***de maximis, inc.***

135 Beaver Street
Fourth Floor
Waltham, MA 02452
(781) 642-8775
FAX (781) 642-1078

July 7, 2014

***VIA FEDEX***

Massachusetts Department of Environmental Protection
Wetlands and Waterways Program
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

**RE: DEP Transmittal No. X254090**
**DEP Wetlands File No. 61-0633**

Dear Sir:

On behalf of KHB Venture, LLC, and in accordance with Condition No. 15 of the Water Quality Certification dated June 4, 2013, attached is the first vegetation monitoring report for Oak Island RAM Mitigation Project in Revere, Massachusetts.

Per Condition No. 17 of the Water Quality Certification, a copy is being provided to the City of Revere Conservation Commission.

Please do not hesitate to call me at 781-642-8775, should you have any questions.

Sincerely,

***de maximis, inc.***

Thor Helgason

Attachment
CC: (Via Electronic Transmittal):
Paul Sneeringer – USACE
Eric Hutchins – NOAA
Ed Reiner – USEPA
Georgeann Keer – MADEP
Frank Stringi – City of Revere
Andrew DeSantis – City of Revere
Conservation Commission
Jeffrey Holden – ARCADIS
KHB Venture, LLC

ARCADIS of New York, Inc.
6723 Towpath Road
P O Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

**MEMO**

To:
Thor Helgason
***de maximis, inc.***

Copies:
Jeff Holden

From:
Anthony Esposito

Date:
July 3, 2014

ARCADIS Project No.:
B0038878.0000

Subject:
Spring 2014 Vegetation Monitoring Report
Oak Island RAM Area Salt Marsh Restoration
KHB Venture, LLC
Revere, Massachusetts

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## 1. PURPOSE AND SCOPE

This report summarizes the results of monitoring tasks performed in fall 2013 and spring 2014 at the Release Abatement Measure (RAM) Mitigation project area in Revere, Massachusetts. The mitigation project involved excavation and offsite disposal of sediment within the project area to restore salt marsh habitat and increase flood storage capacity, provide feeder creeks through the marsh to increase tidal flow and flushing through the wetland, and eliminate existing *Phragmites australis* (Common Reed) to reduce fire hazards and improve habitat quality. No soil amendments or seeding/planting were required as part of the salt marsh restoration project.

Vegetation monitoring efforts were performed by ARCADIS on behalf of KHB Venture, LLC, in accordance with the requirements included in Condition 15 of the Water Quality Certification (WQC) issued by the Massachusetts Department of Environmental Protection (MassDEP) for the RAM Mitigation project. Per the WQC, a 5-year monitoring and reporting program are required for the RAM Mitigation Area to track the development and success of the restoration effort, and document the level of attainment of habitat restoration goals. The 5-year monitoring program is to include measuring of tide height, a qualitative assessment of erosion and creek stability, a qualitative assessment of the extent of invasive weed populations, a spring inspection to evaluate winter damage, vegetation field sampling and data collection from permanent plots during the peak growing season (summer), and the quarterly collection of photographs from fixed photo locations. The quantitative vegetation assessment during the growing season is to be based on a comparison to baseline vegetation characteristics, which were identified during a field effort conducted prior to site disturbance (Section 2).

Note that the tide height measurements were collected as part of Condition 6 of the WQC, which required one full year of continuous water surface elevation data collection upon completion of construction activities in the RAM Mitigation Area. Two reports have been generated to date transmitting the water level data. The tide height data support visual observations and photographs (Attachment A) that tidal flow has been restored to the RAM Mitigation Area, as intended by the mitigation project.

The spring 2014 monitoring events were performed to evaluate post-winter wetland conditions, to determine if any erosion occurred to the restored wetlands, to characterize the vegetation establishing on the site, and to map the extent of weed populations that may be present in the RAM Mitigation Area. The spring monitoring events consisted of one site inspection to evaluate erosion and vegetation establishment, and two photo documentation events performed in the first and second quarter of 2014 (as required by Condition 15.f of the WQC). The first quarter photo-documentation was performed on March 27, 2014 and the second quarter photo-documentation was performed on June 3, 2014. The spring vegetation and erosion assessments were performed concurrently with the photo-documentation effort on June 3, 2014. The field activities and results of these activities are described in Sections 3 and 4.

## 2. 2013 FALL BASELINE VEGETATION CHARACTERIZATION

Prior to implementation of the wetland enhancement activities, and as required by Condition 15 of the WQC, a baseline vegetation characterization was performed in the RAM Mitigation Area by an ARCADIS wetland scientist on September 30, 2013. Its purpose was to characterize existing vegetation and to photo-document pre-disturbance conditions to provide a baseline supporting subsequent evaluations. As part of this effort, locations were selected in adjacent, undisturbed wetlands for the identification of reference vegetation community metrics.

