☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

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FOR LAB USE ONLY

Temp of samples ______ °C On Wet Ice ? ______

Comments: ______

TURNAROUND DESIRED: Standard ☒ RUSH: Next BD ☐ 2nd BD ☐ 3rd BD ☐

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#2

RTI

# RTI LABORATORIES

# CHAIN OF CUSTODY

PAGE 4 OF 4

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www.rtilab.com

**RTI WORK ORDER NO:**

*Please Include Email Address of Report Recipient !!!*

| | | |
|---|---|---|
| SUBMITTING COMPANY: CH2M | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBRERF / PROJECT #: 457958.09 HU.01 / QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): AK | ADDRESS: bernice.kidd@ch2m.com | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | CITY, STATE, ZIP: | CITY, STATE, ZIP: |
| | PHONE: 530-229-3203 / EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HU.01 |
| SAMPLER'S PRINTED NAME: K. Stevens / SAMPLER'S SIGNATURE: [signature] | TESTS REQUESTED | |

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | HNO3 | H2SO4 | NaOH | Methanol | OTHER | EPA 7580 | | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BIP10_0916 | 9/19/16 | 1400 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 2 | AREACPOND155_0916 | 9/19/16 | 1425 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 3 | NORTHDITCHE_0916 | 9/19/16 | 1455 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 4 | NORTHDITCHW_0916 | 9/19/16 | 1505 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 5 | BOMBCRATERE_0916 | 9/19/16 | 1545 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 6 | BOMBCRATERW_0916 | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 7 | BOMBCRATERW_0916MS | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 8 | BOMBCRATERW_0916SD | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~21/16 | ~~1800~~ 1200 | | | |
| | | | | | |
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**REPORT TRANSMITTAL DESIRED:**

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Temp of samples ______ °C On Wet Ice ? ______

Comments: ______

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#2

# CHAIN OF CUSTODY

RTI LABORATORIES

PAGE: 1 OF: 5

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**Materials Testing Division**
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Livonia, MI 48150

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FAX: (734) 422-5342
www.rtilab.com

RTI WORK ORDER NO:

*Please Include Email Address of Report Recipient !!!*

| | | |
|---|---|---|
| SUBMITTING COMPANY: CH2M | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBR ERF · PROJECT #: 457958.09 HU.01 · QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): ALASKA | ADDRESS: bernice.kidd@CH2M.COM | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | CITY, STATE, ZIP | CITY, STATE, ZIP |
| | PHONE: 530-229-3203 · EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HU.01 |
| SAMPLER'S PRINTED NAME: Kristin Stevens | SAMPLER'S SIGNATURE: [signature] | |

TESTS REQUESTED

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | EPA 7580 | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POND146CANOEPIE_0916R1 | 9/13/16 | 1145 | S | 1 | X | | | | | | | X | | |
| 2 | POND146CANOEPIE_0916R2 | 9/13/16 | 1150 | S | 1 | X | | | | | | | X | | |
| 3 | POND146CANOEP2W_0916R1 | 9/13/16 | 1435 | S | 1 | X | | | | | | | X | | |
| 4 | POND146CANOEP2W_0916R2 | 9/13/16 | 1440 | S | 1 | X | | | | | | | X | | |
| 5 | POND183C100MA_0916R1 | 9/14/16 | 1502 | S | 1 | X | | | | | | | X | | |
| 6 | POND183C100MA_0916R2 | 9/14/16 | 1507 | S | 1 | X | | | | | | | X | | |
| 7 | POND155SWGRID_0916R1 | 9/14/16 | 1510 | S | 1 | X | | | | | | | X | | |
| 8 | POND155SWGRID_0916R2 | 9/14/16 | 1515 | S | 1 | X | | | | | | | X | | |
| 9 | POND171CMARSH_0916R1 | 9/14/16 | 1530 | S | 1 | X | | | | | | | X | | |
| 10 | POND171CMARSH_0916R2 | 9/14/16 | 1535 | S | 1 | X | | | | | | | X | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~ 21/16 | ~~1800~~ 1200 ks | | | |
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**REPORT TRANSMITTAL DESIRED:**

☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

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**FOR LAB USE ONLY**

Temp of samples ______ °C On Wet Ice ? ______

Comments: ______

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**Materials Testing Division**
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PAGE: 2 OF: 5

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FAX: (734) 422-5342
www.rtilab.com

RTI WORK ORDER NO:

*Please Include Email Address of Report Recipient !!!*

SUBMITTING COMPANY: CH2M

PROJECT NAME: JBER PBR ERF | PROJECT #: 457958.09.HU.01 | QUOTE #:

SAMPLING LOCATION (STATE or COUNTRY): AK

SPECIAL INSTRUCTIONS / COMMENTS:

REPORT TO (Name): Berney Kidd
COMPANY: CH2M
ADDRESS: bernice.kidd@CH2M.COM
CITY, STATE, ZIP:
PHONE: 530-229-3203
EMAIL (OR FAX IF NO EMAIL AVAILABLE):

BILL TO:
COMPANY: CH2M
ADDRESS:
CITY, STATE, ZIP:
P.O NUMBER: 457958.09.HU.01

SAMPLER'S PRINTED NAME: K. Stevens
SAMPLER'S SIGNATURE: [signature]

TESTS REQUESTED

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | EPA 7580 | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POND109BTS100MB_0916R1 | 9/15/16 | 1140 | S | 1 | X | | | | | | | X | | |
| 2 | POND109BTS100MB_0916R2 | 9/15/16 | 1145 | S | 1 | X | | | | | | | X | | |
| 3 | POND109BTS100MB_0916R2D | 9/15/16 | 1150 | S | 1 | X | | | | | | | X | | |
| 4 | POND109BTS100MA_0916R1 | 9/15/16 | 1200 | S | 1 | X | | | | | | | X | | |
| 5 | POND109BTS100MA_0916R2 | 9/15/16 | 1205 | S | 1 | X | | | | | | | X | | |
| 6 | 03DIS37_0916 | 9/15/16 | 1315 | S | 1 | X | | | | | | | X | | |
| 7 | 03DIS37_0916D | 9/15/16 | 1320 | S | 1 | X | | | | | | | X | | |
| 8 | 03DIS38_0916 | 9/15/16 | 1325 | S | 1 | X | | | | | | | X | | |
| 9 | 03DIS38_0916MS | 9/15/16 | 1325 | S | 1 | X | | | | | | | X | | |
| 10 | 03DIS38_0916SD | 9/15/16 | 1325 | S | 1 | X | | | | | | | X | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~ 21/16 | ~~1800~~ 1200 | | | |
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**REPORT TRANSMITTAL DESIRED:**
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE
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**FOR LAB USE ONLY**
Temp of samples ______ °C On Wet Ice ? ______
Comments: ______

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#1

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FAX: (734) 422-5342
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**RTI WORK ORDER NO:** ______

*Please Include Email Address of Report Recipient !!!*

| | | | |
|---|---|---|---|
| SUBMITTING COMPANY: CH2M | | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBR ERF | PROJECT #: 457958.09.HV.01 | QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): AK | | ADDRESS: bernice.kidd@CH2M.com | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | | CITY, STATE, ZIP: | CITY, STATE, ZIP: |
| | | PHONE: 530-229-3203 · EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HV.01 |
| SAMPLER'S PRINTED NAME: K. Stevens | SAMPLER'S SIGNATURE: [signature] | | |

TESTS REQUESTED

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | EPA 7580 | | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03DIS36_0916 | 9/15/16 | 1340 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 2 | 04DIS84_0916 | 9/15/16 | 1355 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 3 | 04DIS84SOC_0916 | 9/15/16 | 1400 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 4 | 04DIS82_0916 | 9/15/16 | 1410 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 5 | 03DIS11_0916 | 9/15/16 | 1430 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 6 | 03DIS18_0916 | 9/15/16 | 1435 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 7 | 03DIS18_0916D | 9/15/16 | 1440 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 8 | 04DIS85_0916 | 9/15/16 | 1445 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 9 | 04DIS68_0916 | 9/15/16 | 1500 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 10 | 03DIS21_0916 | 9/15/16 | 1510 | S | 1 | X | | | | | | | X | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~ 21/16 | ~~1800~~ 1200 KS | | | |
| | | | | | |
| | | | | | |

**REPORT TRANSMITTAL DESIRED:**

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**FOR LAB USE ONLY**

Temp of samples ______ °C On Wet Ice ? ______

Comments: ______

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**RTI WORK ORDER NO:**

***Please Include Email Address of Report Recipient !!!***

SUBMITTING COMPANY: CH2M

PROJECT NAME: JBER PBR ERF

PROJECT #: 457958.09.HV.01

QUOTE #:

SAMPLING LOCATION (STATE or COUNTRY): AK

SPECIAL INSTRUCTIONS / COMMENTS:

REPORT TO (Name): Berney Kidd

COMPANY: CH2M

ADDRESS: bernice.kidd@ch2m.com

CITY, STATE, ZIP:

PHONE: 530-229-3203

EMAIL (OR FAX IF NO EMAIL AVAILABLE):

BILL TO:

COMPANY: CH2M

ADDRESS:

CITY, STATE, ZIP:

P.O NUMBER: 457958.09.HV.01

SAMPLER'S PRINTED NAME: K. Stevens

SAMPLER'S SIGNATURE: [signature]

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | TESTS REQUESTED: EPA 7580 | | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03DIS03_0916 | 9/15/16 | 1520 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 2 | GIZZARD01_092016 | 9/20/16 | 1325 | SD | 1 | X | | | | | | | X | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | | |
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| 9 | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/21/16 (~~20~~) | 1200 (~~1800~~) | | | |
| | | | | | |
| | | | | | |

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| | | |
|---|---|---|
| SUBMITTING COMPANY: CH2M | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBR ERF / PROJECT #: / QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): AK | ADDRESS: bernice.kidd@ch2m.com | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | CITY, STATE, ZIP | CITY, STATE, ZIP |
| | PHONE: 530-229-3203 / EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HV.01 |
| SAMPLER'S PRINTED NAME: K. Stevens | SAMPLER'S SIGNATURE: [signature] | |

TESTS REQUESTED

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | EPA 7580 | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EB01_0916 | 9/20/16 | 1215 | W | 1 | X | | | | | | | X | | | | | | | | |
| 2 | EB02_0916 | 9/20/16 | 1220 | W | 1 | X | | | | | | | X | | | | | | | | |
| 3 | EB03_0916 | 9/20/16 | 1225 | W | 1 | X | | | | | | | X | | | | | | | | |
| 4 | EB04_0916 | 9/20/16 | 1235 | W | 1 | X | | | | | | | X | | | | | | | | |
| 5 | EB05_0916 | 9/20/16 | 1240 | W | 1 | X | | | | | | | X | | | | | | | | |
| 6 | EB06_0916 | 9/20/16 | 1245 | W | 1 | X | | | | | | | X | | | | | | | | |
| 7 | EB07_0916 | 9/20/16 | 1250 | W | 1 | X | | | | | | | X | | | | | | | | |
| 8 | EB08_0916 | 9/20/16 | 1255 | W | 1 | X | | | | | | | X | | | | | | | | |
| 9 | EB09_0916 | 9/20/16 | 1300 | W | 1 | X | | | | | | | X | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~ 21/16 | ~~1800~~ 1200 | | | |
| | | | | | |
| | | | | | |

**REPORT TRANSMITTAL DESIRED:**
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE

ALL REPORTING IS VIA THE RTI "FLASHPOINT" ONLINE SYSTEM UNLESS OTHERWISE SPECIFIED

**FOR LAB USE ONLY**
Temp of samples ____ °C On Wet Ice ? ____
Comments: ____

**TURNAROUND DESIRED:** Standard ☐ **RUSH:** Next BD ☐ 2nd BD ☐ 3rd BD ☐
**Note: RUSH requests will incur surcharges!**

Distribution: White - Lab; Pink - Field

See reverse side for Laboratory Terms and Conditions of Service

**MATRIX CODES:** A = AIR, SD = SOLID, DW = DRINKING WATER, SL = SLUDGE, GW = GROUNDWATER, SV = SOLVENT WASTE, L = LIQUID, W = WATER, O = OIL, WP = WIPE, WW = WASTE WATER, SW = SURFACE WATER, S = SOIL

#1

RTI

# RTI LABORATORIES

# CHAIN OF CUSTODY

PAGE: 4 OF: 4

**Environmental Sciences Division**
31628 Glendale Street
Livonia MI, 48150

**Materials Testing Division**
33080 Industrial Road
Livonia, MI 48150

**PHONE: (734) 422-8000**
FAX: (734) 422-5342
www.rtilab.com

RTI WORK ORDER NO:

*Please Include Email Address of Report Recipient !!!*

SUBMITTING COMPANY: CH2M

PROJECT NAME: JBER PBRERF | PROJECT #: 457958.09.HU.01 | QUOTE #:

SAMPLING LOCATION (STATE or COUNTRY): AK

SPECIAL INSTRUCTIONS / COMMENTS:

REPORT TO (Name): Berney Kidd
COMPANY: CH2M
ADDRESS: bernice.kidd@ch2m.com
CITY, STATE, ZIP:
PHONE: 530-229-3203
EMAIL (OR FAX IF NO EMAIL AVAILABLE):

BILL TO:
COMPANY: CH2M
ADDRESS:
CITY, STATE, ZIP:
P.O NUMBER: 457958.09.HU.01

SAMPLER'S PRINTED NAME: K. Stevens
SAMPLER'S SIGNATURE: [signature]

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | $HNO_3$ | $H_2SO_4$ | NaOH | Methanol | OTHER | TESTS REQUESTED: EPA 7580 | | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BIP10_0916 | 9/19/16 | 1400 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 2 | AREACPOND155_0916 | 9/19/16 | 1425 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 3 | NORTHDITCHE_0916 | 9/19/16 | 1455 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 4 | NORTHDITCHW_0916 | 9/19/16 | 1505 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 5 | BOMBCRATERE_0916 | 9/19/16 | 1545 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 6 | BOMBCRATERW_0916 | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 7 | BOMBCRATERW_0916MS | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 8 | BOMBCRATERW_0916SD | 9/19/16 | 1550 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 9 | SOUTHDITCHWW_0916 | 9/19/16 | 1130 | S | 1 | X | | | | | | | X | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | |

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| [signature] | 9/~~20~~ 21/16 | 1200 ~~1800~~ | | | |
| | | | | | |
| | | | | | |

**REPORT TRANSMITTAL DESIRED:**
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE
ALL REPORTING IS VIA THE RTI "FLASHPOINT" ONLINE SYSTEM UNLESS OTHERWISE SPECIFIED

**FOR LAB USE ONLY**
Temp of samples ____ °C On Wet Ice ? ____
Comments:

**TURNAROUND DESIRED:** Standard ☒ **RUSH:** Next BD ☐ 2nd BD ☐ 3rd BD ☐
**Note: RUSH requests will incur surcharges!**

Distribution: White - Lab; Pink - Field

**See reverse side for Laboratory Terms and Conditions of Service**

**MATRIX CODES:** A = AIR; SD = SOLID; DW = DRINKING WATER; SL = SLUDGE; GW = GROUNDWATER; SV = SOLVENT WASTE; L = LIQUID; W = WATER; O = OIL; WP = WIPE; WW = WASTE WATER; SW = SURFACE WATER; S = SOIL

#2

RTI
RTI LABORATORIES

# CHAIN OF CUSTODY

PAGE 1 OF 1

**Environmental Sciences Division**
31628 Glendale Street
Livonia MI, 48150

**Materials Testing Division**
33080 Industrial Road
Livonia, MI 48150

PHONE: (734) 422-8000
FAX: (734) 422-5342
www.rtilab.com

RTI WORK ORDER NO: ____________

Please Include Email Address of Report Recipient !!!

| | | |
|---|---|---|
| SUBMITTING COMPANY: CH2M | REPORT TO (Name): Berney Kidd | BILL TO: |
| PROJECT NAME: JBER PBR ERF — PROJECT #: 457958.09.HU.01 — QUOTE #: | COMPANY: CH2M | COMPANY: CH2M |
| SAMPLING LOCATION (STATE or COUNTRY): Alaska | ADDRESS: bernice.kidd@ch2m.com | ADDRESS: |
| SPECIAL INSTRUCTIONS / COMMENTS: | CITY, STATE, ZIP | CITY, STATE, ZIP |
| | PHONE: 530-229-3203 — EMAIL (OR FAX IF NO EMAIL AVAILABLE): | P.O NUMBER: 457958.09.HU.01 |
| SAMPLER'S PRINTED NAME: Gary Santolo | SAMPLER'S SIGNATURE: *Gary Santolo | TESTS REQUESTED |

| ITEM NUMBER | SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED (24-hour format) | MATRIX CODE (see codes below) | NBR OF BOTTLES | NONE | HCL | HNO 3 | H 2 SO 4 | NaOH | Methanol | OTHER | EPA 7580 | | | | | | | pH Acceptable? Y N n/a (Lab only) | COMMENTS Methanol Preserved Weights HOT Sample Notation Additional Sample Description, Air Volume, etc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | GIZZARD02-102416 | 10/24/16 | 13:45 | SD | 1 | X | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | |

NBR OF CONTAINERS AND PRESERVATIVES

| Relinquished By | Date | Time | Received By | Date | Time |
|---|---|---|---|---|---|
| Gary Santolo | 10/25/16 | 1000 | | | |
| | | | | | |
| | | | | | |

**REPORT TRANSMITTAL DESIRED:**
☐ HARDCOPY (extra cost) ☐ FAX ☐ EMAIL ☐ ONLINE
ALL REPORTING IS VIA THE RTI "FLASHPOINT" ONLINE SYSTEM UNLESS OTHERWISE SPECIFIED

**FOR LAB USE ONLY**
Temp of samples ______ °C On Wet Ice ? ______
Comments: ______

**TURNAROUND DESIRED:** Standard ☐ **RUSH:** Next BD ☐ 2nd BD ☐ 3rd BD ☐
**Note: RUSH requests will incur surcharges!**

Distribution: White - Lab; Pink - Field

See reverse side for Laboratory Terms and Conditions of Service

**MATRIX CODES:** A = AIR, SD = SOLID, DW = DRINKING WATER, SL = SLUDGE, GW = GROUNDWATER, SV = SOLVENT WASTE, L = LIQUID, W = WATER, O = OIL, WP = WIPE, WW = WASTE WATER, SW = SURFACE WATER, S = SOIL

# Appendix B-4
# Field Worksheets

## Field Worksheet

| | |
|---|---|
| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** Pond146CanoeP1E **Sample Date:** 9/13/16

Verified: ☐ Plant operation required: ☑ Northing 6801172.0 Easting: 355322.0

Sample ID **POND146CANOEP1E_0916R1** **SOIL** Depth From To: 0 Total Depth 4" ~~FT~~ ft bgs

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [initials] / 1145 / 9/13/16 |

Pump Number: 1040 – 1130

*End of Sample ID*

Sample ID **POND146CANOEP1E_0916R2** **SOIL** Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [initials] / 1150 / 9/13/16 |

Pump Number: 1040 – 1130
Start End

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **Pond146CanoeP2W** **Sample Date:**

Verified: ☐ Plant operation required: ☑ Northing ~~6801172.0~~ 6801169.0470 TC Easting: ~~355322.0~~ 355302.2876 TC

Sample ID **POND146CANOEP2W_0916R1** **SOIL** Depth From To: 0 Total Depth 4" ~~FT~~ TC bgs

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | SR/1435/9/13/16 |

Pump Number: ______ increments 1330 - 1410

*End of Sample ID*

Sample ID **POND146CANOEP2W_0916R2** **SOIL** Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | SR/1440/9/13/16 |

Pump Number: ______ increments 1330 - 1410

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** Pond155SWGRID **Sample Date:** 9/14/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND155SWGRID_0916R1** SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS/1510/9/14/16 |

Pump Number: ____________

*End of Sample ID*

Sample ID **POND155SWGRID_0916R2** SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS/1515/9/14/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

Pond 155

NW: 815425.87m N
515568.57m E
13.66m (HAE)

NE: 815440.70m N
515581.75m E
14.8m (HAE)

SW: 815424.26m N
515572.68m E
16.10m (HAE)

SE: 815437.30m N
515586.39m E
14.00m (HAE)

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| | |
|---|---|
| **Project: Eagles River Flats White Phos 2016** | **DO/TO:** |
| **PM: Stacey Re** | **Field Phone:** |

**Site:** **Location Pond171CMarsh** **Sample Date:** 9/14/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND171CMARSH_0916R1** **SOIL** Depth From To: 0 Total Depth 4" FT bgs

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS 1130? 9/14/16 |

Pump Number:

*End of Sample ID*

Sample ID **POND171CMARSH_0916R2** **SOIL** Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS 1135? 9/14/16 |

Pump Number:

*End of Sample ID*

*End of Location*

Pond 171

NW: 815316.98m N
515629.10m E
13.53m (HAE)

NE: 815323.98m N
515647.07m E
12.96m (HAE)

SW: 815312.01m N
515630.03m E
13.81 m (HAE)

SE: 815318.93m N
515648.32m E
12.98m (HAE)

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **Pond183C100ma** **Sample Date:**

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND183C100MA_0916R1** **SOIL** Depth From To: 0 Total Depth 4" **FT** bgs

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS / 1502l 9/14/16 |

Pump Number: ____________

*End of Sample ID*

Sample ID **POND183C100MA_0916R2** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS/1502 9/14/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

NE Northing 6801325.0
Easting 355028.6

SE Northing 6801305.0
Easting 355028.6

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location 03DIS03 | Sample Date: 9/15/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID **03DIS03_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1520 / 9/15/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 03DIS11** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS11_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1430 / 9/15/16 |

Pump Number: ______

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| | |
|---|---|
| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** 03DIS18 **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS18_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | 1 1 9/15/16 1435 |

Pump Number: __________

*End of Sample ID*

*End of Location*

+ FD

03DIS18_0916D 1440 9/15/16

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 03DIS21** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS21_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS / 1510 / 9/15/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location 03DIS36 | Sample Date: 9/15/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID **03DIS36_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] 1340 9/15/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** | **Location** 03DIS37 | **Sample Date:** 9/15

Verified: ☐ | Plant operation required: ☑ | Northing | Easting:

Sample ID **03DIS37_0916** | **SOIL** | Depth From | To: | Total Depth | **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | ~~X~~01 / 1315 / 9/15/16 |

Pump Number: ____________

*End of Sample ID*

Sample ID **03DIS37_0916D** | **SOIL** | Depth From | To: | Total Depth | **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | X01 / 1320 / 9/15/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 03DIS38** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS38_0916** SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | 1 / 1325 / 9/15/16 |

Pump Number: ________________

*End of Sample ID*

Sample ID **03DIS38_0916MS** SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | MS | 1 / 1325 / 9/15/16 |

Pump Number: ________________

*End of Sample ID*

Sample ID **03DIS38_0916SD** SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | SD | 1 / 1325 / 9/15/16 |

Pump Number: ________________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 04DIS68** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS68_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] 9/15/16 1500 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location 04DIS82 | Sample Date: 9/15/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID 04DIS82_0916 SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KO1 / 1410 / 9/15/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 04DIS84** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS84_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1355 / 9/15/16 |

Pump Number: ______

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 04DIS84SoC** **Sample Date:**

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS84SOC_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KWS / 1400 / 9/15/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |



1400

## *Field Worksheet*

| | |
|---|---|
| **Project: Eagles River Flats White Phos 2016** | **DO/TO:** |
| **PM: Stacey Re** | **Field Phone:** |

**Site:** **Location 04DIS85** **Sample Date:**

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS85_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KO / 1445 / 9/15/16 |

Pump Number: ______________

*End of Sample ID*

Sample ID **04DIS85_0916D** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | / / |

Pump Number: ______________ Did not collect

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **Pond109BTS100ma** **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND109BTS100MA_0916R1** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | dko / 1200 / 9/15/16 |

Pump Number:

*End of Sample ID*

Sample ID **POND109BTS100MA_0916R2** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | dko / 1205 / 9/15/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
|---|---|
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** Pond109BTS100mb **Sample Date:** 9/15/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND109BTS100MB_0916R1** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | LP / 1140 / 9/15/16 |

Pump Number:

Start 1050 –

*End of Sample ID*

Sample ID **POND109BTS100MB_0916R2** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | LP / 1145 / 9/15/16 |

Pump Number:

*End of Sample ID*

Sample ID **POND109BTS100MB_0916R2D** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | LP / 1150 / 9/15/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

*Field Worksheet*

| Project: **Eagles River Flats White Phos 2016** | DO/TO: |
|---|---|
| PM: **Stacey Re** | Field Phone: |

**Site:** **Location 04DIS106** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS106_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | Kos / 1410 / 9/16/16 |

Pump Number: ______________________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: **Eagles River Flats White Phos 2016** | DO/TO: |
|---|---|
| PM: **Stacey Re** | Field Phone: |

| | | | |
|---|---|---|---|
| **Site:** | **Location 04DIS86** | | **Sample Date:** 9/16/16 |
| Verified: ☐ | Plant operation required: ☑ | Northing | Easting: |

Sample ID **04DIS86_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | / 1505 / 9/16/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
|---|---|
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location 04DIS90** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS90_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | XG / 1450 / 9/16/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 04DIS93** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS93_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | ✗ / 1345 / 9/16/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## Field Worksheet

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| | | | |
|---|---|---|---|
| Site: | Location 04DIS96 | | Sample Date: 9/16/16 |
| Verified: ☐ | Plant operation required: ☑ | Northing | Easting: |

Sample ID 04DIS96_0916 SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | K / 1320 / 9/16/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 04DIS97** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **04DIS97_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] 1300 9/16/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **AreaBTDuckPond** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **AREABTDUCKPOND_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | XS / 1430 / 9/16/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location Pond730N** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND730N_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1100 / 9/16/16 |

Pump Number:

*End of Sample ID*

Sample ID **POND730N_0916D** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | [illegible] / 1105 / 9/16/16 |

Pump Number:

*End of Sample ID*

Sample ID **POND730N_0916MS** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | MS | [illegible] / 1100 / 9/16/16 |

Pump Number:

*End of Sample ID*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## Field Worksheet

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** Pond730N **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND730N_0916SD** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | SD | / 1100 / 9/16/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| | |
|---|---|
| **Project: Eagles River Flats White Phos 2016** | **DO/TO:** |
| **PM: Stacey Re** | **Field Phone:** |

**Site:** **Location Pond730SW** **Sample Date:** 9/16/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND730SW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N Ko / 1150 / 9/16/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

Pond730SWE_0916
EPA 7580 Ko / 1200 / 9/16/16

Location Pond 730 S

Pond730S_0916
EPA 7580 Ko / 1220 / 9/16/16

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
|---|---|
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location 03DIS40** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS40_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1100 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location 03DIS42** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **03DIS42_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1040 / 9/19/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location 04DIS76 | Sample Date: 9/19/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID 04DIS76_0916 SOIL Depth From To: Total Depth FT

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1045 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
| --- | --- |
| PM: Stacey Re | Field Phone: |

**Site:** **Location AreaCPond155** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **AREACPOND155_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
| --- | --- | --- | --- | --- | --- | --- | --- |
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1425 / 9/19/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
| --- | --- | --- |
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location BIP10 | Sample Date: 9/19/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID **BIP10_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 9/19/16 1400 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

| Site: | Location BIP11 | Sample Date: 9/19/16 |
|---|---|---|
| Verified: ☐ | Plant operation required: ☑ Northing | Easting: |

Sample ID **BIP11_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1350 / 9/19/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

## *Field Worksheet*

| | |
|---|---|
| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** BIP2 **Sample Date:**

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **BIP2_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | / / |

Pump Number: ____________________

*End of Sample ID*

*End of Location*

DID NOT Collect

NOT FOUND

CAP

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location BIP5_9East** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **BIP5_9EAST_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | Ko / 1325 / 9/19/16 |

Pump Number: ____________________

*End of Sample ID*

Sample ID **BIP5_9EAST_0916D** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | Ko / 1330 / 9/19/16 |

Pump Number: ____________________

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location BIP5_9West** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **BIP5_9WEST_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | Ko / 1335 / 9/19/16 |

Pump Number: ______________________

*End of Sample ID*

*End of Location*

| | **Signatures** | **Date/Time** |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| | |
|---|---|
| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** BombcraterE **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **BOMBCRATERE_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1545 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
|---|---|
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** BombcraterW **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **BOMBCRATERW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1550 / 9/19/16 |

Pump Number:

*End of Sample ID*

Sample ID **BOMBCRATERW_0916MS** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | MS | [illegible] / 1550 / 9/19/16 |

Pump Number:

*End of Sample ID*

Sample ID **BOMBCRATERW_0916SD** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | SD | [illegible] / 1550 / 9/19/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location CrossditchJE** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **CROSSDITCHJE_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1245 / 9/19/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| | |
|---|---|
| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** CrossditchJN **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **CROSSDITCHJN_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KB / 1250 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **CrossditchJW** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **CROSSDITCHJW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS / 1300 / 9/19/16 |

Pump Number: ____________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location NorthditchE** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **NORTHDITCHE_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KS / 1455 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location NorthditchW** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **NORTHDITCHW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KG / 1505 / 9/19/16 |

Pump Number: ________________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** Pond23 **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **POND23_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | Ksl / 1225 / 9/19/16 |

Pump Number: ______

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## Field Worksheet

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **SouthditchEE** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **SOUTHDITCHEE_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible], 1205, 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** SouthditchEW **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **SOUTHDITCHEW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | KD / 1200 / 9/19/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location** **SouthditchWE** **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **SOUTHDITCHWE_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1135 / 9/19/16 |

Pump Number:

*End of Sample ID*

Sample ID **SOUTHDITCHWE_0916D** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | FD | [illegible] / 1140 / 9/19/16 |

Pump Number:

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## *Field Worksheet*

| **Project:** Eagles River Flats White Phos 2016 | **DO/TO:** |
|---|---|
| **PM:** Stacey Re | **Field Phone:** |

**Site:** **Location** SouthditchWW **Sample Date:** 9/19/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **SOUTHDITCHWW_0916** **SOIL** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC | By/Time/Date |
|---|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 4oz Amber jar | 4'C | N | [illegible] / 1130 / 9/19/16 |

Pump Number: ______________

*End of Sample ID*

*End of Location*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## Field Worksheet

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** **Location FieldQC** **Sample Date:** 9/20/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **EB01_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB / 1215 / 9/20/16 |

Pump Number: Auger

*End of Sample ID*

Sample ID **EB02_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB / 1220 / 9/20/16 |

Pump Number: Bucket

*End of Sample ID*

Sample ID **EB03_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB / 1225 / 9/20/16 |

Pump Number: Probe

*End of Sample ID*

| | Signatures | Date/Time |
|---|---|---|
| **Sampled by** | | |
| **Relinquished by** | | |
| **Received by** | | |
| **Relinquished by** | | |
| **Received by** | | |

## Field Worksheet

| Project: Eagles River Flats White Phos 2016 | DO/TO: |
|---|---|
| PM: Stacey Re | Field Phone: |

**Site:** Location **FieldQC** **Sample Date:** 9/20/16

Verified: ☐ Plant operation required: ☑ Northing Easting:

Sample ID **EB04_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB [initials] / 1235 / 9/20/16 |

Pump Number: Auger

*End of Sample ID*

Sample ID **EB05_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB [initials] / 1240 / 9/20/16 |

Pump Number: Bucket

*End of Sample ID*

Sample ID **EB06_0916** **WATER** Depth From To: Total Depth **FT**

| Lab Name | Methods | Filter | Count | Container | Preservative | QA/QC By/Time/Date |
|---|---|---|---|---|---|---|
| RTI | EPA 7580 | ☐ | 1 | 250 ml amber | 4'C | EB [initials] / 1245 / 9/20/16 |

Pump Number: Probe

*End of Sample ID*

*End of Location*

EB07 - Auger - 1250 [initials] 9/20/16
EB08 - Bucket - 1255 [initials] 9/20/16
EB09 - Probe - 1300 [initials] 9/20/16

| | Signatures | Date/Time |
|---|---|---|
| Sampled by | | |
| Relinquished by | | |
| Received by | | |
| Relinquished by | | |
| Received by | | |

# Appendix B-5
# Necropsy Forms

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# Necropsy Form

Species Mallard Field ID # Gizzard - 01
Abbreviation MALL - 01 Laboratory ID # ____
Date Collected 09-02-16 Method ____ Found X By: Stacy Re
*Cause of Death:* unknown
Location & Habitat: Ditch Transect

Date Necropsied: 09-20-16 By: G Santolo Whole body wt: ____ g
Fresh: Y N Adult Subadult Juvenile ♂

External Examination: Normal Y N ____
*Fur/Feathers:* ____ Normal Y N ____
Comments:
No signs of trauma

*Lungs:* ____ Normal Y N Samples Taken: Y N ____
*Kidneys:* ____ Normal Y N Samples Taken: Y N ____
*Heart:* ____ Normal Y N Samples Taken: Y N ____
*Liver:* ____ Normal Y N Samples Taken: Y N ____
Comments: Collected gizzard contents

General Comments:
No obvious signs of mortality observed

---

Species ____ Field ID # ____
Abbreviation ____ Laboratory ID # ____
Date Collected ____ Method ____ Found ____ By: ____
*Cause of Death:* ____
Location & Habitat:

Date Necropsied: ____ By: ____ Whole body wt: ____ g
Fresh: Y N Adult Subadult Juvenile

External Examination: Normal Y N ____
*Fur/Feathers:* ____ Normal Y N ____
Comments:

*Lungs:* ____ Normal Y N Samples Taken: Y N ____
*Kidneys:* ____ Normal Y N Samples Taken: Y N ____
*Heart:* ____ Normal Y N Samples Taken: Y N ____
*Liver:* ____ Normal Y N Samples Taken: Y N ____
Comments:

General Comments:

# Necropsy Form

Species Green-winged teal Field ID # MO13T-008
Abbreviation GWTE Laboratory ID # ____
Date Collected 09/26/16 Method ____ Found X By: Stacey Re
Location: Belo trail near Cloony Pt.
Habitat: Wetland

Date Necropsied: 10/24/16 By: G Santolo Whole body wt: ____ g

Total Length: ____ mm Fresh: Y N
Tail Length: ____ mm
Right foot Length ____ mm Male Adult Subadult Juvenile
Right Ear Length: mm Female

External Examination: Normal Y N
Fur/Feathers: ____ Normal Y N
Samples Taken: Y N
Comments:
No external injuries observed

Digestive System: ____ Normal Y N Food items: Y N ____
Crop (Birds): ____ Normal Y N Mouth/Esophagus Y N ____
Gizzard (Birds): ____ Normal Y N Stomach Y N ____
Mouth & esophagus: ____ Normal Y N Crop (Birds) Y N ____
Samples Taken: Y N Gizzard (Birds) Y N ____
Stomach contents: ____
Comments:
Small lesions in esophagus and upper intestine

Liver: ____ Normal Y N
Samples Taken: Y N Weight: ____ g
Comments:
Some mottling

Left testis: ____ mm Placental scars: L ____ R ____
____ g No. of embryos: ____ Largest embryo: ____
Samples Taken: Y N Reproductive: Y N
Comments:

Lungs: ____ Normal Y N Samples Taken: Y N ____
Kidneys: ____ Normal Y N Samples Taken: Y N ____
Heart: ____ Normal Y N Samples Taken: Y N ____
Comments:
Heart appeared slightly enlarged

General Comments:
Bird was in good flesh with some fat.

# Appendix C
# Eagle River Flats
# 2016 UXO Anomaly Avoidance Support

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# EAGLE RIVER FLATS
# 2016 UXO ANOMALY AVOIDANCE SUPPORT

CH2M Hill Contract # FA8903-09-D-8589
Task Order 0016

Eagle River Flats
Joint Base Elmendorf-Richardson, Alaska

August 2016-September 2016

*Prepared for:*


CH2M Hill
9191 South Jamaica Street
Englewood, Colorado 80112
P.O. Box 241325
Denver, Colorado 80224-9325


*Prepared by:*


Bering Sea Eccotech, Inc.
615 E. 82nd Avenue, Suite 200
Anchorage, Alaska 99518


September 2016

# Table of Contents

# Acronyms

| | |
|---|---|
| AHA | Activity Hazard Analysis |
| AK | Alaska |
| BSE | Bering Sea Eccotech, Inc. |
| CFR | Code of Federal Regulations |
| CPR | Cardiopulmonary Resuscitation |
| DDESB TP-18 | Department of Defense Explosive Safety Board Technical Paper 18 |
| EOD | Explosive Ordnance Disposal |
| Inc. | Incorporated |
| JBER | Joint Base Elmendorf-Richardson |
| MEC | Munitions and Explosives of Concern |
| OP | Observation Point |
| SDS | Safety Data Sheet |
| SOW | Statement of Work |
| TO | Task Order |
| USAF | United States Air Force |
| UXO | Unexploded Ordnance |

## 1.0 Introduction

This is an after action report encompassing Unexploded Ordnance (UXO) services provide by Bering Sea Eccotech, Inc. (BSE) in effort to assist the prime contractor CH2M Hill in the execution of contract number FA8903-09-D-8589 Task Order 0016. UXO services occurring during this period of performance were limited to Munitions and Explosives of Concern (MEC) Avoidance at Joint Base Elmendorf-Richardson (JBER) specifically at the Eagle River Flats Area.

## 2.0 Scope of Services

The scope of services was divided into two main objectives. The first was to perform MEC Avoidance Services in effort to to allow mortality transect monitoring and secondly, to support the sediment sampling efforts by providing real-time anomaly avoidance services to collection personnel. MEC/Anomaly avoidance would be provided by a DDESB TP-18 qualified UXO Technician III. The UXO Technician III would also meet the requirements of 29 CFR 1910.120. The following table (Table 1) describes mobilization dates and UXO Technician assigned to support CH2M Hill for this contract:

*Table 1 Services Overview*

| Mobilization Dates | UXO Technician III | Services Provided |
|---|---|---|
| 8/31/16-9/8/16 | Donald Ebersole | Site Access and Mortality Transect Anomaly Avoidance Survey |
| 9/13/16-9/19/16 | Donald Ebersole | Sediment Sampling Anomaly Avoidance Support |

## 3.0 Tasks

The Statement of Work (SOW) was divided into four tasks. The tasks are as follows:

- Task 1 - Pre-mobilization Submittals
- Task 2 - Access Areas and Mortality Transects
- Task 3 - Sediment Sampling Areas
- Task 4 - Report

## 3.1 Task 1 Pre-Mobilization Submittals

Pre-mobilization submittals were provided to CH2M in accordance with the SOW. BSE provided the following to CH2M Hill in accordance with the SOW:

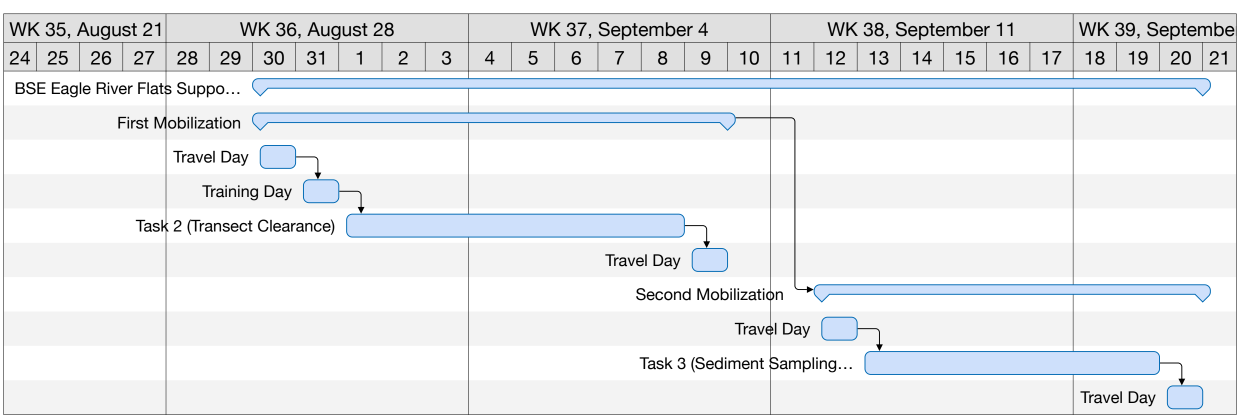
- Activity Hazard Analysis (AHA) for the activities conducted under their SOW.
- Equipment list including training and inspection requirements.
- Personnel Certifications and Qualifications
- Alcohol and drug abuse surveillance policy
- Current proof of First aid and cardiopulmonary resuscitation (CPR) training and blood-borne pathogen training.
- Safety Data Sheets (SDS) for chemicals brought on to the site.