The results of the baseline vegetation characterization efforts in the RAM Mitigation Area and the selected reference wetland areas are summarized in the following sub-sections. Photographs of these areas taken on the day of the field inspection are presented in Attachment A. The locations and directions of the photographs are indicated on Figure 1. Tables 1 and 2 summarize the baseline vegetation data collected in the field.

### 2.1 RAM Mitigation Areas Vegetation Characterization

Prior to the baseline vegetation monitoring event, the majority of the RAM Mitigation Area had been mowed by the City of Revere as part of their routine management program to reduce the fire hazard associated with the dry stalks of *Phragmites*, which dominated the site. Due to the dominance of *Phragmites* and the recent mowing of the area that limited vegetation identification, quantitative baseline vegetative data could not be collected from the RAM Mitigation Area. Therefore, a qualitative meander survey was performed to define the extent of *Phragmites* domination from the post-mowing plant remnants, to determine if any other significant plant communities were present on the site, and to identify

other plant species that existed on the site that could populate the RAM Mitigation Area following the mitigation activities.

Plants identified during the meander survey were recorded and photographs of the existing conditions were taken for documentation purposes (Attachment A). The vegetation data was used to establish the baseline vegetative characteristics of the area to compare the developing vegetation of the restored wetland during subsequent monitoring events.

During the baseline data collection effort, the dominance of *Phragmites* was determined from the number of remnant plant stalks and a significantly smaller remnant stand of *Typha latifolia* (Broad-leaf Cattail) was observed in the northern portion of the RAM Mitigation Area (Figure 1). Undisturbed vegetation was present and identifiable in areas adjacent to the RAM Mitigation Area on the west side of the fence along the western border, along the road to the east, along the banks of Diamond Creek, and in the vicinity of a billboard along the eastern boundary where the mower could not access. Vegetation identified in these areas was assumed to include most of the species present in the RAM Mitigation Area prior to the mowing, but likely exhibited a higher diversity of vegetation as these areas occurred on the edge of the *Phragmites*-dominated plant community. Edge communities are often higher in diversity than the center of a plant community due to the edges containing a mix of environmental conditions of both adjacent plant communities. A list of plant species observed in these edge areas is presented in Table 1. As shown, a total of 45 plant species were observed in undisturbed upland areas, consisting of trees, shrubs, forbs, ferns, and grasses (Table 1). *Phragmites* was identified as the dominant species in the RAM Mitigation Area, providing an estimated 90 percent of the ground cover in the surveyed area.

## 2.2 Reference Wetland Vegetation Characterization

The plant communities of existing wetlands at lower ground elevations in the vicinity RAM Mitigation Area were characterized to establish the reference condition for tidal wetlands in the project area. Although establishment of the reference condition is not a goal of the restoration effort, the data are useful in identifying target plant communities that are expected to develop in the restored wetland over the long term.

Four reference wetland areas located south and west of the RAM Mitigation Area were selected for vegetation characterization (Figure 1). Three of the reference wetland locations were established downstream (west) of the tide gate on Diamond Creek, and one location was established in Diamond Creek upstream (east) of the tide gate. The extents of vegetative communities in Diamond Creek reference areas were primarily defined by elevation, with discrete plant communities associated with various elevations above the channel bed.

Vegetation characterization efforts in the reference wetland areas were performed by establishing transects from the bank of Diamond Creek into the adjacent tidal flats. Transects were established

perpendicular to the creek from the top of the bank to the highest adjacent ground elevation in the tidal flat to characterize the plant communities associated with varying ground elevations above the channel bed. Quadrats of 1-square meter in size were established along each transect in discrete plant communities that corresponded to varying ground elevations. Data collected from each quadrat consisted of the total percent ground cover, the percent cover by each species present in the plot, and percent cover by invasive weeds. In addition, the total number of individual plant stems was counted in subsets of the quadrat to provide a baseline estimate of plant density (number of stems per unit area).

In the data collection points west of the tide gate, nearly monotypic plant communities occurred in two to three zones from the top of the bank to the highest tidal flat elevation. The zone at the top of the bank was dominated by *Spartina alterniflora*, which extended between 16 inches and 44 inches in elevation above the top of bank, depending on data collection location. Above the *S. alterniflora*, the tidal flat vegetation abruptly changed in a second vegetative zone to *Distichlis spicata* (Saltgrass). *Phragmites* dominated a third zone of vegetation in Reference Location 3, which is located west of the tide gate on the south bank of Diamond Creek. The *Phragmites* community began at a ground elevation 38-inches above the top of bank and extended throughout the adjacent higher ground elevations. The reference location east of the tide gate on Diamond Creek exhibited vegetation that transitioned directly from *S. alterniflora* to *Phragmites* at ground height higher than 26 inches above the channel bed. Diamond Creek exhibited nearly vertical banks that did not support vegetation until the top of the bank.

The vegetation data collected from the reference transects are summarized in Table 2. Table 2 also presents the observed stem density of the different plant species present in the reference area plots. As shown, stem densities for *S. alterniflora* ranged from 17 to 23 stems/ft$^2$; stem densities for *D. spicata* ranged from 400 to 582 stems/ft$^2$; and stem densities for *Phragmites* ranged from 8 to 19 stems/ft$^2$.

## 3. 2014 SPRING MONITORING METHODOLOGIES

Condition 15.f of the WQC requires that photographs be taken quarterly from permanently established photo locations to assist in the documentation of restored wetland conditions and development throughout the growing season and over the 5-year monitoring period. The first quarter photo-documentation event was performed on March 27, 2014. During this event, fixed-point photo locations were staked in the field and surveyed with a hand-held GPS instrument to enable consistent photographs over time from the same locations. Photographs of the developing wetlands were taken in multiple directions from each photograph point and directions were recorded for replication during future monitoring events.

The second quarter photo-documentation event, erosion assessment, and the spring vegetation monitoring event were performed concurrently by two ARCADIS biologists on June 3, 2014. The purposes of this event were to inspect the site for signs of erosion or bank instability, assess the status of developing vegetation in the restoration areas, and to photo-document existing conditions. As part of the inspection, the entire RAM Mitigation Area was walked and observations of significant soil erosion or bank

instability were noted and documented. To assess vegetation status, a meander survey was performed throughout the RAM Mitigation Area to identify the vegetative species developing on the site and the presence and limits of significant stands of invasive weeds. The spatial limits of significant stands of vegetation were surveyed with a hand-held GPS to document their locations and for future evaluations of their response to changing site conditions over time. Plants identified during the survey were recorded and photographs of the current conditions were taken from the fixed photo points for documentation purposes. These vegetation data will be used to evaluate the development of vegetation in the restored wetland during future monitoring activities.

## 4. 2014 SPRING MONITORING RESULTS

The following sections summarize the results of the quarterly photo-documentation events and spring vegetation monitoring in the RAM Mitigation Area.

### 4.1 Quarterly Photo-Documentation Events

The first and second quarter photo-documentation events were performed on March 27, 2014, and the second event was performed on June 4, 2014 in conjunction with the spring vegetation monitoring event. Photographs taken from the two photo events from the same location and in the same direction are presented side by side in Attachment B. The fixed photo locations and directions of the photographs are indicated on Figure 2. A comparison of the conditions photographed during the two monitoring events shows little change in the vegetation from the first quarter to the second quarter and indicates an overall lack of vegetation has established in the RAM Mitigation Area. The majority of the vegetation currently on the site is present along the margins of Diamond Creek, where minimal soil disturbance occurred. The RAM Mitigation Area is dominated by exposed muds that contain the remnants of *Phragmites* shoots and roots. Photos from the same locations during future monitoring events will provide an indication of the rate of vegetation establishment on the site over time.

### 4.2 Spring Vegetation Monitoring

The vegetation assessment was performed near the end of the outgoing tide to enable safe access and observation of soil conditions and vegetation establishment. Soils were saturated to the surface during the inspection and residual surface water was observed to be draining into the feeder canals. Very little vegetation had established in the RAM Mitigation Area by the time of the spring monitoring inspection. Numerous remnants of *Phragmites* were observed throughout the RAM Mitigation Area. These remnant roots and rhizomes did not appear to be alive and, with very few exceptions, were not supporting new growth. It should be noted that undisturbed areas adjacent to the RAM Mitigation Area (but not part of the RAM Mitigation project) were supporting high percentages of ground cover. Although the majority of the adjacent areas were uplands, the presence of well-developed vegetation in these areas indicates that the growing season is far enough along for vegetation to become established. *Phragmites* observed in areas

adjacent to the RAM Mitigation Area were green and approximately 6-ft in height, indicating that if the *Phragmites* remnants within the RAM Mitigation Area were alive, they would have sprouted by the time of the inspection.