BSE provided these documents to CH2M Hill for the UXO Technician III selected to perform the MEC avoidance services.

### 3.1.1 Mobilization Schedule

The following schedule (Figure 1) illustrates the mobilization dates and services provided by BSE:

*Figure 1 Mobilization Schedule*



### 3.2 Task 2 Access Areas and Mortality Transects

Prior to performing field activities, BSE's UXO Technician attended two safety briefs. The first was a range safety brief provided by JBER Range Control and the second was an Explosive Ordnance Disposal (EOD) brief provided by the United States Air Force (USAF) EOD facility. Both safety briefs were conducted on August 31, 2016. Under Task 2 BSE provided Anomaly Avoidance Surveys for the roads, trails, access points, in the uplands surrounding the XU022 site. Mortality transects were surveyed for anomalies to a width of approximately 3 meters to allow unescorted access later in the season. The following table (Table 2) illustrates the areas surveyed:

*Table 2 Areas Cleared by Date*

| **Area Description** | **9/1/16** | **9/2/16** | **9/3/16** | **9/8/16** |
|---|---|---|---|---|
| OP Fagan | X | | | |
| Road to EOD Pad | X | | | |
| EOD Pad and Bomb Crater Road | X | | | |
| EOD Pad to Clunie Point Road | X | | | |
| Generator Pad | X | | | |
| Access Routes to Cap Locations | | X | X | |
| Area A Ponds and Transects | | | | X |
| Area C Ponds and Transects | | X | X | |
| OP Cole Lower | | | | X |
| Clunie Point to Eagle River Mouth Trail | | X | | |
| Canoe Transect, Access Trail, Beluga Point | X | | | |

### 3.3 Task 3 Sediment Sampling Areas

Sediment sampling support by BSE was limited to anomaly avoidance services. The UXO Technician III used a Schonstedt GA72-Cd analogue detector to survey areas prior to personnel collecting sediment samples. The analogue detector was checked out in accordance with manufacture's guidance. Anomalies discovered during the sediment sampling were marked clearly with an orange surveyor flag. The UXO Technician III briefed the location of anomalies to sediment personnel working in the area. If the area was free of anomalies they would be allowed to collect the sediment sample. If an anomaly was identified the sampler would be informed and a new sediment sample site would be selected.

The following table (Table 3) describes areas where sediment sampling occurred:

*Table 3 Sediment Sample Areas by Date (Anomaly Avoidance)*

| **Area Description** | **9/13/16** | **9/14/16** | **9/15/16** | **9/16/16** | **9/19/16** |
|---|---|---|---|---|---|
| Ponds | X | X | X | X | |
| Caps | X | | X | X | X |
| Ditches | X | X | | | |

## 4.0 Task 4 Report

This after action report is the only report provided by BSE for this period of performance.

### 4.1 Daily Safety Logs

Daily Safety Logs are normally provided as an attachment to BSE's After Action Reports. However, CH2M Hill provided daily safety briefs and documented them on their forms.

### 4.2 MEC Discovery Log

During the period of performance of this contract, no MEC was encountered, therefore a MEC Discovery Log is not provided. Due to the absence of MEC or MEC-related items, no coordinates or shapefiles are included in this report.

## 5.0 Photographs

*Figure 3 Eagle River Flats as Viewed from Observation Point Fagan*

*Figure 4 Operational Area C as Viewed from Clunie Point*

# Appendix D
# Aerial Waterfowl Surveys, XU022 – Eagle River Flats
# Joint Base Elmendorf-Richardson, Alaska, Fall 2016

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# AERIAL WATERFOWL SURVEYS, XU022-EAGLE RIVER FLATS, JOINT BASE ELMENDORF-RICHARDSON, ALASKA, FALL 2016

**FINAL STUDY REPORT**

Prepared for
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January 2017

## EXECUTIVE SUMMARY


- In 2016, ABR flew 13 surveys during the period of 1 September through 13 October.
- Surveys were terminated in October when ice coverage reached 80 percent.
- Surveys were flown in a fixed-wing aircraft in overlapping transects, with one observer recorded observations.
- A total of 7,272 ducks were observed in 2016 and averaged 559 birds per survey.
- Dabbling ducks constituted 99 percent of all duck observations.
- Mallard, American Widgeon, Northern Pintail, and Green-winged Teal were the most commonly observed duck species.
- Almost 80% of all ducks occurred in subareas B, D, A, and C.
- Highest densities of ducks occurred in the ponds of subareas C/D, B, and D.
- The four most common duck species were the same as observed in previous years.
- Distribution and abundance of ducks in fall 2016 were generally similar to fall 2012.
- A total of 2,630 geese were observed and averaged 202 birds per survey.
- A total of 512 swans were observed and averaged 39 birds per survey.
- Because August surveys were cancelled, substantial numbers of ducks, geese, and cranes were likely missed, complicating direct comparisons to previous years.


## ACKNOWLEDGMENTS


Numerous entities provided support for study, including Stacey Ré of CH2M HILL, Spernak Airways, JBER Range Control, and Dennis Marks of the U.S. Fish and Wildlife Service. At ABR Inc., we thank Tim Obritschkewitsch and Steve Murphy for their expertize with aerial waterfowl surveys, Pam Odom for document preparation and Robert Burgess editorial review.

## INTRODUCTION

ABR, Inc., performed aerial waterfowl surveys in XU022–Eagle River Flats (ERF) at the former Fort Richardson on Joint Base Elmendorf–Richardson (JBER), Anchorage, AK, for CH2M HILL Constructors, Inc. The work was executed under a performance-based remediation task order issued by the U.S. Air Force Civil Engineer Center under the U.S. Air Force Worldwide Environmental Restoration and Construction 2009 IDIQ program. The history of the study area was previously reported on by Racine and Cate (Racine and Cate 1996).

## STUDY AREA

The study area XU022–ERF is 870 hectares (ha) and lies within an estuarine salt marsh at the mouth of Eagle River with Knik Arm to the north and west of the study area (Figure 1). Directly adjacent to XU022–ERF to the southeast is XE023 (Explosive Ordinance Disposal Area abbreviated EOD), which is also called the former Open Burning/Open Detonation Pad and was not included in these surveys (Figure 1). The study area XU022–ERF, was divided into 9 standardized subareas [Coastal East (CE), Coastal West (CW), Bread Truck (BT), Racine Island (RI), and Subareas A, B, C, C/D, and D], which were developed for the ERF database by the Cold Regions Research and Engineering Laboratory (CRREL; Marks and Fischer 2013).

## METHODS

In 2016, ABR flew aerial surveys about twice a week during 1 September through 13 October, until there was approximately 80 percent ice coverage. Surveys originally were scheduled to begin in mid-August to correspond with fall migration; however, live-fire exercises on the JBER range prevented surveying in the ERF until 1 September. All surveys were flown in a fixed-wing, single-engine aircraft, the first survey was in a Cessna 207, while the remaining 12 surveys were flown in a Cessna 172. On all surveys, the primary observer sat in the front right seat of the aircraft. The first survey was flown in a Cessna 207 to accommodate three observers, so that back-up observers could be trained and calibrated for subsequent surveys. A single back-up observer also joined on the second survey for further calibration and all remaining surveys were conducted by a single observer.

Surveys were flown in overlapping transects to ensure full coverage of the study area. Surveys were flown at an altitude of approximately 30–90 m above ground level and at an air speed of 105–160 km/h. The observer used a digital voice recorder as well as a paper map of the study area to record survey information. A tablet device with a moving map was used to keep track of the aircraft location and relate it to bird locations. Birds were identified to species or species-group and counted, birds that could not be identified to species were designated as unidentified dabbling ducks, unidentified duck, unidentified swan, unidentified shorebird, etc. Birds were associated with the subarea in which they were first observed and, when possible, birds were assigned to the habitats that they were observed using (i.e., pond, vegetated flats, mudflats, slough, river, shoreline, etc.).

The U.S. Fish and Wildlife (USFWS) provided estimates of the area of each recognized pond and for each standardized subarea that were used to calculate mean bird densities. These estimated areas were calculated for them by CRREL from digitized maps (Marks and Eldridge 2012) and were the values used in previous reports, thus enabling comparisons across years. For duck and swan densities, the estimated pond surface areas were summed for each subarea to provide a total pond area. Total pond area was then used to calculate the densities of ducks and swans by subarea, as was done in previous studies. These analysis methods were retained from previous studies to allow comparisons across years. Densities for geese similarly were derived using the analysis methods from previous years; however, because geese spend considerable time on land, goose densities also were calculated based on total area per subarea.

## RESULTS AND DISCUSSION

### SURVEY CONDITIONS

Overall, surveys were performed under favorable weather conditions and no extreme weather events occurred during the fall survey period. Because the study area is located within an estuarine salt marsh of Knik Arm, water levels of waterbodies in the study area were influenced by tide cycles, including monthly peak or flood tide events. Tidal influence in the study area has changed the landscape of permanent and temporary ponds over the years (Marks and Eldridge 2012) but no attempt was made to correct pond surface area measurements from the USFWS. Environmental variables frequently associated with the fall season in this area, such as low light conditions, backlighting, glare, and turbulence, although present, did not substantially affect surveys and likely were similar during surveys in previous years.

Low temperatures in October caused waterbodies in the study area to freeze; small amounts of ice were first observed on 7 and 11 October surveys. Ice coverage on 13 October increased to over 80% and surveys were not conducted after that date.

## BIRD DISTRIBUTION AND ABUNDANCE

A total of 13 surveys were performed during fall 2016 (Figure 2, Table 1). Because no surveys were conducted in August, the early migration was not captured in 2016 and there is some evidence that peak migration was missed for ducks, geese, and cranes. On average, surveys were conducted every 3.5 ± 1.0 days (mean ± SD). Although ice cover was more than 80% during the final survey, the 265 ducks recorded was within the range of numbers observed during earlier surveys (range = 233–894) and these observations were, therefore, included in analysis.

Twenty-six waterbird species are known to occur in the ERF (Marks and Eldridge 2012, Marks and Fischer 2013). In 2016, 13 bird species, including six waterbird species, were observed (Table 1). Overall, 11,005 birds were recorded and an average of 846.5 ± 417.1 birds were recorded per survey (able 1), with the same three species for the highest mean numbers of birds per survey, although in different orders (Figure 3; Marks and Eldridge 2002). Across all surveys, approximately 88% of all individuals observed were identified to species and 98% were identified to genus. Comparisons to previous studies in the ERF indicate that abundance, distribution, and species composition were similar to previous years.

### DUCKS

Across all surveys, 7,272 ducks were observed in 2016, with an average of 559 ± 212 ducks/survey (Table 1). Peak duck numbers were observed on the first three surveys (Figure 2), therefore substantial numbers of ducks probably were missed in August prior to the first survey in 2016. Ducks represented 66% of total bird observations, with dabbling ducks (genus *Anas)* totaling 99.96% of all duck observations (Table 2). The mean number of ducks per survey in 2016 was similar to 2012, when observers recorded 577 ducks per survey and dabbling ducks comprised 99% of ducks observed (Marks and Eldridge 2012). The number of ducks peaked on 6

September, when 894 individuals were recorded. The lowest number of ducks was recorded on 11 October, when only 233 ducks were observed in ERF.

Six duck species were observed, with Mallards (*Anas platyrhynchos*) being the most abundant and representing over half (53 percent) of all duck observations, averaging 295 mallards/survey (Table 1). Mallard, American Widgeon (*Anas americana*), Northern Pintail (*Anas acuta*), and Green-winged Teal (*Anas crecca*), comprised 91% of all ducks observed and 99% of identified ducks observed, with the latter three species averaging 150, 38, and 26 ducks per survey, respectively. Northern Shoveler (*Anas clypeata*) and Common Merganser (*Mergus merganser*) represented the remainder of duck species observed; combined these two species accounted for less than 1% of duck observations. On average, 48 unidentified dabbling ducks (*Anas* spp.) were recorded per survey, representing 9% of all duck observations.

The four most commonly observed duck species in 2016 were also the most frequently observed species in the fall of 2012 (Marks and Eldridge 2012). In both the 2012 and 2016 fall surveys, these four species accounted for over 90% of all duck observations (Marks and Eldridge 2012). Overall, species richness was lower in 2016 than in 2012, with no observations of Gadwall (*Anas strepera*), scaup (*Aythya* spp.), or Ringed-necked ducks (*Aythya collaris*), all of which were observed occasionally in low numbers in 2012 (<2% of total identified ducks; Marks and Eldridge 2012). In 2016, 9% of all duck observations were unidentified ($n$ = 628), compared to 0.3 percent in 2012. However, >99% of ducks were identified to genus in 2012 and dabbling ducks (genus *Anas*) clearly were the most abundant waterfowl in ERF in both years (Table 2; Marks and Eldridge 2012).

During the 2016 surveys, nearly 80% of all ducks were observed in subareas B, D, A, and C. Subarea B was most heavily used, with 21.6% of all ducks using waterbodies in this subarea (Table 3, Figure 4). Subareas D, A, C, and C/D were used by 20.9, 19.6, 16.3, and 12.1% of ducks observed, respectively. Only 3% of total ducks were recorded in each of the BT, CE, and CW subareas and the remainder (0.6%) were observed in the RI subarea. Throughout the fall some subareas were used consistently (A, B, C, C/D, D) by ducks and some areas had less consistent patterns of use (BT, CE, RI; Table 4).

The highest concentrations of ducks occurred in the ponds of subareas C/D and B (14 and 13 ducks/pond-ha, respectively), followed by subarea D (10 ducks/pond-ha; Table 3, Figure 4). Subareas C and A had similar duck concentrations (6 and 5 ducks/pond-ha, respectively). BT, RI, CE, and CW subareas all had fewer than 2 ducks/pond-ha.

The densities of ducks in the ERF during fall 2016 were similar to those reported in fall 2012. In both 2016 and 2012, the highest densities of ducks occurred in subareas D, C/D, and B (Table 3; Marks and Eldridge 2012). Subareas A, D, C, and B were used by more ducks than other subareas in both years, accounting for 76% of duck observations in 2012 and 78% in 2016. Unlike 2016, however, subarea A was the most used subarea in 2012, accounting for 28.5% of observations of ducks and subarea B (most used in 2016) accounted for only 11.5% of observations, about half of the 2016 value (Table 5). The percent occurrence of ducks in subareas C and D were fairly similar between 2012 and 2016 (Table 5).

When averaged across all 17 years of fall surveys (1997–2012 and 2016), the largest proportions of duck observations occurred in subareas A, D, B, and C, as was the case in both 2016 and 2012. In addition, the mean percentages of duck observations over all years in subareas A, D, C/D, and RI were similar to values in 2016 (Table 5). Only two subareas exhibited considerably below average proportions of duck observations in 2016: CW and CE, each accounting for only 3% of duck observations in 2016 compared to 7% over all years. The only subarea exhibiting a considerable increase in the proportion of ducks observed was subarea B, in which 21.6% of ducks were observed in 2016, by comparison with only 15.6% over all years.

GEESE

Over all subareas, 2,630 geese were observed during the 2016 surveys with an average of 202 ± 198 geese/survey (Table 1, Figure 3), which was lower than the 2012 average of 328 geese/survey (Marks and Eldridge 2012). Numbers of geese were highest during the first survey on 1 September ($n$ = 746) and, therefore, substantial numbers of geese probably were missed in August prior to the first 2016 survey. Canada Geese (*Branta canadensis*) were the most abundant goose species in 2016 and accounted for 93 percent of all goose observations; Greater White-fronted Geese (*Anser albifrons*) accounted for the remainder of goose observations (Table 2). In

2012 Greater White-fronted Geese were more abundant than Canada geese in 2016, totaling 818 and representing 16% of all geese (Marks and Eldridge 2012).

In 2016, 36% of geese were observed in the CW subarea, followed by subarea A with 29% of goose observations (Table 3). Combined, these two subareas accounted for over 60 percent of goose observations. A substantial percentage of observed geese also were located in the CE (18%) and BT subareas (11%), which together accounted for nearly 30% of all goose observations.

Similarly, the highest densities of geese occurred in the CW subarea, with 0.47 geese/ha (Table 3, Figure 5). Densities of geese in the CE (0.43 geese/ha) and BT subareas (0.42 geese/ha) were only slightly less than in the CW subarea. Subarea A had a density of 0.31 geese/ha and all remaining areas had less than or equal to 0.1 geese/ha. No geese were observed in subareas C/D, D, or RI. Overall, geese use of the ERF was similar to previous years, with the majority of geese occurring closer to Knik Arm in subareas CW, CE, BT, and A in the vegetated flats and along the Eagle River (Figure 5; Marks and Eldridge 2012).

SWANS

Two species of swans are known to occur in the ERF, the Tundra Swan (*Cygnus columbianus*) and the Trumpeter Swan (*C. buccinator;* Marks and Fischer 2013). It is nearly impossible to differentiate between the two species from an aircraft; however, Trumpeter Swans are common in the ERF while Tundra Swans are uncommon (Marks and Eldridge 2012). A total of 512 swans was observed during the 2016 surveys (Table 1, Figure 3). Swans were observed on every survey, with the highest number of swans recorded on 26 September ($n$ = 108) and the lowest number recorded on 11 October ($n$ = 7). The average number of swans observed per survey was 39 ± 30, which was similar to 2012 (38 swans/survey; Marks and Eldridge 2012).

Most swans (73%) were observed using subareas B, D, C/D. Subarea CE was also used by large numbers of swans in 2016 (16% of total observed; Figure 6). Densities also were greatest in these subareas, with the highest density occurring in subarea C/D (1.63 swans/pond-ha), followed by subarea B (1.27 swans/pond-ha). Subareas D and CE both had densities of 0.8 swans/pond-ha. The remaining subareas had densities less than 0.25 swans/pond-ha (Table 3).

The distribution of swans in 2016 differed somewhat from that in 2012, when subareas B, D, and C/D together were used by 96% of swans observed, compared to only 72.8% in 2016 (Table 3; Marks and Eldridge 2012). The use of subarea CE by swans increased substantially from 0.3% of total swans in 2012 to 16% in 2016 and densities in subarea CE increased from 0.02 swans/pond-ha in 2012 to 0.83 swans/pond-ha in 2016. Nonetheless, the densities of swans in the total study area were similar between 2012 and 2016 and the subareas B, D, and C/D had the highest densities in both years.

## RAPTORS AND CORVIDS

Bald Eagles were the only raptors observed in 2016 and, as in 2012, they were recorded in low numbers ($n$ = 12), averaging approximately one bird/survey. Additionally, three Common Ravens (*Corvus corax*) were the only corvids recorded during the fall surveys in 2016 (Table 1, Figure 3).