A few live individual *Phragmites* plants were observed scattered throughout the restoration area. Live *Phragmites* were also observed up to and above the top of the north bank of Diamond Creek at the south end of the RAM Mitigation Area. The lower creek banks also supported *Spartina* sp. closest to the low water elevation. The new *Spartina* growth of approximately 6-inches in height had not developed adequately to enable identification to species, but was estimated to be providing approximately 20% cover on the lower banks. *Phragmites* observed on the upper banks of Diamond Creek provided a visually-estimated cover of approximately 40% and similar cover was observed in two narrow bands along and beyond the top of the bank (See June photos in Attachment B on Figures B-31, B-34, B-35, B-36, B-38, and B-39). The limits of the *Phragmites* in these two areas were defined using GPS and are presented on Figure 2. The total area of Phragmites cover in these two delineated *Phragmites* areas was approximately 6,000 square feet, which represents approximately 2% of the RAM Mitigation Area.

Due to the lack of vegetation present in the RAM Mitigation Area, comparison of vegetation community characteristics to baseline vegetation data or reference area data was not performed. The evaluation of the vegetation status later in the growing season (August) may result in the opportunity to collect vegetation data that can be used for more meaningful comparisons to baseline and reference data.

## 5. CONCLUSIONS

The RAM Mitigation Area has not yet developed any significant vegetative communities, except along the north bank of Diamond Creek, where *Phragmites* and *Spartina* were observed. The presence of vegetation only at these bank locations likely reflects the minimal amount of disturbance to those banks during the RAM Mitigation project. Provided that tide gate operations result in sufficient salinity levels within the RAM Mitigation Area, *Phragmites* growth is expected to be eliminated over time as it cannot tolerate salinities above approximately 18 parts per thousand (URI, 2014).

The absence of vegetation in the majority of the RAM Mitigation Area could be the result of several conditions. The newly exposed soils may require more time for the existing seed bank to begin germinating and the amount of vegetation on the site will increase later in the growing season and in subsequent years. Alternatively, there may not be a viable wetland seed bank in the newly exposed soils due to its long-term existence as upland habitat prior to ground excavation. If a viable wetland seed source is not present in the newly exposed soils, the establishment of vegetation in the RAM Mitigation Area will need to rely on airborne and waterborne sources of seeds that become distributed across the site and germinate in their preferred soil, sunlight, and hydrology conditions. Monitoring the RAM Mitigation Area over time will assist in the evaluation of whether the site will naturally develop desired vegetation over time.

Future monitoring events to occur in 2014 include the following:

- Third quarter photo-documentation to be performed in August 2014.
- Summer quantitative vegetation assessment to be performed in August 2014.
- Submittal of the second monitoring summary report within 30 days of completing the August 2014 vegetation assessment event.
- Fourth quarter photo-documentation to be performed in October 2014 (with photos to be submitted with the spring 2015 monitoring report).

## REFERENCES

Massachusetts Department of Environmental Protection (MassDEP). 2013. Section 401 Water Quality Certification. June 4, 2013.

University of Rhode Island (URI). 2014. Common Reed (*Phragmites australis*) Control Fact Sheet. URI CELS Outreach Center. http://www.uri.edu/cels/ceoc/documents/commonReed.pdf

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**Tables**

**Table 1. RAM Mitigation Area Baseline Vegetation Meander Survey Summary**

**Oak Island Salt Marsh Restoration**
**KHB Venture, LLC Revere, Massachusetts**

| Scientific Name | Common Name |
|---|---|
| **Trees** | |
| *Acer negundo* | Box elder |
| *Acer platanoides* | Norway maple |
| *Betula sp.* | Birch |
| *Malus sp.* | Apple |
| *Prunus virginiana* | Chokecherry |
| *Rhamnus cathartica* | European buckthorn |
| *Rhus typhina* | Staghorn sumac |
| *Ulmus americana* | American elm |
| **Shrubs** | |
| *Rosa multiflora* | Multiflora rose |
| *Rubus allegheniensis* | Blackberry |
| *Sambucus canadensis* | Elderberry |
| **Forbs** | |
| *Ambrosia artemisiifolia* | Common ragweed |
| *Artemisia vulgaris* | Mugwort |
| *Asclepias syriaca* | Common milkweed |
| *Cirsium vulgare* | Bull thistle |
| *Impatiens capensis* | Spotted jewelweed |
| *Lactuca biennis* | Tall blue lettuce |
| *Linaria vulgaris* | Butter-and-eggs |
| *Phytolacca americana* | Pokeweed |
| *Polygonum pennsylvanicum* | Pennsylvania smartweed |
| *Symphyotrichum ericoides* | White aster |
| *Symphyotrichum lateriflorum* | Small white aster |
| *Symphyotrichum novae-angliae* | New England aster |
| *Symphyotrichum sp.* | Aster |
| *Rubus flagellaris* | Northern dewberry |
| *Rumex crispus* | Curled dock |
| *Securigera varia* | Crown vetch |
| *Solanum dulcamara* | Bittersweet nightshade |
| *Solidago altissima* | Tall goldenrod |
| *Verbena hastata* | Blue vervain |
| **Ferns** | |
| *Onoclea sensibilis* | Sensitive fern |
| *Osmunda cinnamomea* | Cinnamon fern |
| **Grasses** | |
| *Cyperus sp.* | Nut sedge |
| *Panicum sp.* | Panic grass |
| Poaceae | Unknown grasses |
| *Spartina alterniflora* | Smooth cordgrass |
| *Spartina patens* | Saltmeadow cordgrass |
| *Typha latifolia* * | Broad-leaf cattail |
| **Vines** | |
| *Calystegia sepium* | Hedge bindweed |
| *Echinocystis lobata* | Wild cucumber |
| *Parthenocissus quinquefolia* | Virginia creeper |
| *Toxicodendron radicans* | Poison ivy |
| **Invasive Weeds** | |
| *Lythrum salicaria* | Purple loosestrife |
| *Phragmites australis* * | Common reed |
| *Polygonum cuspidatum* | Japanese knotweed |