## SHOREBIRDS

Due to the coarse-scale nature of the survey method, shorebirds typically were not identified to species and all shorebird observations were combined for analysis, as in Marks and Eldridge (2012). Over all surveys in 2016, 175 shorebirds were observed and they were observed during each survey until 2 October (Table 1, Figure 7). Small numbers of shorebirds were observed, with an average of 14 shorebirds per survey in 2016 compared to 12 per survey in 2012 (Marks and Eldridge 2012).

## GULLS AND TERNS

Only one gull, a Herring Gull (*Larus argentatus*), was observed in 2016. No other seabirds or terns were observed in 2016 (Table 1).

## SANDHILL CRANES

In 2016, 400 Sandhill Cranes (*Grus canadensis*) were observed and they were recorded on each survey up through 23 September (Table 1, Figure 7). The number of cranes peaked on the first survey (172 on 1 September) and substantial numbers of cranes probably were missed in August prior to the first survey on 1 September. On average, 31 cranes/survey were observed in

2016, with the majority seen in the vegetated flats of subareas B and C (Table 1). Numbers of cranes were similar between 2012 and 2016 (399 and 400, respectively). However, the number of cranes per survey increased from 19 in 2012 to 31 in 2016, likely because fewer surveys were flown in 2016 (Table 1; Marks and Eldridge 2012).

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# TABLES

Table 1. Number of birds observed during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016.

| | 9/1 | 9/6 | 9/9 | 9/13 | 9/15 | 9/19 | 9/23 | 9/26 | 9/29 | 10/2 | 10/7 | 10/11 | 10/13 | Total | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ducks | | | | | | | | | | | | | | | |
| Mallard | 383 | 473 | 365 | 344 | 376 | 256 | 271 | 378 | 125 | 312 | 229 | 183 | 143 | 3,838 | 295.2 |
| American Wigeon | 300 | 264 | 205 | 94 | 65 | 90 | 138 | 282 | 176 | 85 | 130 | 6 | 109 | 1,944 | 149.5 |
| Northern Pintail | 14 | 6 | 35 | 135 | 115 | 80 | 46 | 21 | | 20 | | 15 | 4 | 491 | 37.8 |
| Green-winged Teal | 54 | 25 | 12 | 50 | 49 | 30 | 21 | 38 | 24 | 24 | 5 | 5 | 5 | 342 | 26.3 |
| Northern Shoveler | 1 | 6 | | 2 | | 2 | | | | | | | | 11 | 0.8 |
| Unidentified dabbling duck | | 120 | 158 | 70 | 75 | 85 | 34 | 10 | 19 | 32 | 4 | 14 | 4 | 625 | 48.1 |
| Total dabbling ducks | 752 | 894 | 775 | 695 | 680 | 543 | 510 | 729 | 344 | 473 | 368 | 223 | 265 | 7,251 | 557.8 |
| Common Merganser | | | | | | | | | 8 | | | 10 | | 18 | 1.4 |
| Unidentified diving duck | | | | | | | | | | 2 | | | | 2 | 0.2 |
| Total diving ducks | | | | | | | | | 8 | 2 | 0 | 10 | 0 | 20 | 1.5 |
| Unidentified duck | | | | | 1 | | | | | | | | | 1 | 0.1 |
| Total ducks | 752 | 894 | 775 | 695 | 681 | 543 | 510 | 729 | 352 | 475 | 368 | 233 | 265 | 7,272 | 559.4 |
| Geese | | | | | | | | | | | | | | | |
| Canada Goose | 635 | 245 | 300 | 99 | 70 | 235 | 196 | 345 | 104 | 30 | 45 | 65 | 70 | 2,439 | 187.6 |
| Greater White-fronted Goose | 111 | 30 | 50 | | | | | | | | | | | 191 | 14.7 |
| Total geese | 746 | 275 | 350 | 99 | 70 | 235 | 196 | 345 | 104 | 30 | 45 | 65 | 70 | 2,630 | 202.3 |
| Total swans | 27 | 21 | 17 | 30 | 31 | 35 | 65 | 108 | 79 | 60 | 21 | 7 | 11 | 512 | 39.4 |
| Bald Eagle | | 2 | 1 | 2 | 2 | | 1 | | | 2 | | | 2 | 12 | 1 |
| Other birds | | | | | | | | | | | | | | | |
| Common Raven | | | 1 | 2 | | | | | | | | | | 3 | 0.2 |
| Herring Gull | | | 1 | | | | | | | | | | | 1 | 0.1 |
| Sandhill Crane | 172 | 50 | 62 | 77 | 2 | 2 | 35 | | | | | | | 400 | 30.8 |
| Shorebirds, various | 11 | 2 | 32 | 30 | 10 | 14 | 2 | 50 | 14 | 10 | | | | 175 | 13.5 |
| Total other birds | 183 | 54 | 97 | 111 | 14 | 16 | 38 | 50 | 14 | 12 | | | 2 | 591 | 45.5 |
| Total | 1,708 | 1,244 | 1,239 | 935 | 796 | 829 | 809 | 1,232 | 549 | 577 | 434 | 305 | 348 | 11,005 | 846.5 |

Table 2. Total numbers of birds and percent of total by species and species groups during aerial surveys on the Eagle River Flats, Alaska, 1 September–13 October 2016.

| SPECIES GROUP<br>Species or Group | Number | Percent within Species Group | Percent of Total Observations |
|---|---|---|---|
| TOTAL WATERFOWL | 10,414 | | 94.63 |
| DUCKS | 7,272 | 100 | 66.08 |
| Mallard | 3,838 | 52.78 | 34.88 |
| American Wigeon | 1,944 | 26.73 | 17.66 |
| Northern Pintail | 491 | 6.75 | 4.46 |
| Green-winged Teal | 342 | 4.70 | 3.11 |
| Northern Shoveler | 11 | 0.15 | 0.10 |
| Unidentified dabbling duck | 625 | 8.60 | 5.68 |
| Total dabbling ducks | 7,251 | 99.71 | 66.89 |
| Common Merganser | 18 | 0.25 | 0.16 |
| Unidentified diving duck | 2 | 0.03 | <0.10 |
| Total diving ducks | 20 | 0.28 | 0.18 |
| Unidentified duck | 1 | 0.01 | <0.10 |
| GEESE | 2,630 | 100 | 23.90 |
| Canada Goose | 2,439 | 92.74 | 22.16 |
| Greater White-fronted Goose | 191 | 7.26 | 1.74 |
| SWANS | 512 | | 4.65 |
| OTHER BIRDS | 591 | | 5.37 |
| TOTAL BIRDS | 11,005 | | 100 |

Table 3. Total number, mean, percent of total, and density of ducks, geese, and swans in each standardized subarea during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016. Densities of ducks and swans were calculated using total pond area and goose densities were calculated using total area.

| | Total Number | | | Mean | | | Percent | | | Mean Density (per hectare) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subarea | Ducks | Geese | Swans | Ducks | Geese | Swans | Ducks | Geese | Swans | Ducks | Geese | Swans |
| A | 1,427 | 750 | 13 | 109.8 | 58.0 | 1.0 | 19.6 | 28.5 | 2.5 | 4.52 | 0.31 | 0.04 |
| B | 1,573 | 25 | 151 | 121.0 | 2.0 | 11.6 | 21.6 | 1.0 | 29.5 | 13.00 | 0.01 | 1.27 |
| BT | 222 | 285 | 0 | 17.0 | 22.0 | 0.0 | 3.1 | 10.8 | 0.0 | 2.26 | 0.42 | 0.00 |
| C | 1,182 | 160 | 44 | 90.9 | 12.0 | 3.4 | 16.3 | 6.1 | 8.6 | 5.75 | 0.11 | 0.23 |
| CD | 878 | 0 | 99 | 67.5 | 0.0 | 7.6 | 12.1 | 0.0 | 19.3 | 14.43 | 0.00 | 1.63 |
| CE | 222 | 460 | 82 | 17.0 | 35.0 | 6.3 | 3.1 | 17.5 | 16.0 | 2.00 | 0.43 | 0.83 |
| CW | 203 | 950 | 0 | 16.0 | 73.0 | 0.0 | 2.8 | 36.1 | 0.0 | 1.28 | 0.47 | 0.00 |
| D | 1,522 | 0 | 123 | 117.1 | 0.0 | 9.5 | 20.9 | 0.0 | 24.0 | 9.99 | 0.00 | 0.81 |
| RI | 43 | 0 | 0 | 3.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 2.00 | 0.00 | 0.00 |

Table 4. Number of ducks observed in each subarea by survey date during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016.

| Survey Date | Subarea | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | BT | C | C/D | CE | CW | D | RI | |
| 1 Sep | 131 | 200 | 92 | 144 | 114 | | | 49 | 22 | 752 |
| 6 Sep | 128 | 252 | 35 | 183 | 24 | | 31 | 241 | | 894 |
| 9 Sep | 112 | 220 | | 183 | 50 | | 10 | 200 | | 775 |
| 13 Sep | 270 | 110 | 3 | 108 | 95 | | | 105 | 4 | 695 |
| 15 Sep | 120 | 237 | | 52 | 1 | | 1 | 260 | 10 | 681 |
| 19 Sep | 57 | 60 | 32 | 89 | 30 | 100 | 30 | 145 | | 543 |
| 23 Sep | 65 | 43 | 21 | 140 | 161 | 4 | 28 | 48 | | 510 |
| 26 Sep | 116 | 156 | 2 | 92 | 102 | 51 | 20 | 190 | | 729 |
| 29 Sep | 38 | 91 | 8 | 4 | 55 | 8 | 16 | 132 | | 352 |
| 2 Oct | 139 | 111 | | 54 | 74 | 10 | 40 | 47 | | 475 |
| 7 Oct | 151 | 39 | 4 | 57 | 46 | 4 | 24 | 43 | | 368 |
| 11 Oct | 83 | 54 | | 48 | 10 | | | 38 | | 233 |
| 13 Oct | 17 | | 25 | 28 | 116 | 45 | 3 | 24 | 7 | 265 |
| Total | 1,427 | 1,573 | 222 | 1,182 | 878 | 222 | 203 | 1,522 | 43 | 7,272 |

Table 5. Annual percent occurrence of ducks in each subarea during fall aerial surveys of the Eagle River Flats, Alaska, 1997–2016. Data for 1997–2012 from Marks and Eldridge (2012).

| Subarea | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CW | 9.9 | 17.6 | 18.8 | 7.9 | 6 | 3.4 | 7.2 | 4.7 | 5.6 | 2.5 | 1.6 | 4.5 | 5.4 | 6.4 | 4.1 | 5.9 | 2.8 | 6.7 |
| A | 14.6 | 5.6 | 14.9 | 23.5 | 18.7 | 16.9 | 10.3 | 18.2 | 24.6 | 23.7 | 27.1 | 33.1 | 31.4 | 23.7 | 25.3 | 28.5 | 19.6 | 21.2 |
| B | 25 | 19.2 | 20.1 | 19 | 10.5 | 21.4 | 33 | 19.3 | 9.8 | 14.3 | 6 | 5 | 7.2 | 10.7 | 12.2 | 11.5 | 21.6 | 15.6 |
| RI | 0.6 | 1.1 | 1.5 | 0.7 | 0.2 | 0.1 | 0.6 | 1 | 0.4 | <0.1 | 0.9 | 0.9 | 0.6 | 0.4 | 0.9 | 0.9 | 0.6 | 0.7 |
| C | 17.9 | 4.8 | 4.8 | 10 | 25.4 | 21.1 | 15.1 | 13 | 17.2 | 10.1 | 15.4 | 14.2 | 11 | 19.3 | 6.3 | 11.6 | 16.3 | 13.7 |
| CD | 11.4 | 15.3 | 8.5 | 9 | 12.5 | 17.5 | 17.4 | 14 | 13 | 15.9 | 14.8 | 11.9 | 13.2 | 6 | 14.1 | 9.6 | 12.1 | 12.7 |
| BT | 1.3 | 1.9 | 2.3 | 3.7 | 0 | 0.1 | 0.3 | 3.5 | 2 | 2 | 4.1 | 2.3 | 0.9 | 0.8 | 1.2 | 2.3 | 3.1 | 1.9 |
| CE | 9.1 | 21.1 | 9.1 | 6.6 | 3.6 | 0.7 | 4.4 | 7.2 | 11.6 | 7.2 | 4.4 | 4.6 | 4.9 | 5.2 | 3 | 5.9 | 3.1 | 6.6 |
| D | 10.7 | 13.4 | 20 | 19.7 | 23.1 | 19 | 11.8 | 19 | 15.7 | 24.3 | 25.8 | 23.5 | 25.4 | 27.6 | 32.8 | 23.9 | 20.9 | 21.0 |

**FIGURES**

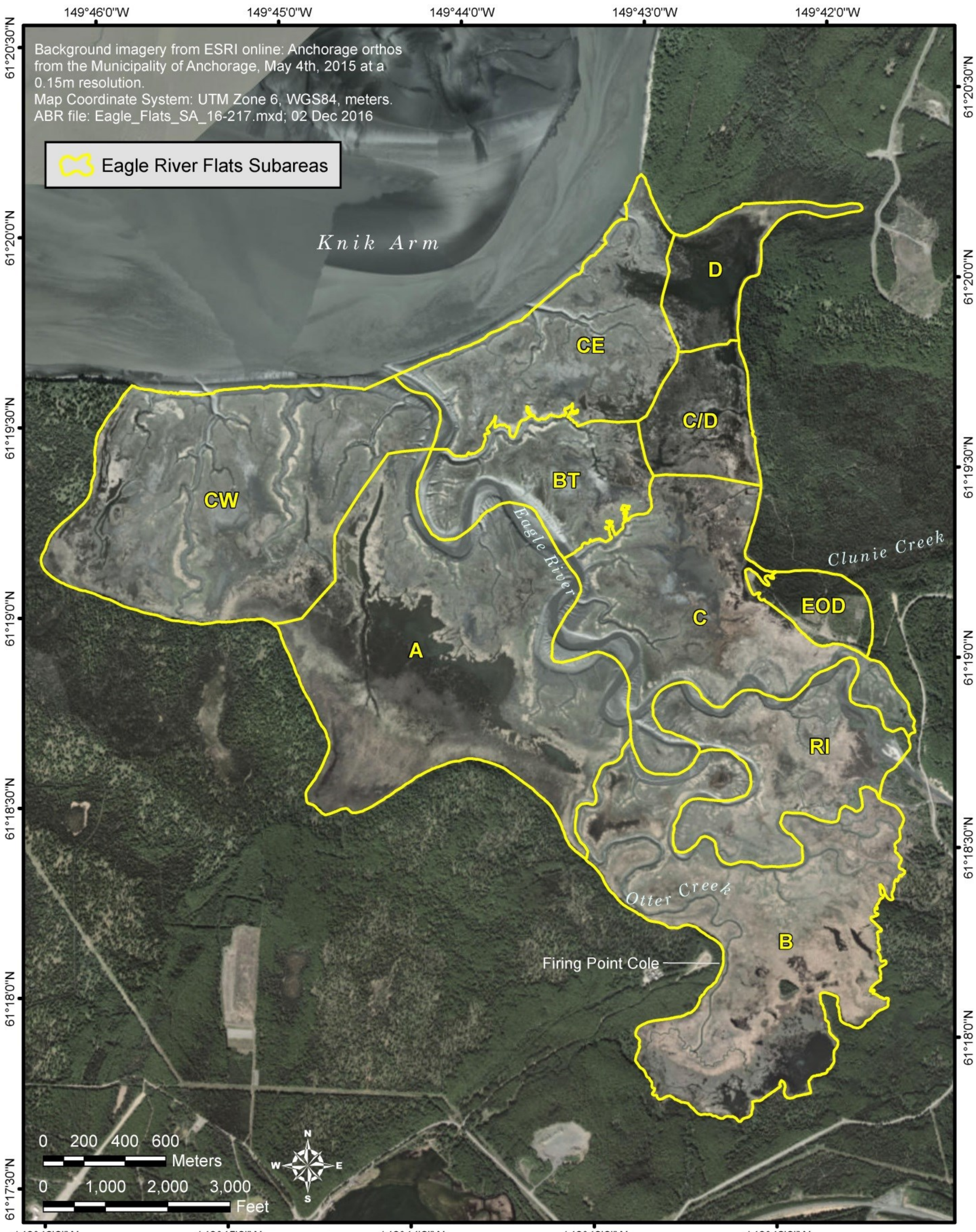


Figure 1. Map of Eagle River Flats study area with 10 standardized survey subareas.

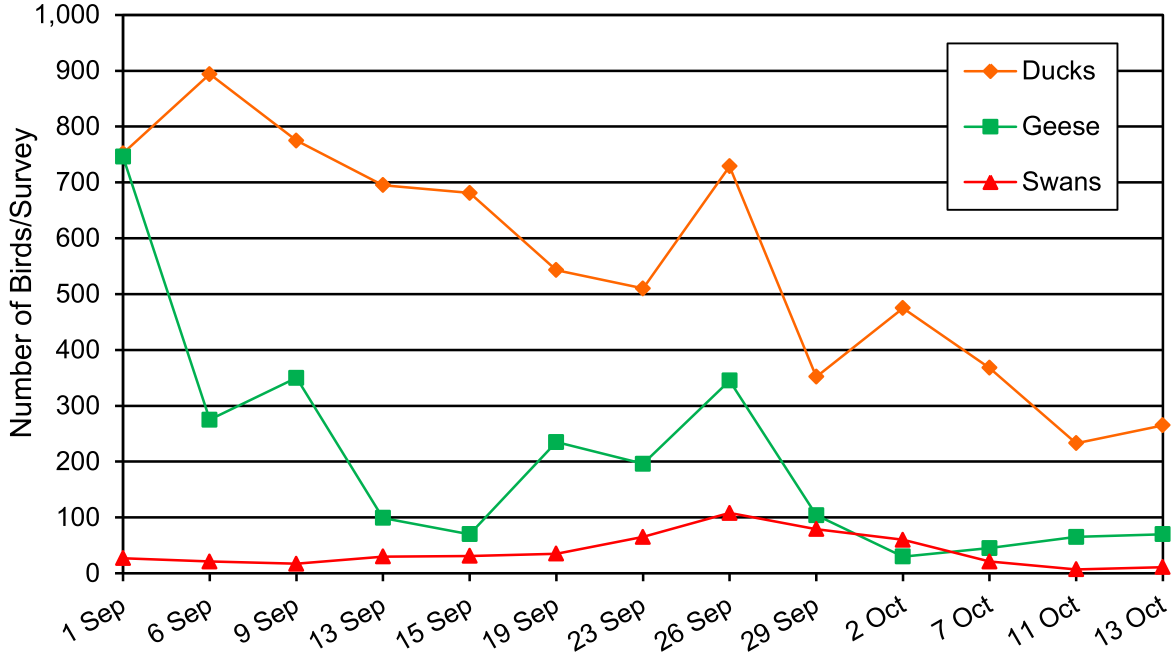


Figure 2. Number of ducks, geese, and swans observed during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016.