* Denotes dominant species of the plant community.

**Table 2. Baseline Reference Wetland Area Vegetation Data Summary**

**Oak Island Salt Marsh Restoration**
**KHB Venture, LLC Revere, Massachusetts**

| Reference Wetland Area | Location | Bank Height (in) | Vegetation Zone 1 | | | | | Vegetation Zone 2 | | | | | Vegetation Zone 3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Elevation Range (in) | Dominant Species | Percent Cover | Stem Density (No./ft$^2$) | Width (in) | Elevation Range (in) | Dominant Species | Percent Cover | Stem Density (No./ft$^2$) | Width (in) | Elevation Range (in) | Dominant Species | Percent Cover | Stem Density (No/ft$^2$) | Width (in) |
| 1 | 150' N of Tide Gate | 38 | 38-82 | *S. alterniflora* | *100* | 18 | 56 | 82--91 | *D. spicata* | *100* | 400 | >360 | NA | NA | NA | NA | NA |
| 2 | 350' N of Tide Gate | 38 | 38-58 | *S. alterniflora* | *100* | 17 | ND | 58-66 | *D. spicata* | *100* | 582 | ND | NA | NA | NA | NA | NA |
| 3 | S bank at Tide Gate | 20 | 20-42 | *S. alterniflora* | *100* | 20 | 72 | 42-58 | *D. spicata* | *100* | ND | 202 | >58 | *P. australis* | *100* | 19 | >360 |
| 4 | N bank E of Tide Gate | 26 | 0-26 | *S. alterniflora* | *100* | 23 | 32 | >26 | *P. australis* | *100* | 8 | >360 | NA | NA | NA | NA | NA |

NA - Not Applicable
ND - Not Determined

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**Figures**


**Legend:**

- (1) Reference Wetland Area Identification No.
- Approximate RAM Mitigation Area Boundary
- (1) Photo Location and Identification No.
- Photo Orientation