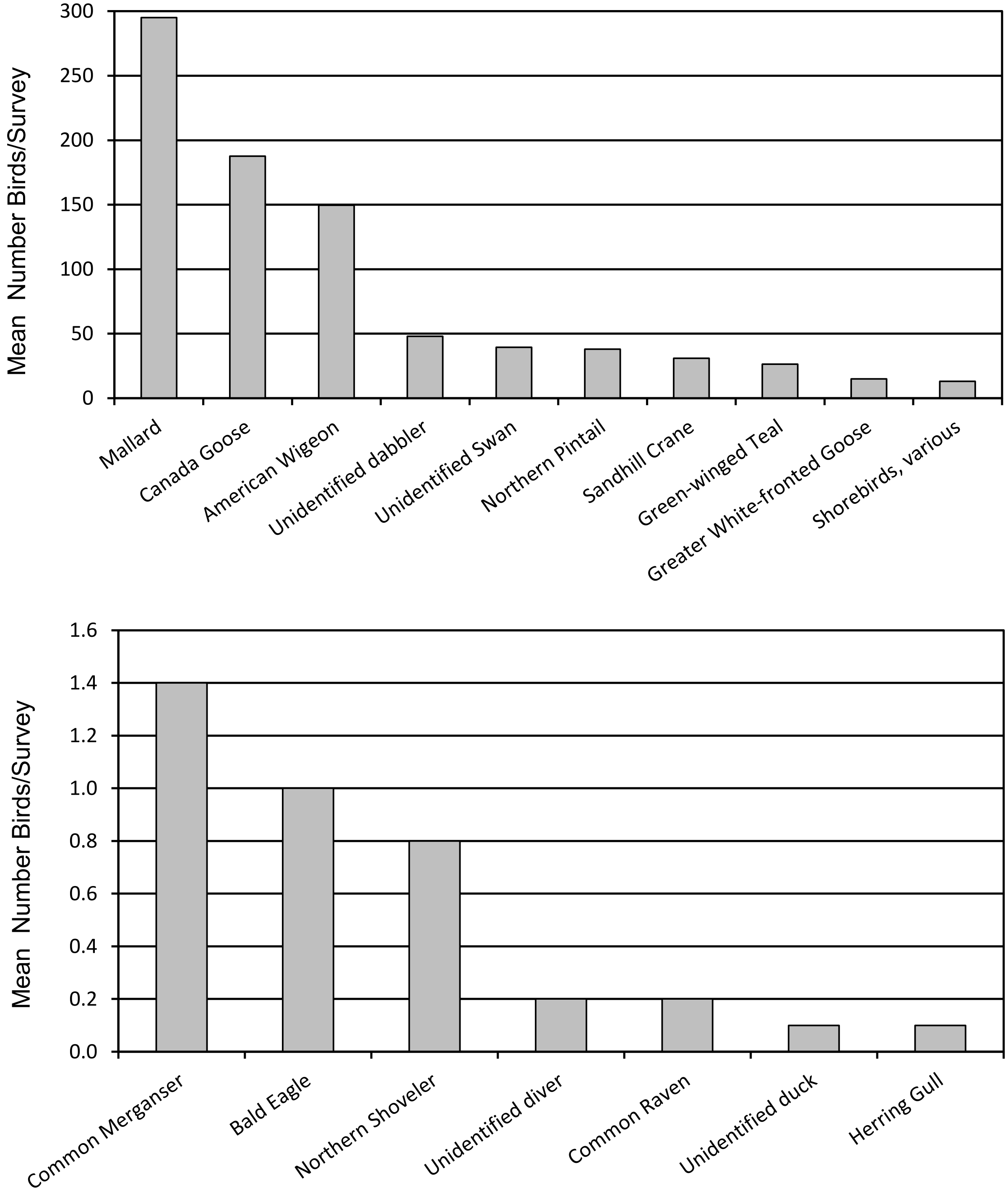


Figure 3. Mean number of birds observed per survey by species or species group, Eagle River Flats, Alaska, 1 September–13 October 2016.

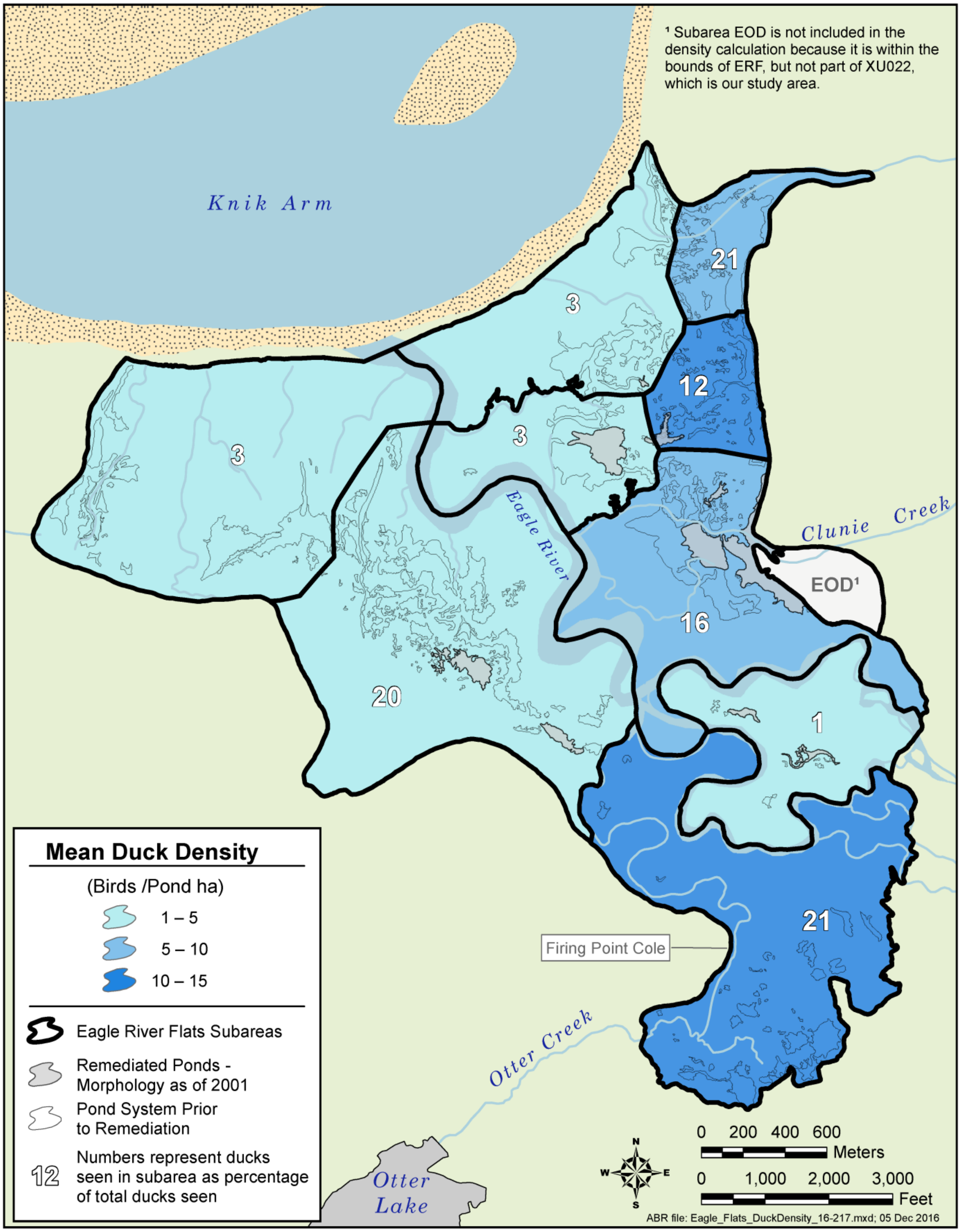


Figure 4. Mean duck densities and percentage of total ducks observed in each subarea during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016. Densities for ducks were calculated on the basis of total pond area in each subarea.

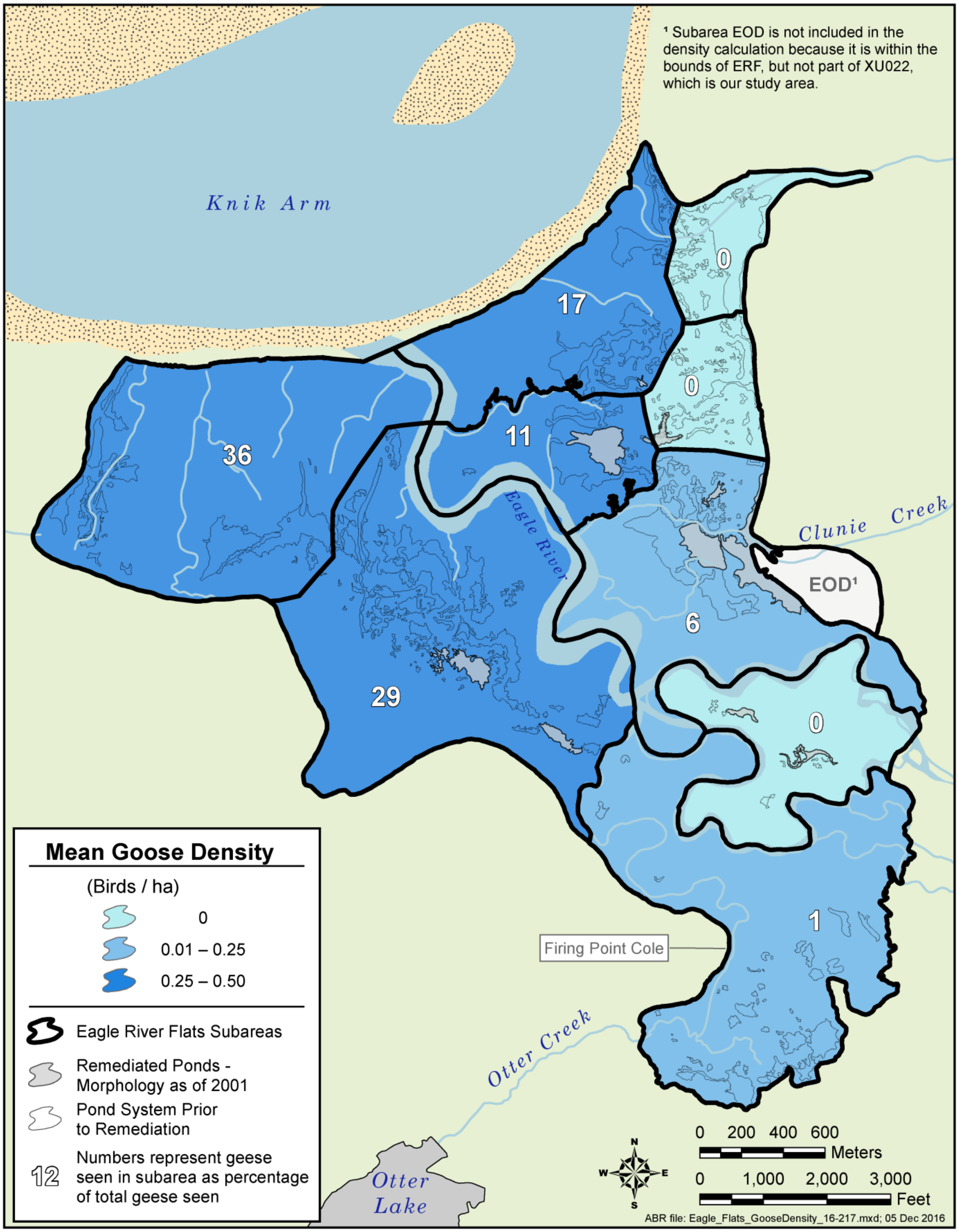


Figure 5. Mean goose densities and percentage of total geese observed in each subarea during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016. Densities for geese were calculated using total hectares per subarea.

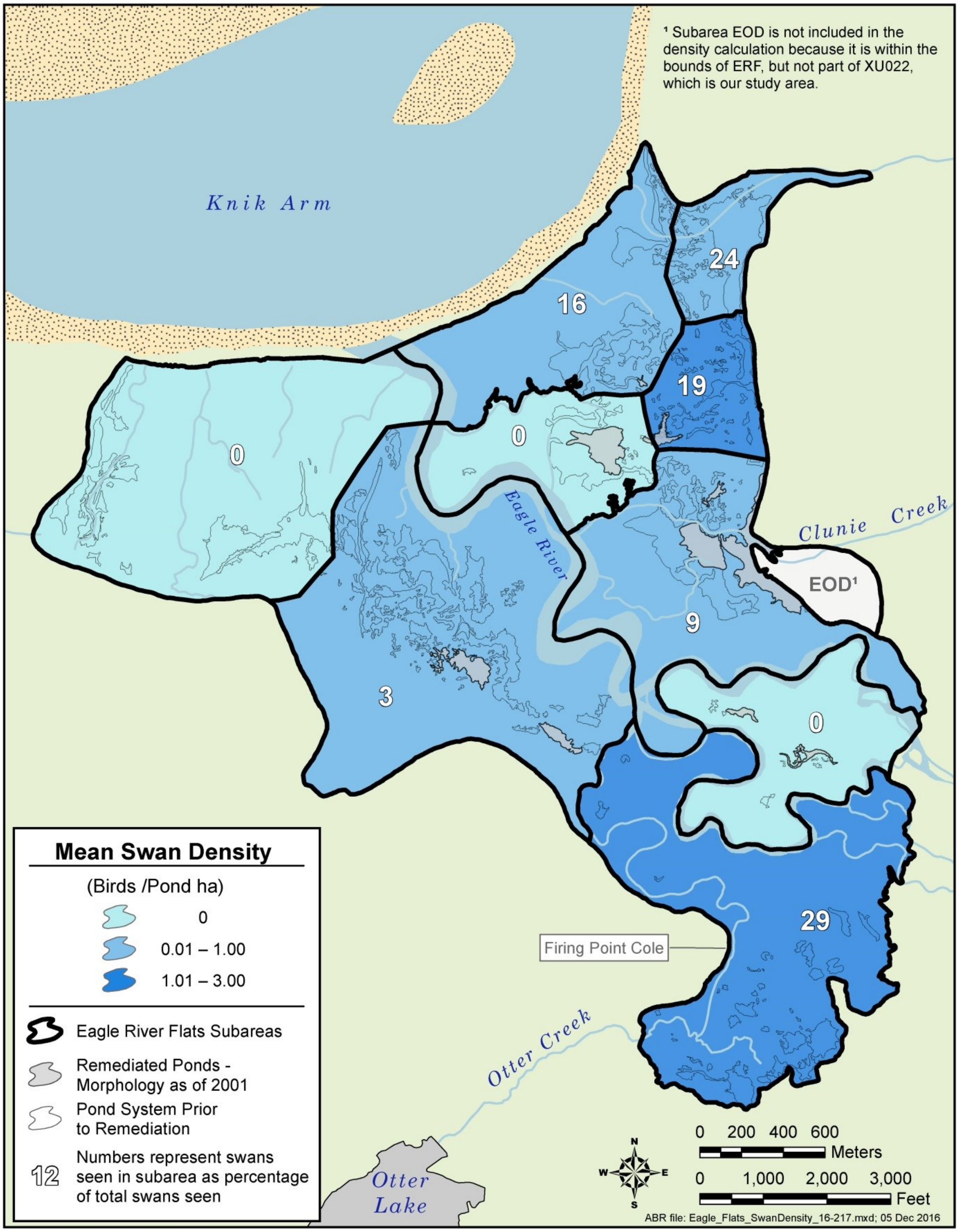


Figure 6. Mean swan densities and percentage of total swans observed in each subarea during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016. Densities for swans were calculated on the basis of total pond area in each subarea.

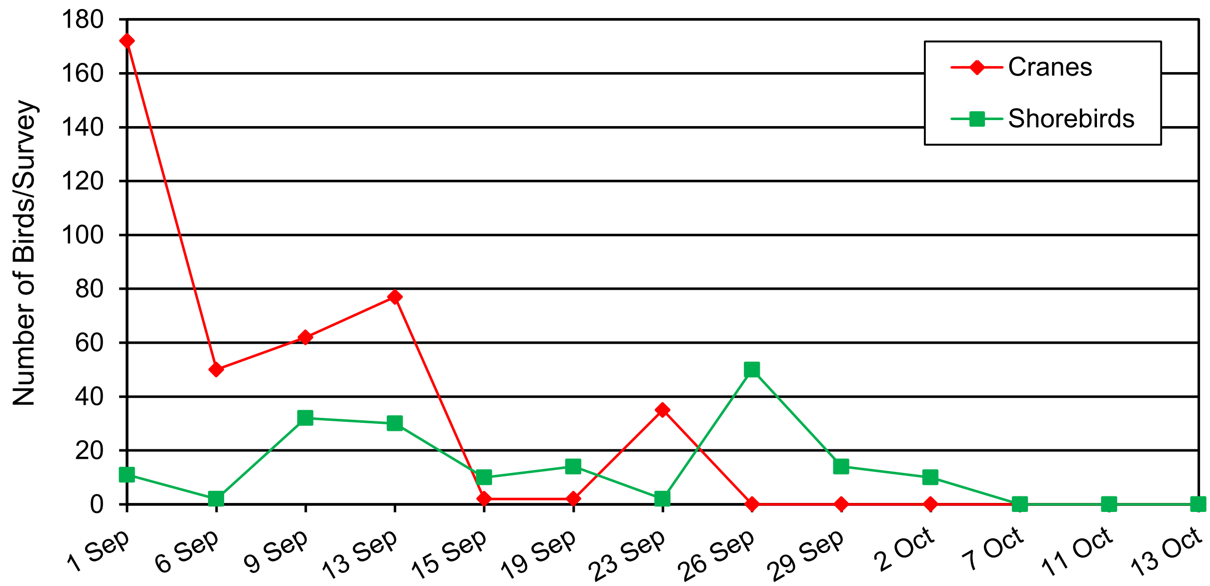


Figure 7. Numbers of cranes and shorebirds observed during aerial surveys of the Eagle River Flats, Alaska, 1 September–13 October 2016.