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS

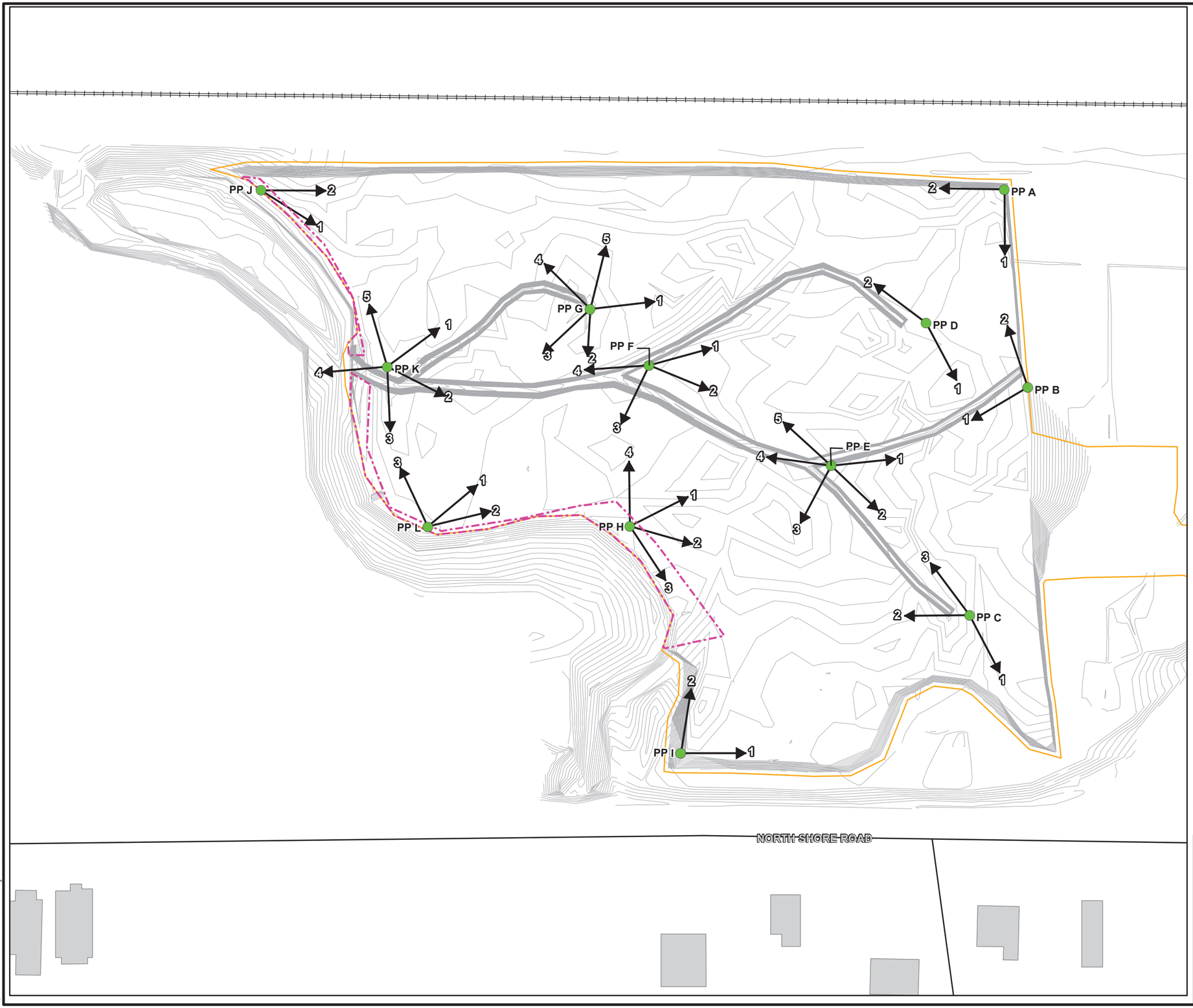
**BASELINE VEGETATION CHARACTERIZATION**

# SITE PLAN

ARCADIS

FIGURE
1

DRAFT




LEGEND:

- PERMANENT PHOTO LOCATION
- PHOTO DIRECTION
- LIMITS OF OBSERVED PHRAGMITES STANDS
- SITE BOUNDARY
- CONTOUR
- ROAD
- RAILROAD
- BUILDING

0 75 150 Feet

GRAPHIC SCALE

NOTES:

1. CONTOUR DATA OBTAINED FROM AS-BUILT SURVEY PREPARED BY WELCH ASSOCIATES LAND SURVEYORS, INC (JANAUARY 2014).
2. ROAD, RAILROAD AND BUILDING FEATURES OBTAINED FROM THE OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS) AT: http://www.mass.gov

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS

**SPRING 2014 VEGETATION MONITORING REPORT**

# SITE PLAN WITH PHOTO LOCATIONS AND IDENTIFIED WEED AREAS

ARCADIS

FIGURE 2

City:SYR Div/Group: SWG Created By: J.RAPP Last Saved By: jrapp
Beazer Revere,MA (B0038878.0000.00044)
Q:\Beazer\RevereMA\PhotoSurvey\mxd\PhotoLocations.mxd 6/13/2014 3:19:14 PM

ARCADIS

**Attachment A**

Fall 2013 Baseline Vegetation Characterization Photolog

1

**Photo #1: West fenceline of RAM Mitigation Area looking south from near northwest corner.**

2

**Photo #2: RAM Mitigation Area looking southwest from northeast corner.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-1**

[File]

3

**Photo #3: RAM Mitigation Area looking east from western boundary.**


4

**Photo #4: South end of RAM Mitigation Area along Diamond Creek, looking east.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-2**

[File]

5

**Photo #5: RAM Mitigation Area looking north from southern boundary.**


6

**Photo #6: Diamond Creek at south end of RAM Mitigation Area, looking northeast.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-3**

[File]


7

**Photo #7: Unmowed billboard area on east side of RAM Mitigation Area, looking northeast.**

8

**Photo #8: Unmowed area on east side of RAM Mitigation Area, looking east.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-4**

[File]

9

**Photo #9: Reference Wetland Area 1, looking northwest.**

10

**Photo #10: Reference Wetland Area 1, looking east.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-5**

[File]


11

**Photo #11: Reference Wetland Area 2, looking northwest.**


12

**Photo #12: Reference Wetland Area 2, looking northeast.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

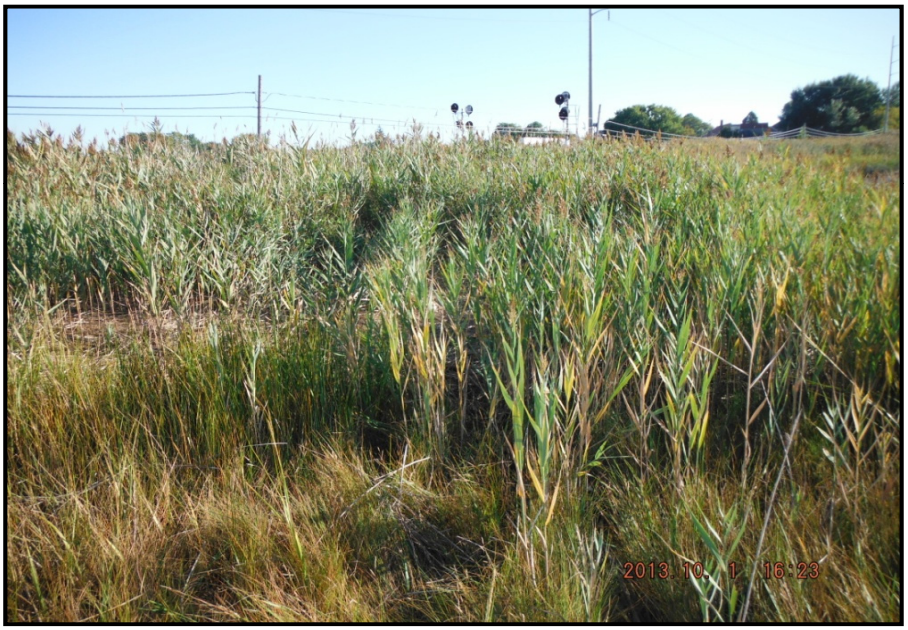
ARCADIS

ATTACHMENT
**A-6**

[File]


13

**Photo #13: Reference Wetland Area 3, looking north.**




14

**Photo #14: Reference Wetland Area 3, looking south.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-7**

[File]


15

**Photo #15: Reference Wetland Area 4, looking northeast.**

16

**Photo #16: Reference Wetland Area 4, looking east.**

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
BASELINE VEGETATION CHARACTERIZATION

## SITE PHOTOGRAPHS

ARCADIS

ATTACHMENT
**A-8**

[File]

ARCADIS

**Attachment B**

Spring 2014 1st and 2nd Quarterly Photo-Documentation Events Photolog

Photo A-1, Looking East - March 2014.


Photo A-1, Looking East - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-1**

Photo A-2, Looking Southwest - March 2014.


Photo A-2, Looking Southwest - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-2**

Photo B-1, Looking South - March 2014.


Photo B-1, Looking South - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-3**

Photo B-2, Looking Northwest - March 2014.