# Appendix E
# Historical Sampling Results

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## Table E-1: Multi-increment Sediment Samples from Established Grids

| Area | Location | Position | Easting | Northing | Date Collected | Field Rep | WP Concentration (µg/g) | Notes |
|---|---|---|---|---|---|---|---|---|
| C | Pond 171 | C Marsh | 355160 | 6801419 | 9/18/2010 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/12/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/14/2012 | Rep 1 | 0.002 | |
| | | | | | | Rep 2 | ND (0.0002) | |
| | Pond 155 | SW Grid | 355115 | 6801543 | 9/18/2010 | Rep 1 | **0.0003** | |
| | | | | | | Rep 2 | **0.0009** | |
| | | | | | 7/21/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | | Rep 3 | **0.00043** | |
| | | | | | | Rep 4 | **0.00008** | |
| | | | | | | Rep 5 | ND | |
| | | | | | | Rep 6 | ND | |
| | | | | | | Rep 7 | ND | |
| | | | | | | Rep 8 | ND | |
| | | | | | | Rep 9 | **0.00012** | |
| | | | | | | Rep 10 | ND | |
| | | | | | | Rep 11 | ND | |
| | | | | | | Rep 12 | ND | In open water south of grid |
| | | | | | | Rep 13 | ND | In open water south of grid |
| | | | | | 9/11/2011 | Rep 1 | **0.004** | |
| | | | | | | Rep 2 | **0.054** | |
| | | | | | 9/14/2012 | Rep 1 | **0.002** | |
| | | | | | | Rep 2 | **0.011** | |
| | Pond 183 | C 100 m + | 355026 | 6801315 | 9/23/2010 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/14/2012 | Rep 1 | ND (0.0002) | |
| | | | | | | Rep 2 | ND (0.0002) | |
| | Pond 146 | Canoe Pt -1 (East, Shore) | 355322 | 6801172 | 9/13/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2012 | Rep 1 | ND (0.0002) | |
| | | | | | | Rep 2 | ND (0.0002) | |
| | | Canoe Pt -2 (West) | 355302 | 6801169 | 9/13/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2012 | Rep 1 | ND (0.0002) | |
| | | | | | | Rep 2 | ND (0.0002) | |

## Table E-1: Multi-increment Sediment Samples from Established Grids

| Area | Location | Position | Easting | Northing | Date Collected | Field Rep | WP Concentration (µg/g) | Notes |
|---|---|---|---|---|---|---|---|---|
| BT | Pond 109 | BT South 100 m + | 354521 | 6801735 | 9/23/2010 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2012 | Rep 1 | ND (0.0002) | |
| | | | | | | Rep 2 | ND (0.0002) | |
| | | BT South 100 m - | 354521 | 6801715 | 9/23/2010 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2011 | Rep 1 | ND | |
| | | | | | | Rep 2 | ND | |
| | | | | | 9/13/2012 | Rep 1 | ND (0.0002) | |
| | | | | | | Rep 2 | ND (0.0002) | |

## Table E-2: Historical Multi-Increment Sample Results from Cap Perimeters

| Sample ID | Date Capped | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| 03DIS03 | 2008 | 355185 | 6801454 | 6/10/2008 | C | 0 to 5 cm | **0.0008, 0.003** | |
| | | 355185 | 6801454 | 5/16/2009 | C | 0 to 5 cm | **0.065, 0.002** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355185 | 6801454 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS11 | 2009 | 355212 | 6801441 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS18 | 2009 | 355208 | 6801428 | 5/16/2009 | C | 0 to 5 cm | **0.0001, 0.0011** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355208 | 6801428 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS21 | 2008 | 355153 | 6801443 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS36 | 2008 expanded in 2009 | 355233 | 6801449 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS37 | 2009 | 355220 | 6801465 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS38 | 2008 | 355217 | 6801490 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS40 | 2008 expanded in 2009 | 355168 | 6801505 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS42 | 2009 | 355144 | 6801509 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 03DIS43 | 2009 | 355138 | 6801473 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 04DIS68 | 2009 | 355175 | 6801437 | 5/16/2009 | C | 0 to 5 cm | **0.0008, 0.001** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355175 | 6801437 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 04DIS76 | 2009 | 355133 | 6801512 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 04DIS82 | 2008 | 355247 | 6801461 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 04DIS84 | 2008 expanded 2013 | 355249 | 6801443 | 9/10/2012 | C | 0 to 5 cm | ND (0.0002) | North side |
| 04DIS84 (South of Cap) | | 355249 | 6801443 | 9/10/2012 | C | 0 to 5 cm | **0.0002** | South side |
| 04DIS85 | 2008 | 355221 | 6801425 | 9/12/2012 | C | 0 to 5 cm | ND (0.0002) | |
| 04DIS86 | 2008 | 355233 | 6801449 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |
| 04DIS90 | 2008 | 354827 | 6801651 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |
| 04DIS93 | 2008 | 354823 | 6801706 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |
| 04DIS96 | 2008 | 354833 | 6801722 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |
| 04DIS97 | 2008 | 354780 | 6801724 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |
| 04DIS106 | 2008 | 354798 | 6801650 | 9/12/2012 | BT | 0 to 5 cm | ND (0.0002) | |

## Table E-2: Historical Multi-Increment Sample Results from Cap Perimeters

| Sample ID | Date Capped | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| Cross Ditch Junction (04DIS125) | 2008 expanded 2011 | 355224 | 6801525 | 6/10/2008 | C | 0 to 5 cm | ND, ND | |
| | | 355224 | 6801523 | 5/16/2009 | C | 0 to 5 cm | **1.65** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355226 | 6801523 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | Cross-South Ditch Junction - North Side |
| | | 355226 | 6801523 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | Cross-South Ditch Junction - West Side |
| | | 355226 | 6801523 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | Cross-South Ditch Junction - East Side |
| North Ditch | 2008 expanded in 2009 | 355215 | 6801643 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | West side |
| | | 355215 | 6801643 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | East side |
| South ditch west (04DIS126) | 2008 expanded in 2009 | 355166 | 6801523 | 6/10/2008 | C | 0 to 5 cm | ND, ND | West side |
| | | 355167 | 6801527 | 5/16/2009 | C | 0 to 5 cm | **0.0045** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355167 | 6801527 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | West side |
| | | 355167 | 6801527 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | East side |
| South ditch east | 2009 | 355253 | 6801517 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | West side |
| | | 355253 | 6801517 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | East side |
| BIP 5 to 9 | 2008 expanded 2009 | 355185 | 6801565 | 9/11/2012 | C | 1 to 5 cm | **0.00031** | West side |
| | | 355185 | 6801565 | 9/11/2012 | C | 2 to 5 cm | **0.0025** | East side |
| BIP 10 | 2008 | 355167 | 6801567 | 9/11/2012 | C | 0 to 5 cm | **0.0012** | |
| BIP 11 | 2008 expanded 2009 | 355166 | 6801586 | 6/10/2008 | C | 0 to 5 cm | ND | |
| | | 355167 | 6801588 | 5/16/2009 | C | 0 to 5 cm | **0.018** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355169 | 6801590 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | |
| Pond 23 | 2008 | 355292 | 6801535 | 8/24/2002 | C | 5 cm | **0.161** | (E of Line 2.5 120m S) |
| Bomb Crater | 2011 | 355355 | 6801672 | 7/20/2011 | C | 0 to 5 cm | ND | |
| | | 355354 | 6801671 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | West side |
| | | 355354 | 6801671 | 9/11/2012 | C | 0 to 5 cm | ND (0.0002) | East side |
| Pond 730 North | 2011 temporary, 2013 permanent | 354885 | 6801896 | 9/12/2012 | C | 0 to 5 cm | ND (0.0002) | 0 to 1m annulus |
| | | 354885 | 6801896 | 9/12/2012 | C | 0 to 5 cm | ND (0.0002) | 1 to 2m annulus |

## Table E-2: Historical Multi-Increment Sample Results from Cap Perimeters

| Sample ID | Date Capped | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| Pond 730 Southwest Arm | 2011 | 354792 | 6801812 | 7/20/2011 | C | 0 to 5 cm | **ND** | |
| | | 354791 | 6801813 | 9/12/2012 | C | 0 to 5 cm | ND (0.0002) | West side |
| | | 354791 | 6801813 | 9/12/2012 | C | 0 to 5 cm | ND (0.0002) | East side |
| Pond 155 | 2011 | 355118 | 6801546 | 9/14/2011 | C | 0 to 5 cm | **ND** | East of Temp Cap (1 to 2 m) |
| | | 355116 | 6801545 | 9/14/2011 | C | 0 to 5 cm | **0.0006** | West of Temp Cap (1 to 2 m) |

## Table E-3: Multi-increment Sediment Samples to Locate Areas with White Phosphorus

| Area | Location | Position | Easting | Northing | Date Collected | Sample Mass (kg) | WP Concentration (µg/g) | Notes |
|---|---|---|---|---|---|---|---|---|
| C | Cross Ditch | 0 to 5 m | 355228 | 6801543 | 5/14/2010 | 0.8 | ND | |
| | | 5 to 10 m | 355227 | 6801548 | 5/14/2010 | 0.4 | ND | |
| | | 10 to 15 m | 355226 | 6801553 | 5/14/2010 | 0.5 | ND | |
| | | 15 to 20 m | 355224 | 6801558 | 5/14/2010 | 0.6 | ND | |
| | | 20 to 25 m | 355223 | 6801563 | 5/14/2010 | 0.6 | ND | |
| | | 25 to 30 m | 355222 | 6801567.5 | 5/14/2010 | 0.7 | ND | |
| | | 30 to 35 m | 355221 | 6801572.5 | 5/14/2010 | 0.6 | ND | |
| | | 35 to 40 m | 355220 | 6801577 | 5/14/2010 | 0.7 | ND | |
| | | 40 to 45 m | 355219 | 6801582 | 5/14/2010 | 0.7 | ND | |
| | | 45 to 50 m | 355218 | 6801587 | 5/14/2010 | 0.6 | ND | |
| | | 50 to 55 m | 355217 | 6801592 | 5/14/2010 | 0.9 | ND | |
| | | 55 to 60 m | 355216 | 6801597 | 5/14/2010 | 0.7 | ND | |
| | | 60 to 65 m | 355215 | 6801602 | 5/14/2010 | 0.9 | ND | |
| | | 65 to 70 m | 355214 | 6801607 | 5/14/2010 | 0.8 | ND | |
| | North Ditch, west of sump | 0 to 10 m | 355111 | 6801588 | 9/20/2010 | 1.7 | ND | |
| | | 10 to 20 m | 355120 | 6801593 | 9/20/2010 | 1.7 | ND | |
| | | 20 to 30 m | 355129 | 6801598 | 9/20/2010 | 2 | ND | |
| | | 30 to 40 m | 355138 | 6801602 | 9/20/2010 | 2 | ND | |
| | | 40 to 50 m | 355147 | 6801606 | 9/20/2010 | 1.8 | ND | |
| | | 50 to 60 m | 355156 | 6801611 | 9/20/2010 | 1.7 | ND | |
| | | 60 to 70 m | 355165 | 6801616 | 9/20/2010 | 1.7 | ND | |
| | | 70 to 80 m (at sump) | 355173 | 6801621 | 9/20/2010 | 2.2 | ND | |
| | | Lobe (3-m × 3-m) N of 70 to 80 m | 355177 | 6801622 | 9/20/2010 | 2.4 | ND | |

## Table E-3: Multi-increment Sediment Samples to Locate Areas with White Phosphorus

| Area | Location | Position | Easting | Northing | Date Collected | Sample Mass (kg) | WP Concentration (µg/g) | Notes |
|---|---|---|---|---|---|---|---|---|
| | North Ditch, open water to the north of the ditch | CMN-1 | 355355 | 6801774 | 9/8/2011 | 2.8 | ND | |
| | | CMN-1 | 355355 | 6801774 | 9/8/2011 | 2.3 | ND | |
| | | CMN-2 | 355326 | 6801768 | 9/8/2011 | 3.8 | ND | |
| | | CMN-2 | 355326 | 6801768 | 9/8/2011 | 2.4 | ND | |
| | | CMN-3 | 355326 | 6801784 | 9/8/2011 | 2.5 | ND | |
| | | CMN-3 | 355326 | 6801784 | 9/8/2011 | 1.9 | ND | |
| | | CMN-4 | 355293 | 6801791 | 9/8/2011 | 2.6 | ND | |
| | | CMN-4 | 355293 | 6801791 | 9/8/2011 | 2.1 | ND | |
| | | CMN-5 | 355283 | 6801805 | 9/8/2011 | 2.5 | ND | |
| | | CMN-5 | 355283 | 6801805 | 9/8/2011 | 2.2 | ND | |
| | | CMN-6 | 355294 | 6801817 | 9/8/2011 | 2 | ND | |
| | | CMN-6 | 355294 | 6801817 | 9/8/2011 | 2.2 | ND | |
| | | CMN-7 | 355300 | 6801824 | 9/11/2011 | 2.5 | ND | |
| | | CMN-7 | 355300 | 6801824 | 9/11/2011 | 2.3 | 0.0014 | |
| BT | W of Pond 730 | Pool 1 | 354777 E to 354766 W | 6801816 E to 6801819 W | 5/17/2010 | 0.85 | ND | Looks like relic drainage |
| | | Pool 2 | 354770 | 6801823 | 5/17/2010 | 0.74 | ND | Round pool with bulrush |
| | | Pool 3 | 354761 | 6801820 | 5/17/2010 | 0.72 | ND | Round |
| | | Pool 4 | 354757 | 6801833 | 5/17/2010 | 0.65 | ND | Figure-eight shape |
| | | Pool 5 | 354771 | 6801811 | 5/17/2010 | 0.58 | ND | Looks like a crater |
| | Pond 730 southwest arm (0 to 10 m) | SW quadrant 5-m × 8.25-m | 354787 | 6801812 | 5/17/2010 | 2 | ND | Starting at Mortality Transect Point 730-5 (354783, 6801808) |
| | | SE quadrant 5-m × 8.25-m | 354791 | 6801810 | 5/17/2010 | 3.1 | **0.00015** | WP ordnance anomaly |
| | | NW quadrant 5-m × 8.25-m | 354791 | 6801819 | 5/17/2010 | 1.9 | ND | |
| | | NE quadrant 5-m × 8.25-m | 354794 | 6801816 | 5/17/2010 | 1.5 | **0.009** | WP ordnance anomaly |
| | | Pond 730 0-10 m around temporary cap | 354791 | 6801813 | 9/22/2010 | 1.6 | ND | |
| | | | 354791 | 6801813 | 9/22/2010 | 1 | ND | |
| | Death Cove | Near 2001 mortalities 1 & 10 | 354789 | 6801920 | 9/12/2011 | 2.1 | ND | |
| | | Near 2001 mortalities 1 & 10 | 354789 | 6801920 | 9/12/2011 | 1.7 | ND | |
| | Pond 730 North | 1.5 × 2.5 area around tail fin | 354885 | 6801896 | 9/12/2011 | 0.6 | 702 | WP mortar fin |
| | | 2 m annulus above fin | 354885 | 6801896 | 9/12/2011 | 1.1 | ND | WP mortar fin |
| | | Annulus around temp cap | 354885 | 6801896 | 9/12/2011 | 1.9 | ND | WP mortar fin |
| | | Annulus around temp cap | 354885 | 6801896 | 9/12/2011 | 0.9 | ND | WP mortar fin |

## Table E-3: Multi-increment Sediment Samples to Locate Areas with White Phosphorus

| Area | Location | Position | Easting | Northing | Date Collected | Sample Mass (kg) | WP Concentration (µg/g) | Notes |
|---|---|---|---|---|---|---|---|---|
| Racine Island | 10RI_DU01 | Racine Island Crater Cluster 1 | 355394 | 6800566.75 | 5/20/2010 | 3.1 | ND | ~10 craters(GPS Points 5-8) |
| | | | 355394 | 6800566.75 | 5/20/2010 | 2.2 | ND | |
| | 10RI_DU02 | Racine Island Crater Cluster 2 | 355352 | 6800594 | 5/20/2010 | 3.1 | ND | ~20 craters (GPS Points 9-13) |
| | | | 355352 | 6800594 | 5/20/2010 | 2.4 | ND | |
| | 10RI_DU03 | Pool | 355363 | 6800554 | 5/20/2010 | 1.4 | ND | (GPS Point 14) |
| | 10RI_DU04 | Crater Cluster 3 | 355360 | 6800540 | 5/20/2010 | 1.9 | **0.016** | 6 craters (GPS Point 15) |
| | 0RI_DU05 | Water-Sedge | 355420 | 6800525 | 9/22/2010 | 3.2 | ND | 62 m ESE of GPS Point 15 |
| | | | 355420 | 6800525 | 9/22/2010 | 3.2 | ND | |
| | | | 355420 | 6800525 | 9/22/2010 | 1.8 | **0.012** | With sediment co-located with anomaly |

## Table E-4: White Phosphorus Concentrations Detected at Locations that have Been Capped

| Sample ID | Capped (Mon-Yr) | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| 03DIS03 | | 355187 | 6801456 | 5/23/2003 | C | 0 to 5 cm | **1.3** | 4.9 m × 2.5 m. WP mortar fin. |
| | | | | 5/29/2007 | C | 0 to 5 cm | **4.04** | Sampled E of drainage ditch and N of metal stake. Log across area. Water depth 15 cm. |
| 03DIS03 cap perimeter | Feb-08 | 355185 | 6801454 | 6/10/2008 | C | 0 to 5 cm | **0.0008, 0.003** | |
| | | 355185 | 6801454 | 5/16/2009 | C | 0 to 5 cm | **0.065, 0.002** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| 03DIS03 drainage channel west of cap | | 355181 | 6801456 | 5/21/2010 | C | 0 to 5 cm | ND | Water-filled depression. 0 to 7.3 m N |
| | | 355185 | 6801449 | 5/21/2010 | C | 0 to 5 cm | **0.0067** | Water-filled depression. 0 to 9 m S |
| 03DIS18 | | 355210 | 6801429 | 5/28/2003 | C | 0 to 5 cm | **400** | WP mortar fin. Two pools: east and west. |
| 03DIS18 East | | 355209 | 6801430 | 7/9/2003 | C | 0 to 5 cm | **240** | |
| | | 355209 | 6801430 | 8/27/2004 | C | 0 to 5 cm | **0.002** | |
| | | 355209 | 6801430 | 9/8/2005 | C | 0 to 5 cm | **0.08** | |
| | | 355209 | 6801430 | 8/30/2006 | C | 0 to 5 cm | **0.007** | Surface sediment from drainage channel. |
| | | 355209 | 6801430 | 5/29/2007 | C | 0 to 5 cm | **0.69** | Surface sediment from water-filled drainage channel. |
| | | 355209 | 6801430 | 8/23/2007 | C | 0 to 5 cm | **0.0055** | |
| 03DIS18 cap perimeter | Mar-09 | 355208 | 6801428 | 5/16/2009 | C | 0 to 5 cm | **0.0001, 0.0011** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| 03DIS18 drainage channel south of cap | | 355207 | 6801425 | 5/21/2010 | C | 0 to 5 cm | **0.0001** | 0 to 5 m W, E, and S |
| 04DIS068 | | 355177 | 6801438 | 5/22/2004 | C | 10 to 15cm | **29.1** | Approximately 1 m from 03DIS30 (toward pond 171 logger). Mortar Body 20 cm deep with smoke. Two samples: Surface 0 to 10 cm and Subsurface 10 to 15 |
| | | 355177 | 6801438 | 5/22/2004 | C | 0 to 10 cm | **0.14** | |
| | | 355177 | 6801438 | 5/29/2007 | C | 0 to 5 cm | ND | 1.7-m × 1-m isolated crater. Metal detected 1 m SW of crater. Subsurface was frozen in May. Excavated in Aug and WP frag found. |
| 1 m SW of 04DIS68 | | 355176 | 6801437 | 5/29/2007 | C | 0 to 5 cm | **41** | WP ordnance scrap. |
| 04DIS68 cap perimeter | Mar-09 | 355175 | 6801437 | 5/16/2009 | | 0 to 5 cm | **0.0008, 0.001** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| 04DIS068 drainage channel south of cap | | 355173 | 6801434 | 5/21/2010 | C | 0 to 5 cm | ND | Water-filled depression. |

## Table E-4: White Phosphorus Concentrations Detected at Locations that have Been Capped

| Sample ID | Capped (Mon-Yr) | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| 04DIS125 | | 355228 | 6801523 | 8/25/2004 | C | at UXO scrap | **950** | Location of WP fin found in May. |
| | | | | 9/12/2005 | | 5 cm | **1.71** | |
| 04DIS125 Ditch Bottom | | 355226 | 6801523 | 5/23/2006 | C | 5 cm | **84** | |
| | | | | 8/30/2006 | | 5 cm | ND | Intersection of cross-ditch and S ditch. Location was blasted to deepen ditch on 11 July 2006. |
| | | | | 5/29/2007 | C | 0 5cm | **0.0058** | In south cross-ditch. Surface sediment from walls and bottom of ditch east of datalogger sensors. |
| 04DIS125 cap perimeter at jct. of the south and cross ditches | Feb-08 | 355224 | 6801525 | 6/10/2008 | C | 0 to 5 cm | ND, ND | |
| 04DIS125 cap perimeter at jct. of the south and cross ditches | | 355224 | 6801523 | 5/16/2009 | C | 0 to 5 cm | **1.65** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| South and Cross Ditch cap perimeter | | | | | C | | | |
| North side, 0 to 1 m from cap | | 355224 | 6801533 | 9/16/2009 | C | 0 to 5 cm | **0.022** | |
| North side, 1 to 2 m from cap | | 355224 | 6801534 | 9/16/2009 | C | 0 to 5 cm | **0.012** | |
| East side, 0 to 1 m from cap | | 355226 | 6801518 | 9/16/2009 | C | 0 to 5 cm | ND | |
| East side, 1 to 2 m from cap | | 355227 | 6801518 | 9/16/2009 | C | 0 to 5 cm | ND | |
| West side, 0 to 1 m from cap | | 355223 | 6801517 | 9/16/2009 | C | 0 to 5 cm | ND | |
| West side, 1 to 2 m from cap | | 355222 | 6801517 | 9/16/2009 | C | 0 to 5 cm | **1.3** | |
| West side, 9 to 11 m from cap | | 355212 | 6801519 | 5/21/2010 | C | 0 to 5 cm | ND | 0 to 9 m was marked for capping in March 2011 |
| West of cap | | 355123 | 6801518 | 7/21/2011 | C | 0 to 5 cm | ND | |
| North of cap | | 355224 | 6801544 | 7/21/2011 | C | 0 to 5 cm | ND | |
| 04DIS126 | | 355167 | 6801527 | 8/25/2004 | C | at UXO scrap | **2033** | South ditch, west (in Segment 1). Thick metal fragment. WP odor in peat layer. |
| 04DIS126 Ditch Bottom | | | | 5/19/2006 | C | 5 cm | **40** | |
| 04DIS126 High Wall | | 355167 | 6801529 | 5/19/2006 | C | 5 cm | **0.001** | |
| 04DIS126 Mid Wall | | 355167 | 6801528 | 5/19/2006 | C | 5 cm | **0.07** | |
| 04DIS126 South Wall | | | | 8/30/2006 | C | 5 cm | **14.4** | |
| 04DIS126 | | | | 5/29/2007 | C | 0 to 5 cm | **48** | Surface sediment from south wall of south ditch. |
| 04DIS126 cap perimeter in south ditch, west side | Feb-08 | 355166 | 6801523 | 6/10/2008 | C | 0 to 5 cm | ND, ND | |

## Table E-4: White Phosphorus Concentrations Detected at Locations that have Been Capped

| Sample ID | Capped (Mon-Yr) | Easting | Northing | Collection Date | Area | Depth | WP Concentration (µg/g) | Field Notes |
|---|---|---|---|---|---|---|---|---|
| 04DIS126 cap perimeter | Expanded Mar-2009 | 355167 | 6801527 | 5/16/2009 | C | 0 to 5 cm | **0.0045** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| East of Cap 0 to 5 m | | 355173 | 6801527 | 5/21/2010 | C | 0 to 5 cm | ND | |
| East of Cap 5 to 10 m | | 355178 | 6801525 | 5/21/2010 | C | 0 to 5 cm | ND | |
| West of Cap 0 to 5 m | | 355156 | 6801535 | 5/21/2010 | C | 0 to 5 cm | ND | |
| West of Cap 5 to 10 m | | 355161 | 6801532 | 5/21/2010 | C | 0 to 5 cm | ND | |
| BIP 11 | | 355169 | 6801590 | 6/1/2005 | C | 5 cm | **511** | |
| | | | | 8/31/2006 | C | 5 cm | **31** | Crater 1.6-m to 2-m across. Depth in center is 67 cm. |
| | | | | 5/29/2007 | C | 0 to 5 cm | **0.019** | Surface sediment inside rim. |
| BIP 11 cap perimeter | Feb-08 | 355166 | 6801586 | 6/10/2008 | C | 0 to 5 cm | ND | |
| | Expanded Mar-2009 | 355167 | 6801588 | 5/16/2009 | C | 0 to 5 cm | **0.018** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| BIP_11 and nearby craters | | 355167 | 6801588 | 5/21/2010 | C | 0 to 5 cm | ND | |
| Edge of C Marsh Pond 23 (E of Line 2.5 120m S) | | 355292 | 6801535 | 8/24/2002 | C | 5 cm | **0.161** | |
| | | | | 5/30/2007 | C | 0 to 5 cm | **1.3** | Surface sediment from walls and bottom of pool. UXO tech found 105-mm UXO. EOD removed projectile, which they identified as a practice round. |
| | Feb-08 | 355290 | 6801531 | 6/10/2008 | C | 0 to 5 cm | **0.0011, 0.0006** | Center point UTM coordinates based on Aero-Metric 20 Aug 2009 image |
| | | 355290 | 6801532 | 5/16/2009 | C | 0 to 5 cm | **0.051, 0.0003** | |
| | | 355290 | 6801532 | 5/21/2010 | C | 0 to 5 cm | **0.0026** | Sampled depressions with standing water. |
| Bomb Crater Ditch Segment 18 | Mar-11 | 355355 | 6801672 | 7/20/2011 | C | 0 to 5 cm | **ND** | |
| Pond 730 Southwest Arm 0-10m | Mar-11 | 354792 | 6801812 | 7/20/2011 | C | 0 to 5 cm | **ND** | |
| | | 354792 | 6801812 | 7/20/2011 | C | 0 to 5 cm | **ND** | Duplicate |
| | | 354792 | 6801812 | 7/20/2011 | C | 0 to 5 cm | **ND** | |
| Pond 155 | Mar-11 | 355118 | 6801546 | 9/14/2011 | C | 0 to 5 cm | **ND** | East of Temp Cap (1 to 2 m) |
| | Mar-11 | 355116 | 6801545 | 9/14/2011 | C | 0 to 5 cm | **0.0006** | West of Temp Cap (1 to 2 m) |

## Table E-5: Multi-increment Sieved Samples (> 0.59 µm)

| Area | Location | Position | Easting | Northing | Date Collected | Sample Mass (kg) | WP Mass (µg) |
|---|---|---|---|---|---|---|---|
| A | Pond 226 | 10-m radius around center | 353681 | 6801015 | 9/21/2010 | 0.077 | 0.036 |
| | | | 353681 | 6801015 | 9/21/2010 | 0.17 | 0.036 |
| | | | 353681 | 6801015 | 9/21/2010 | 0.19 | 0.077 |
| | | | 353681 | 6801015 | 7/24/2011 | 0.172 | ND |
| | | | 353681 | 6801015 | 7/24/2011 | 0.206 | ND |
| | | | 353681 | 6801015 | 7/24/2011 | 0.197 | ND |
| | Pond 258 | 10-m radius around center | 354009 | 6800667 | 9/21/2010 | 0.194 | 0.068 |
| | | | 354009 | 6800667 | 9/21/2010 | 0.144 | 0.049 |
| | | | 354009 | 6800667 | 9/21/2010 | 0.264 | 0.035 |
| | | | 354009 | 6800667 | 7/24/2011 | 0.34 | ND |
| | | | 354009 | 6800667 | 7/24/2011 | 0.28 | ND |
| | | | 354009 | 6800667 | 7/24/2011 | 0.305 | ND |
| C | C Marsh North / CD South | Water N. of North Ditch | 355355 | 6801774 | 9/8/2011 | 0.7 | ND |
| | | | 355355 | 6801774 | 9/8/2011 | 0.7 | ND |
| | | | 355326 | 6801768 | 9/8/2011 | 0.3 | ND |
| | | | 355326 | 6801768 | 9/8/2011 | 0.9 | ND |
| | | | 355326 | 6801768 | 9/8/2011 | 3 | ND |
| | | | 355326 | 6801768 | 9/8/2011 | 1.5 | ND |
| | | | 355293 | 6801791 | 9/8/2011 | 1.9 | ND |
| | | | 355293 | 6801791 | 9/8/2011 | 1 | ND |
| | | | 355283 | 9801805 | 9/9/2011 | 1.2 | ND |
| | | | 355394 | 6801817 | 9/9/2011 | 1.3 | ND |
| | | | 355300 | 6801824 | 9/11/2011 | 0.9 | ND |
| | Pond 730 North | Death Cove (2011 – mortalities 1 and 10 found nearby) | 354789 | 6801768 | 9/12/2011 | 0.4 | ND |

## Table E-6: Discrete Samples

| Area | Position | Easting | Northing | Date Collected | WP Concentration (µg/g) | Comments |
|---|---|---|---|---|---|---|
| BT | Pond 730 May_Anomaly 1 | 354790 | 6801814 | 5/17/2010 | 0.0001 | Surface |
| | | 354790 | 6801814 | 5/17/2010 | 33.4 | Subsurface |
| | Pond 730 May_Anomaly 2 | 354792 | 6801812 | 5/17/2010 | 0.069 | Surface |
| | | 354790 | 6801814 | 5/17/2010 | 1,826 | Subsurface |
| | Pond 730 Sept_Anomaly_01 | 354820 | 6801792 | 9/22/2010 | ND | Looks like a doorknob |
| | Pond730 Sept_Anomaly_02 | 354826 | 6801797 | 9/22/2010 | ND | Looks like a meteorite |
| | Pond 730 Sept_Anomaly_03 – Surface Sediment | 354819 | 6801798 | 9/22/2010 | ND | Deep. Thin-walled ordnance scrap. |
| | Pond 730 Co-located with metal | 354819 | 6801798 | 9/22/2010 | ND | |
| | Pond 730 Under metal | 354819 | 6801798 | 9/22/2010 | ND | |
| | Pond 730 North 11DIS04 | 354885 | 6801896 | 9/12/2011 | 130 | WP mortar fin co-located to sediment |
| | Pond 730 North 11DIS05 | 354885 | 6801896 | 9/12/2011 | 3,000 | Sediment from within the mortar tail fin |
| | Pond 155 11DIS03 | 355117 | 6801545 | 9/11/2011 | ND | Deep Anomaly at Grid Row 4 |
| | 11DIS01 Duck Pond Drainage Anomaly (7 m upstream from tide gate) | 354790 | 6801814 | 7/22/2011 | 3.15 | From area next to munitions anomaly |
| | 11DIS02 Pond 183 Anomaly – Dry sediment from with "bell" | 354790 | 6801633 | 7/25/2011 | ND | Sediment near the anomaly |
| C | CMarsh Anomaly 4.2-inch mortar projectile 01DIS01 | 355145 | 6801497 | 5/21/2010 | **ND** | |
| | 12DIS01 Edge of 04DIS84 Cap Projectile 37 cm deep | | | 9/10/2012 | **800** | |
| | 12DIS02 Anomaly West of Cross Dtich | | | 9/11/2012 | **0.0024** | |
| | 12DIS03 Anomaly near South Sump | | | 9/11/2012 | **0.0003** | |
| | 12DIS04 81-mm fin at old site 53 | | | 9/13/2012 | **0.0011** | |
| | 12DIS05 Empty WP projectile West of Pond 146 grids | | | 9/13/2012 | ND (0.0002) | |
| Racine Island | Inside 10RI_DU05 | 355421 | 6800517 | 9/22/2010 | 0.079 | Rectangular plate. Looks like WP ordnance scrap |
| | 11RI_DU06 Racine Island | 355141 | 6800523 | 7/22/2011 | ND | Crater Cluster West of AquaBlok Pond |
| Coastal East | Crater from 12 May 2010 UXO detonation | 353902 | 6802188 | 5/15/2010 | 0.34 | In gully. Inside crater |
| | | 353902 | 6802188 | 5/15/2010 | 4.47 | In gully. Within 1 m of crater edge |
| | | 353902 | 6802188 | 9/18/2010 | 103 | Subsurface sediment. |

# Appendix F
# Data Quality Information

# Appendix F-1
# 2016 Data Cross Tab

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## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | 03DIS03 | 03DIS11 | 03DIS18 | | 03DIS21 | 03DIS36 |
|---|---|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***03DIS03_ 0916*** | ***03DIS11_ 0916*** | ***03DIS18_ 0916*** | ***03DIS18_ 0916D*** | ***03DIS21_ 0916*** | ***03DIS36_ 0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** |
| | | **Project Trigger Level** | | | | | | |
| **White Phosphorus (µg/g)** | | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.002 U | 0.0021 U | 0.0033 U | 0.0067 U | 0.002 U | 0.012 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | 03DIS37 | | 03DIS38 | 03DIS40 | 03DIS42 | 03DIS43 | 04DIS106 |
|---|---|---|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***03DIS37_ 0916*** | ***03DIS37_ 0916D*** | ***03DIS38_ 0916*** | ***03DIS40_ 0916*** | ***03DIS42_ 0916*** | ***03DIS43_ 0916*** | ***04DIS106_ 0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/16/2016*** |
| | | **Project Trigger Level** | | | | | | | |
| **White Phosphorus (µg/g)** | | | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.005 U | 0.002 U | 0.011 U | 0.0019 U | 0.003 U | 0.0018 U | 0.0017 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | 04DIS68 | 04DIS76 | 04DIS82 | 04DIS84 | 04DIS84SoC | 04DIS85 | 04DIS86 |
|---|---|---|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***04DIS68_ 0916*** | ***04DIS76_ 0916*** | ***04DIS82_ 0916*** | ***04DIS84_ 0916*** | ***04DIS84SOC_ 0916*** | ***04DIS85_ 0916*** | ***04DIS86_ 0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/15/2016*** | ***9/19/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/15/2016*** | ***9/16/2016*** |
| | | **Project Trigger Level** | | | | | | | |
| **White Phosphorus (µg/g)** | | | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0021 U | 0.0019 U | 0.0025 U | 0.0047 U | 0.0048 U | 0.0021 U | 0.0018 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Project Trigger Level | 04DIS90 | 04DIS93 | 04DIS96 | 04DIS97 | AreaBTDuckPond |
|---|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***04DIS90_0916*** | ***04DIS93_0916*** | ***04DIS96_0916*** | ***04DIS97_0916*** | ***AREABTDUCKPOND_0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/16/2016*** | ***9/16/2016*** | ***9/16/2016*** | ***9/16/2016*** | ***9/16/2016*** |
| **White Phosphorus (µg/g)** | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0019 U | 0.0019 U | 0.0018 U | **0.0017 J** | 0.0017 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | AreaCPond155 | BIP10 | BIP11 | BIP5_9East | |
|---|---|---|---|---|---|---|---|
| | | Sample ID: | *AREACPOND155_ 0916* | *BIP10_ 0916* | *BIP11_ 0916* | *BIP5_9EAST_ 0916* | *BIP5_9EAST_ 0916D* |
| | | Sample Depth (feet): | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | Sample Date: | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** |
| | | **Project Trigger Level** | | | | | |
| **White Phosphorus (µg/g)** | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0018 U | 0.0018 U | 0.0019 U | 0.0025 U | 0.0022 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | BIP5_9West | BombcraterE | BombcraterW | CrossditchJE |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***BIP5_9WEST_0916*** | ***BOMBCRATERE_0916*** | ***BOMBCRATERW_0916*** | ***CROSSDITCHJE_0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** |
| | | **Project Trigger Level** | | | | |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0019 U | 0.0063 U | 0.0023 U | 0.0019 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Project Trigger Level | CrossditchJN | CrossditchJW | Gizzard | |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***CROSSDITCHJN_0916*** | ***CROSSDITCHJW_0916*** | ***GIZZARD01_092016*** | ***Gizzard02_102416*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/19/2016*** | ***9/19/2016*** | ***9/20/2016*** | ***10/24/2016*** |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.002 U | 0.0025 U | **--** | **--** |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | **0.0024** | **0.25** |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| | | *Location:* | **NorthditchE** | **NorthditchW** | **Pond109BTS100ma** | |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***NORTHDITCHE_ 0916*** | ***NORTHDITCHW_ 0916*** | ***Pond109BTS100MA_ 0916R1*** | ***Pond109BTS100MA_ 0916R2*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/19/2016*** | ***9/19/2016*** | ***9/15/2016*** | ***9/15/2016*** |
| **Analyte** | **Screening Level** | **Project Trigger Level** | | | | |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0021 U | 0.0018 U | 0.0018 U | 0.0017 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | Pond109BTS100mb | | |
|---|---|---|---|---|---|
| | | Sample ID: | *Pond109BTS100MB_ 0916R1* | *Pond109BTS100MB_ 0916R2* | *Pond109BTS100MB_ 0916R2D* |
| | | Sample Depth (feet): | *0 to 0.2* | *0 to 0.2* | *0 to 0.2* |
| | | Sample Date: | *9/15/2016* | *9/15/2016* | *9/15/2016* |
| | | **Project Trigger Level** | | | |
| **White Phosphorus (µg/g)** | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0017 U | 0.0017 U | 0.0018 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Location: | Pond146CanoeP1E | | Pond146CanoeP2W | |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***Pond146CanoeP1E_ 0916R1*** | ***Pond146CanoeP1E_ 0916R2*** | ***Pond146CanoeP2W_ 0916R1*** | ***Pond146CanoeP2W_ 0916R2*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/13/2016*** | ***9/13/2016*** | ***9/13/2016*** | ***9/13/2016*** |
| | | **Project Trigger Level** | | | | |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0017 U | 0.0016 U | 0.0016 U | 0.0016 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | *Location:* | Pond155SWGRID | | Pond171CMarsh | |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***Pond155SWGRID_ 0916R1*** | ***Pond155SWGRID_ 0916R2*** | ***Pond171CMARSH_ 0916R1*** | ***Pond171CMARSH_ 0916R2*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/14/2016*** | ***9/14/2016*** | ***9/14/2016*** | ***9/14/2016*** |
| | | **Project Trigger Level** | | | | |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0021 U | 0.0023 U | 0.002 U | 0.0023 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | *Location:* | Pond183C100ma | | Pond23 | Pond730N | |
|---|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***Pond183C100MA_ 0916R1*** | ***Pond183C100MA_ 0916R2*** | ***POND23_ 0916*** | ***POND730N_ 0916*** | ***POND730N_ 0916D*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/14/2016*** | ***9/14/2016*** | ***9/19/2016*** | ***9/16/2016*** | ***9/16/2016*** |
| | | **Project Trigger Level** | | | | | |
| **White Phosphorus (µg/g)** | | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0017 U | 0.0017 U | 0.0025 U | 0.0021 U | 0.0023 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | Project Trigger Level | Pond730S | Pond730SW | Pond730SWE | SouthditchEE |
|---|---|---|---|---|---|---|
| | | *Location:* | **Pond730S** | **Pond730SW** | **Pond730SWE** | **SouthditchEE** |
| | | *Sample ID:* | ***POND730S_ 0916*** | ***POND730SW_ 0916*** | ***POND730SWE_ 0916*** | ***SOUTHDITCHEE_ 0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/16/2016*** | ***9/16/2016*** | ***9/16/2016*** | ***9/19/2016*** |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.002 U | 0.002 U | 0.0022 U | 0.0016 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

## Table F-1: Summary of Chemicals Detected in Soil: Site Eagle River Flats

| Analyte | Screening Level | *Location:* | SouthditchEW | SouthditchWE | | SouthditchWW |
|---|---|---|---|---|---|---|
| | | *Sample ID:* | ***SOUTHDITCHEW_0916*** | ***SOUTHDITCHWE_0916*** | ***SOUTHDITCHWE_0916D*** | ***SOUTHDITCHWW_0916*** |
| | | *Sample Depth (feet):* | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** | ***0 to 0.2*** |
| | | *Sample Date:* | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** | ***9/19/2016*** |
| | | **Project Trigger Level** | | | | |
| **White Phosphorus (µg/g)** | | | | | | |
| White Phosphorus (composite sample) | -- | 0.01 | 0.0035 U | 0.0019 U | 0.0018 U | 0.0017 U |
| White Phosphorus (grab sample) | -- | 0.10 | -- | -- | -- | -- |

Notes:

-- = not collected
µg/g = microgram(s) per gram
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

**Bold indicates that the analyte was detected.**
Shading indicates that the result exceeded screening criteria.

# Appendix F-2
# Data Quality Evaluation Report

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# JOINT BASE ELMENDORF-RICHARDSON EAGLE RIVER FLATS SOIL SAMPLING 2016 DATA QUALITY EVALUATION REPORT

## Introduction

The objective of this data quality evaluation (DQE) report is to assess the data quality of analytical results for soil and gizzard samples collected at Joint Base Elmendorf-Richardson, Eagle River Flats. Samples were collected and analyzed in support of the remedial action. The data may be used to support future activities such as feasibility studies, risk assessments, fate and transport modeling, and remedial actions. Individual method requirements and guidelines from the *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Restoration Program, Uniform Federal Policy-Quality Assurance Project Plan, Remedial Action Work Plan, XU022 – Eagle River Flats, Final (July 2016) (*Work Plan) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

## Analytical Data

This DQE report covers two gizzard samples, 58 primary soil samples, six soil field duplicates (FDs), and nine equipment blanks (EBs). Samples were collected between September 13 and October 24, 2016. A list of samples associated with this DQE is included in Attachment F-1.

The Work Plan requires a collection frequency of 10 percent for FDs and 5 percent for matrix spike/matrix spike duplicate (MS/MSD) sets and EBs; collection frequencies are outlined by method in Table 1. The required frequency was met for each method/matrix combination with the exception of the gizzard samples, for which limited sample volume prevented collection of FDs and MS/MSDs.