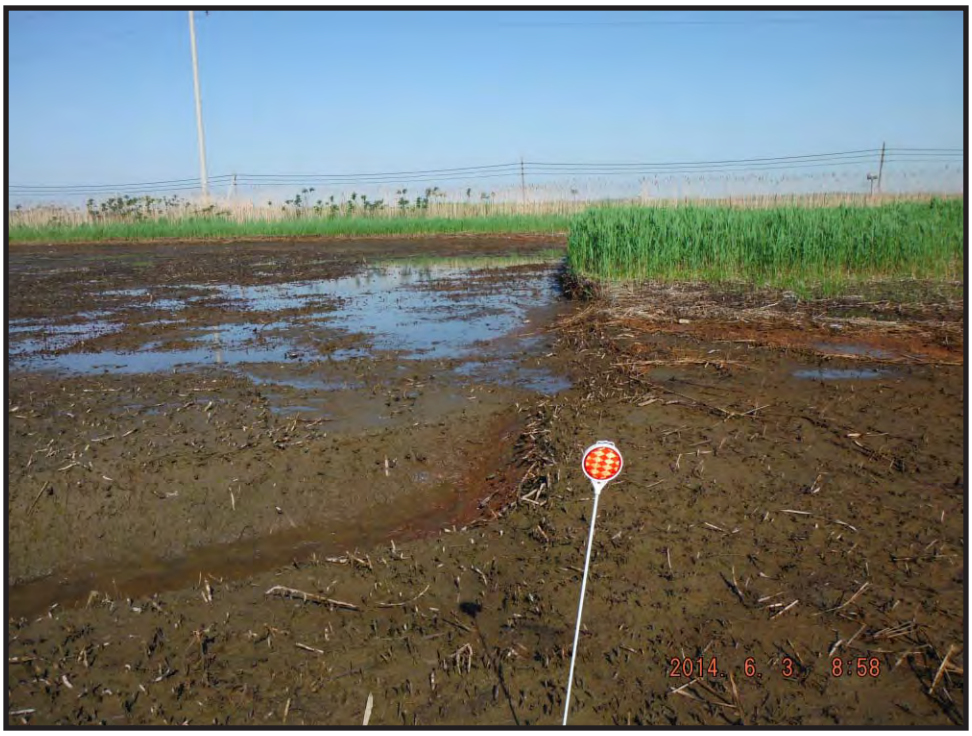



Photo B-2, Looking Northwest - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-4**

Photo C-1, Looking East - March 2014.


Photo C-1, Looking East - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-5**

Photo C-2, Looking Southwest - March 2014.


Photo C-2, Looking Southwest - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-6**

Photo C-3, Looking West - March 2014.


Photo C-3, Looking West - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-7**

Photo D-1, Looking East - March 2014.


Photo D-1, Looking East - June 2014.

FCTPF OAK ISLAND SALT MARSH RESTORATION
REVERE, MASSACHUSETTS
**SPRING 2014 VEGETATION MONITORING REPORT**

## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-8**

Photo D-2, Looking West - March 2014.


Photo D-2, Looking West - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-9**

Photo E-1, Looking North - March 2014.


Photo E-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-10**

Photo E-2, Looking East - March 2014.


Photo E-2, Looking East - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-11**

Photo E-3, Looking South - March 2014.


Photo E-3, Looking South - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-12**

Photo E-4, Looking Southwest - March 2014.


Photo E-4, Looking Southwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-13**

Photo E-5, Looking West/Southwest - March 2014.


Photo E-5, Looking West/Southwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-14**

Photo F-1, Looking North - March 2014.


Photo F-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-15**

Photo F-2, Looking Northeast - March 2014.


Photo F-2, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-16**

Photo F-3, Looking South - March 2014.


Photo F-3, Looking South - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-17**

Photo F-4, Looking Southwest - March 2014.


Photo F-4, Looking Southwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-18**

Photo G-1, Looking North - March 2014.


Photo G-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-19**

Photo G-2, Looking East - March 2014.


Photo G-2, Looking East - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-20**

Photo G-3, Looking South - March 2014.


Photo G-3, Looking South - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-21**

Photo G-4, Looking Southwest - March 2014.


Photo G-4, Looking Southwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-22**

Photo G-5, Looking Northwest - March 2014.


Photo G-5, Looking Northwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-23**

Photo H-1, Looking North - March 2014.


Photo H-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-24**

Photo H-2, Looking Northeast - March 2014.


Photo H-2, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-25**

Photo H-3, Looking East - March 2014.


Photo H-3, Looking East - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-26**

Photo H-4, Looking Northwest - March 2014.


Photo H-4, Looking Northwest - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-27**

Photo I-1, Looking Northeast - March 2014.


Photo I-1, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-28**

Photo I-2, Looking West - March 2014.


Photo I-2, Looking West - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-29**

Photo J-1, Looking Northeast - March 2014.


Photo J-1, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-30**

Photo J-2, Looking East - March 2014.


Photo J-2, Looking East - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-31**

Photo K-1, Looking North - March 2014.


Photo K-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-32**

Photo K-2, Looking Northeast - March 2014.


Photo K-2, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-33**

Photo K-3, Looking Southeast - March 2014.


Photo K-3, Looking Southeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-34**

Photo K-4, Looking South - March 2014.


Photo K-4, Looking South - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-35**


Photo K-5, Looking West - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-36**

Photo L-1, Looking North - March 2014.


Photo L-1, Looking North - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-37**

Photo L-2, Looking Northeast - March 2014.


Photo L-2, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-38**

Photo L-3, Looking West - March 2014.


Photo L-3, Looking West - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-39**

Photo Railroad Culvert 1, Looking Northeast - March 2014.


Photo Railroad Culvert 1, Looking Northeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-40**

Photo Railroad Culvert 2, Looking Southeast - March 2014.


Photo Railroad Culvert 2, Looking Southeast - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-41**

Photo Railroad Culvert 3, Looking South - March 2014.


Photo Railroad Culvert 3, Looking South - June 2014.

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## SITE PHOTOGRAPHS

ARCADIS

FIGURE
**B-42**