**Table 1: Percentage of FD, EB, and MS/MSD Collected by Method**

| Method | Matrix | Count of Primary Samples | Count of FDs | Percent of FDs | Count of MS/MSDs | Percent of MS/MSDs | Count of EBs | Percent of EBs |
|---|---|---|---|---|---|---|---|---|
| EPA 7580 | Soil | 58 | 6 | 10.3 | 3 | 5.2 | 9 | 15.5 |

The sample results were reported as four sample delivery groups (SDGs), presented in Table 2. The analyses were performed by RTI Laboratories Inc. in Livonia, Michigan (RTI, Department of Defense Environmental Laboratory Accreditation Program Certification #0570.03). Samples were collected and shipped via overnight carrier to RTI.

**Table 2: Sample Delivery Groups**

| SDG | Performing Laboratory |
|---|---|
| 1609709 | RTI |
| 1609714 | RTI |
| 1609717 | RTI |
| 1610793 | RTI |

One method was used to analyze the environmental samples. Samples were analyzed for the following analyte/method in Table 3.

**Table 3: Analytical Parameters**

| Parameter | Method |
|---|---|
| White phosphorus | EPA 7580 |

The assessment of data includes a review of (1) the chain-of-custody (COC) documentation; (2) holding-time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) method blanks; (5) laboratory control sample/laboratory control sample duplicates (LCS/LCSDs); (6) surrogate spike recoveries; (7) MS/MSD samples; and (8) initial and continuing calibration information and other method-specific criteria as defined by the Work Plan.

Field samples were also reviewed to ascertain field compliance and data quality issues. This included a review of FDs and EBs.

Data flags were assigned according to the Work Plan. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data, and it is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are defined as follows:

- **J** = The analyte was positively identified, and the quantitation is an estimation because of discrepancies in meeting certain analyte-specific quality control criteria. Or the analyte was positively identified, but the associated concentration is estimated above the method detection limit and below the limit of quantitation.
- **B** = The analyte was detected in the sample at a concentration less than or equal to five times (10 times for common laboratory contaminants) the blank concentration.
- **R** = The data are rejected because of deficiencies in meeting QC criteria, and may not be used for decision making.

- **U** = The analyte was analyzed for but not detected.
- **UJ** = The analyte was not detected; however, the result is estimated because of discrepancies in meeting certain analyte-specific QC criteria.

**Findings**

The overall summaries of the data validation findings are contained in the following sections. No data required qualification due to this assessment.

Also included as documentation of data validation findings is the Alaska Department of Environmental Conservation Laboratory Data Review Checklist (Version 2.7, January 2010). A checklist is provided for each laboratory SDG, and can be found in Attachment F-2 to this DQE.

### Holding Times

All holding-time criteria were met.

### Calibration

All initial and continuing calibration criteria were met.

### Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination that would affect the sample results.

### Equipment Blanks

Nine EBs were collected and were free of contamination that would affect the sample results. The collection of EBs at the end of the field event (rather than associated with batches of 20 samples as they were collected in the field) did not affect data quality.

### Field Duplicates

Six soil FD sets were collected, and precision was acceptable.

The FD sample identifications were labeled with a “D” suffix on the original sample identification. This naming convention would allow the laboratory to identify FD sets. There was no net effect on the data quality because all FD sets were nondetect for the target analyte.

### Matrix Spike Samples

The results of MS/MSD analyses provide information about the possible influence of the matrix on either accuracy or precision of the measurements. The field crew designated samples for MS/MSD analysis, and the laboratories chose additional samples for MS/MSD analysis. Accuracy and precision criteria were met.

Batch #41248 in laboratory report 1609717 did not contain an MS/MSD because it did not include a sample for which an MS/MSD set was requested on the COC with resulting triplicate volume of sample submitted. In order to demonstrate precision, the batch included an LCS/LCSD set.

**Surrogates**

Surrogates were added to all samples for the methods requiring their use. Surrogate recoveries met criteria.

**Laboratory Control Samples**

LCS/LCSDs were analyzed, and all accuracy and precision criteria were met.

**Chain-of-Custody and Sample Receipt Discrepancies**

- **SDG 1609709.** No discrepancies were noted.
- **SDG 1609714.** No discrepancies were noted.
- **SDG 1609717.** No discrepancies were noted.
- **SDG 1609717.** Sample received at 1.9 degrees Celsius; there was no evidence of freezing, so no data were qualified.

**Overall Assessment**

The final activity in the DQE is an assessment of whether the data meet the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and that the resulting analytical data can be used to support the decision making process. The precision, accuracy, representativeness, completeness, and comparability are addressed in the Work Plan. The following summary highlights the data evaluation findings for the above-defined events:

1. No data were rejected, and completeness for all method/matrix/analyte combinations was 100 percent.
2. No data were qualified because of low-level detections in the method blanks and EBs.
3. Overall precision and accuracy of the data as measured by field and laboratory QC indicators suggest that data are usable for project objectives.

# Attachment F-1: Samples Associated with DQE

| Sample ID | Collection Date | Sample Type | Matrix |
|---|---|---|---|
| EB01_0916 | 20-Sep-16 | EB | Water |
| EB02_0916 | 20-Sep-16 | EB | Water |
| EB03_0916 | 20-Sep-16 | EB | Water |
| EB04_0916 | 20-Sep-16 | EB | Water |
| EB05_0916 | 20-Sep-16 | EB | Water |
| EB06_0916 | 20-Sep-16 | EB | Water |
| EB07_0916 | 20-Sep-16 | EB | Water |
| EB08_0916 | 20-Sep-16 | EB | Water |
| EB09_0916 | 20-Sep-16 | EB | Water |
| 03DIS18_0916D | 15-Sep-16 | FD | Sediment |
| 03DIS37_0916D | 15-Sep-16 | FD | Sediment |
| BIP5_9East_0916D | 19-Sep-16 | FD | Sediment |
| Pond109BTS100mb_0916R2D | 15-Sep-16 | FD | Sediment |
| Pond730N_0916D | 16-Sep-16 | FD | Sediment |
| SouthditchWE_0916D | 19-Sep-16 | FD | Sediment |
| 03DIS03_0916 | 15-Sep-16 | N | Sediment |
| 03DIS11_0916 | 15-Sep-16 | N | Sediment |
| 03DIS18_0916 | 15-Sep-16 | N | Sediment |
| 03DIS21_0916 | 15-Sep-16 | N | Sediment |
| 03DIS36_0916 | 15-Sep-16 | N | Sediment |
| 03DIS37_0916 | 15-Sep-16 | N | Sediment |
| 03DIS38_0916 | 15-Sep-16 | N | Sediment |
| 03DIS40_0916 | 19-Sep-16 | N | Sediment |
| 03DIS42_0916 | 19-Sep-16 | N | Sediment |
| 03DIS43_0916 | 19-Sep-16 | N | Sediment |
| 04DIS106_0916 | 16-Sep-16 | N | Sediment |
| 04DIS68_0916 | 15-Sep-16 | N | Sediment |
| 04DIS76_0916 | 19-Sep-16 | N | Sediment |
| 04DIS82_0916 | 15-Sep-16 | N | Sediment |
| 04DIS84_0916 | 15-Sep-16 | N | Sediment |
| 04DIS84SoC_0916 | 15-Sep-16 | N | Sediment |
| 04DIS85_0916 | 15-Sep-16 | N | Sediment |

# Attachment F-1: Samples Associated with DQE

| Sample ID | Collection Date | Sample Type | Matrix |
|---|---|---|---|
| 04DIS86_0916 | 16-Sep-16 | N | Sediment |
| 04DIS90_0916 | 16-Sep-16 | N | Sediment |
| 04DIS93_0916 | 16-Sep-16 | N | Sediment |
| 04DIS96_0916 | 16-Sep-16 | N | Sediment |
| 04DIS97_0916 | 16-Sep-16 | N | Sediment |
| AreaBTDuckPond_0916 | 16-Sep-16 | N | Sediment |
| AreaCPond155_0916 | 19-Sep-16 | N | Sediment |
| BIP10_0916 | 19-Sep-16 | N | Sediment |
| BIP11_0916 | 19-Sep-16 | N | Sediment |
| BIP5_9East_0916 | 19-Sep-16 | N | Sediment |
| BIP5_9West_0916 | 19-Sep-16 | N | Sediment |
| BombcraterE_0916 | 19-Sep-16 | N | Sediment |
| BombcraterW_0916 | 19-Sep-16 | N | Sediment |
| CrossditchJE_0916 | 19-Sep-16 | N | Sediment |
| CrossditchJN_0916 | 19-Sep-16 | N | Sediment |
| CrossditchJW_0916 | 19-Sep-16 | N | Sediment |
| GIZZARD01_092016 | 20-Sep-16 | N | Gizzard content |
| Gizzard02.102416 | 24-Oct-16 | N | Gizzard content |
| NorthditchE_0916 | 19-Sep-16 | N | Sediment |
| NorthditchW_0916 | 19-Sep-16 | N | Sediment |
| Pond109BTS100ma_0916R1 | 15-Sep-16 | N | Sediment |
| Pond109BTS100ma_0916R2 | 15-Sep-16 | N | Sediment |
| Pond109BTS100mb_0916R1 | 15-Sep-16 | N | Sediment |
| Pond109BTS100mb_0916R2 | 15-Sep-16 | N | Sediment |
| Pond146CanoeP1E_0916R1 | 13-Sep-16 | N | Sediment |
| Pond146CanoeP1E_0916R2 | 13-Sep-16 | N | Sediment |
| Pond146CanoeP2W_0916R1 | 13-Sep-16 | N | Sediment |
| Pond146CanoeP2W_0916R2 | 13-Sep-16 | N | Sediment |
| Pond155SWGrid_0916R1 | 14-Sep-16 | N | Sediment |
| Pond155SWGrid_0916R2 | 14-Sep-16 | N | Sediment |
| Pond171CMarsh_0916R1 | 14-Sep-16 | N | Sediment |
| Pond171CMarsh_0916R2 | 14-Sep-16 | N | Sediment |

# Attachment F-1: Samples Associated with DQE

| Sample ID | Collection Date | Sample Type | Matrix |
|---|---|---|---|
| Pond183C100ma_0916R1 | 14-Sep-16 | N | Sediment |
| Pond183C100ma_0916R2 | 14-Sep-16 | N | Sediment |
| Pond23_0916 | 19-Sep-16 | N | Sediment |
| Pond730N_0916 | 16-Sep-16 | N | Sediment |
| Pond730S_0916 | 16-Sep-16 | N | Sediment |
| Pond730SW_0916 | 16-Sep-16 | N | Sediment |
| Pond730SWE_0916 | 16-Sep-16 | N | Sediment |
| SouthditchEE_0916 | 19-Sep-16 | N | Sediment |
| SouthditchEW_0916 | 19-Sep-16 | N | Sediment |
| SouthditchWE_0916 | 19-Sep-16 | N | Sediment |
| SouthditchWW_0916 | 19-Sep-16 | N | Sediment |

Notes:

EB = equipment blank
FD= field duplicate
N = primary sample

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# Attachment F-2: ADEC Checklists

# Laboratory Data Review Checklist

| | | | |
|---|---|---|---|
| CompletedBy | Berney Kidd | | |
| Title | Project Chemist | Date | 1/3/2017 |
| CS Report Name | | ReportDate | 11/23/2016 |
| Consultant Firm | CH2M Hill | | |
| Laboratory Name | RTI Laboratories | Laboratory Report Number | 1609709 |
| ADEC File Number | | ADECRecKeyNumber | |

1. Laboratory

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

No samples transferred.

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:

3.1 degrees Celsius

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

| |
|---|
| |

d. If there were any discrepancies, were they documented? - For example, incorrect sample containers/

○ Yes ○ No ◉ NA (Please explain.) Comments:

| |
|---|
| No discrepancies. |

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

Comments:

| |
|---|
| All data are usable as reported. |

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:

| |
|---|
| No discrepancies. |

c. Were all corrective actions documented?

◉ Yes ○ No ○ NA (Please explain.) Comments:

| |
|---|
| |

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

Comments:

| |
|---|
| All data are usable as reported. |

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:

| |
|---|
| No soil samples reported. |

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

Only EBs reported.

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

Comments:

All data are usable as reported.

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:

iii. If above PQL, what samples are affected?

Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits?

And

project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102

◉ Yes ○ No ○ NA (Please explain.) Comments:

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory

limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/DMSD, and

○ Yes ○ No ● NA (Please explain.) Comments:

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

Comments:

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

○ Yes ○ No ● NA (Please explain.) Comments:

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

Comments:

All data are usable.

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

● Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ● NA (Please explain.) Comments:

No surrogate exceedances.

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

Comments:

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:

No volatiles reported.

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:

iii. All results less than PQL?

○ Yes ○ No ◉ NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

e. Field Duplicate

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

Only EBs reported.

ii. Submitted blind to lab?

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

$$RPD (\%) = \text{Absolute Value of: } \frac{(R1 - R2)}{((R1 + R2)/2)} \times 100$$

Where R1 = Sample Concentration

R2 = Field Duplicate Concentration

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

f. Decontamination or Equipment Blank (if applicable)

◉ 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?

| |
|---|
| |

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

| |
|---|
| |

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?

○ Yes ○ No ◉ NA (Please explain.) Comments:

| |
|---|
| No other flags applied. |

# Laboratory Data Review Checklist

| | | | |
|---|---|---|---|
| CompletedBy | Berney Kidd | | |
| Title | Project Chemist | Date | 1/3/2017 |
| CS Report Name | | ReportDate | 10/24/2016 |
| Consultant Firm | CH2M Hill | | |
| Laboratory Name | RTI Laboratories | Laboratory Report Number | 1609714 |
| ADEC File Number | | ADECRecKeyNumber | |

1. Laboratory

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

(●) Yes ( ) No ( ) NA (Please explain.) Comments:

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

( ) Yes ( ) No (●) NA (Please explain.) Comments:

No samples transferred.

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:

3.1 degrees Celsius

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

(●) Yes ( ) No ( ) NA (Please explain.) Comments:

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

(•) Yes ( ) No ( ) NA (Please explain.) Comments:

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

( ) Yes ( ) No (•) NA (Please explain.) Comments:

No discrepancies.

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

Comments:

All data are usable as reported.

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:

There surrogate recovery exceedances.

c. Were all corrective actions documented?

( ) Yes ( ) No (•) NA (Please explain.) Comments:

No corrective actions required, surrogate recoveries were high and associated sample results were nondetect.

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

Comments:

No data were affected.

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:

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:

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

Comments:

All data are usable as reported.

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:

iii. If above PQL, what samples are affected?

Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

All data are usable.

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 surrogate exceedances.

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

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:

No volatiles reported.

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:

iii. All results less than PQL?

○ Yes ○ No ◉ NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

No data 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:

Field duplicate sample names included "-D” on the end of the original sample ID.

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

$$RPD (\%) = \text{Absolute Value of: } \frac{(R1 - R2) \times 100}{((R1 + R2)/2)}$$

Where R1 = Sample Concentration
R2 = Field Duplicate Concentration

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

No field duplicate Relative Percent Difference exceedences.

f. Decontamination or Equipment Blank (if applicable)

◉ Yes ○ No ○ NA (Please explain.) Comments:

All project EBs are reported in laboratory report 1609709

i. All results less than PQL?

◉ Yes ○ No ○ NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

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

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

a. Defined and appropriate?

○ Yes ○ No ◉ NA (Please explain.) Comments:

No other flags applied.

# Laboratory Data Review Checklist

| | | | |
|---|---|---|---|
| CompletedBy | Berney Kidd | | |
| Title | Project Chemist | Date | 1/3/2017 |
| CS Report Name | | ReportDate | 11/6/2016 |
| Consultant Firm | CH2M Hill | | |
| Laboratory Name | RTI Laboratories | Laboratory Report Number | 1609717 |
| ADEC File Number | | ADECRecKeyNumber | |

1. Laboratory

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

No samples transferred.

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:

4.1 degrees Celsius

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

(•) Yes ( ) No ( ) NA (Please explain.) Comments:

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

( ) Yes ( ) No (•) NA (Please explain.) Comments:

No discrepancies.

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

Comments:

All data are usable as reported.

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:

No discrepancies.

c. Were all corrective actions documented?

( ) Yes ( ) No (•) NA (Please explain.) Comments:

No corrective actions required.

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

Comments:

All data are usable as reported.

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:

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:

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

Comments:

All data are usable as reported.

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:

iii. If above PQL, what samples are affected?

Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

(•) Yes ( ) No ( ) NA (Please explain.) Comments:

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

Comments:

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

( ) Yes ( ) No (•) NA (Please explain.) Comments:

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

Comments:

All data are usable.

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 surrogate exceedances.

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

Comments:

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:

No volatiles reported.

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:

iii. All results less than PQL?

○ Yes ○ No ◉ NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

No data 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:

Field duplicate sample names included "-D” on the end of the original sample ID.

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

$$RPD (\%) = \text{Absolute Value of: } \frac{(R1 - R2)}{((R1 + R2)/2)} \times 100$$

Where R1 = Sample Concentration

R2 = Field Duplicate Concentration

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

No field duplicate Relative Percent Difference exceedences.

f. Decontamination or Equipment Blank (if applicable)

◉ Yes ○ No ○ NA (Please explain.) Comments:

All project EBs are reported in laboratory report 1609709.

i. All results less than PQL?

◉ Yes ○ No ○ NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

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

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?

○ Yes ○ No ◉ NA (Please explain.) Comments:

Batch #41248 in laboratory report 1609717 did not contain a MS/MSD because it did not include a sample for which an MS/MSD set was requested on the COC with resulting triplicate volume of sample submitted. In order to demonstrate precision, the batch included a LCS/LCSD set.

# Laboratory Data Review Checklist

| | | | |
|---|---|---|---|
| CompletedBy | Berney Kidd | | |
| Title | Project Chemist | Date | 1/3/2017 |
| CS Report Name | | ReportDate | 11/23/2016 |
| Consultant Firm | CH2M Hill | | |
| Laboratory Name | RTI Laboratories | Laboratory Report Number | 1610793 |
| ADEC File Number | | ADECRecKeyNumber | |

1. Laboratory

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

(●) Yes ( ) No ( ) NA (Please explain.) Comments:

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

( ) Yes ( ) No (●) NA (Please explain.) Comments:

No samples transferred.

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:

1.9 degrees Celsius, there was no evidence of freezing so no data were qualified.

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

(●) Yes ( ) No ( ) NA (Please explain.) Comments:

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

(•) Yes ( ) No ( ) NA (Please explain.) Comments:

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

( ) Yes ( ) No (•) NA (Please explain.) Comments:

No discrepancies.

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

Comments:

All data are usable as reported.

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:

No discrepancies.

c. Were all corrective actions documented?

(•) Yes ( ) No ( ) NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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:

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:

See site-specific report for details.

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

Comments:

All data are usable as reported.

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:

iii. If above PQL, what samples are affected?

Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

Comments:

All data are usable as reported.

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 surrogate exceedances.

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

Comments:

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:

No volatiles were reported.

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:

iii. All results less than PQL?

○ Yes ○ No ◉ NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

e. Field Duplicate

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

A FD was not reported in this sample delivery group.

ii. Submitted blind to lab?

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

$$RPD\ (\%) = \text{Absolute Value of: } \frac{(R1 - R2)}{((R1 + R2)/2)} \times 100$$

Where R1 = Sample Concentration
R2 = Field Duplicate Concentration

○ Yes ○ No ◉ NA (Please explain.) Comments:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

f. Decontamination or Equipment Blank (if applicable)

◉ Yes ○ No ○ NA (Please explain.) Comments:

All project EBs are reported in laboratory report 1609709.

i. All results less than PQL?

◉ Yes ○ No ○ NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

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

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
a. Defined and appropriate?

○ Yes ○ No ◉ NA (Please explain.) Comments:

No other flags applied.