US Army Corps
of Engineers®
New England District

2006 ANNUAL REPORT

WETLAND & UPLAND HABITAT RESTORATION AND LONG TERM ADAPTIVE MONITORING AND MAINTENANCE PROGRAM

AREA OF CONTAMINATION (AOC) 57

DEVENS, MASSACHUSETTS

July 2007

PREPARED BY:

DEPARTMENT OF ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
ENVIRONMENTAL RESOURCES SECTION
CONCORD, MASSACHUSETTS 01742

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2006 ANNUAL REPORT

AREA OF CONTAMINATION (AOC) 57

WETLAND & UPLAND HABITAT RESTORATION AND LONG TERM ADAPTIVE MONITORING AND MAINTENANCE PROGRAM

1.0 OBJECTIVES

The objectives of the Area of Contamination (AOC) 57 Wetlands and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Plan (i.e. the Habitat LTMP) are to evaluate the restoration measures implemented in AOC 57 - Areas 2 and 3 during the first three or more growing seasons after site remediation and restoration activities to ensure success and to identify and implement needed corrective actions based on the periodic monitoring (USACE 2007a). The Record of Decision (ROD) requires monitoring for a period of five years after wetland restoration. The locations of the two restoration sites are provided in Figure 1. The remediation and restoration were completed in October 2003 in accordance with the January 2002 Work Plan (Conti 2002) and 2003 Work Plan Amendment for Additional Soil Removal (Conti 2003), as reported in the Final Interim Remedial Action Completion Report (Conti 2004). Consequently the long term monitoring began in 2004 with annual monitoring inspections scheduled twice a year in the Late Spring/Early Summer and Late Summer/Early Fall time frames. The Habitat LTMP summarized the restoration approach and construction measures for the restoration of impacted wetland/upland habitat, provided the subsequent long term adaptive monitoring and maintenance plan approach that was developed concurrently during implementation of the 2004 program, and defined the relevant performance standards to evaluate the implemented restoration measures. Results of the 2005 and 2004 program are summarized in the first and second annual habitat long term monitoring plan program reports (USACE 2007b, c).

As the third annual habitat long term monitoring and maintenance program report, this report summarizes the results of our 2006 periodic monitoring field observations of restored wetland/upland habitat relative to the performance standards with recommendations, if any, for future corrective actions. A copy of the field data/inspection report for each site visit to Areas 2 and 3 is provided in Appendix A with representative photographs provided in Appendix B.

This report also includes conclusions and recommendations for the termination or continuation of the long term monitoring at Areas 2 and 3 based on the monitoring results described herein after three complete growing seasons (i.e. 2006 Annual Report).

2.0 AOC 57 AREAS 2 AND 3

2.1 Area 2: The wetland boundary, 2002 and 2003 final soil removal excavation limits, and the limit of wetland restoration are shown in Figure 2. Details of the restoration approach and construction measures for the restoration of impacted wetland and upland habitat are provided in the Habitat LTMP (USACE 2007a). Approximately 1,744 square feet of wetlands was restored at Area 2 as shown in Figure 3.

2.2 Area 3: The wetland boundary, planned/final excavation limit and approximate limit of site restoration are shown in Figure 2. Details of the restoration approach and construction measures for the restoration of impacted upland habitat are provided in the Habitat LTMP (USACE 2007a). Since cleanup objectives were attained within the planned/final excavation limits, no wetland resource areas were disturbed during remediation of Area 3. The silt fence and hay bales installed immediately downgradient at the edge of the planned/final excavation limit and approximate limit of site restoration may have intruded slightly into the wetland. Since removal of the silt fence may have disturbed the edge of the Area 3 wetland, this wetland edge was monitored as part of the Habitat LTMP.

3.0 MONITORING PLAN PEFORMANCE STANDARDS & CONTROL OF INVASIVE/EXOTIC PLANTS

This section provides the relevant performance standards for evaluation of the wetland and upland habitats and the protocol of controlling invasive/exotic plants as discussed in the Habitat LTMP (USACE 2007a).

3.1 Long Term Adaptive Monitoring Plan Performance Standards

The objectives of the Devens AOC57 Habitat Long Term Adaptive Monitoring and Maintenance Program are:

1. Measurement of the success of the restoration relative to attainment of the Performance Standards in the restored areas to identify and implement needed corrective actions; and

2. Monitoring of the invasive/exotic weeds. The three primary species of concern are purple loosestrife (*Lythrum salicaria)*, common reed *(Phragmites australis)* and Japanese knotweed (*Polygonum cuspidatum*) in the restored wetland and upland areas (Somers et al. 2006). If present the exotics will be removed by approved methods described below.

The Performance Standards for AOC 57, consistent with those established in the Devens Consolidated Landfill (DCL) Wetland and Upland Habitat Restoration Plan (WUHRP) (Stone & Webster 2002), for wetland areas are:

1. Seeded areas for wetlands shall have an average 75% perennial native obligate/facultative vegetative cover; and
2. Contain no non-vegetated (bare) areas more than 250 square feet.

Performance standards were also established in the WUHRP for uplands. They were based on whether they were considered level or steep slope uplands. The difference between these standards is the single criterion of slope stability.

The standards for level uplands are:

1. Seeded areas shall have an average of 75% perennial native vegetative cover; and
2. Contain no non-vegetated (bare) areas more than 500 square feet.

The standards for steep slope uplands are:

1. Shall be stabilized slope with 75% perennial native vegetative cover; and
2. Contain no non-vegetated bare areas more than 500 square feet.

However, due to the relatively small overall size of the two AOC57 restored sites in comparison to the larger DCL restored sites, the second performance standard will not be used as a measure of success.

The entire restored wetland, upland and ecotone transition areas are systematically observed via the meandering survey methodology coupled with the concept of adaptive monitoring. The meandering survey involves the members of the USACE Habitat Team, usually 2-3 individuals, traverse the restored area several times observing and recording the vegetation within about 10 feet of either side of their path. Species are noted and identified according to their wetland status. This observational data is compared relative to the above applicable listed Performance Standards. Wetland status is assigned according to Cowardin's classification (Cowardin et al. 1969).

3.2 Control of Invasive/Exotic Plants

The second objective the adaptive monitoring program is to check for the appearance of the three targeted invasive species: 1) purple loosestrife; 2) common reed (*Phragmites*); and 3) Japanese knotweed (Somers et al. 2006). If these varieties of invasive plants were observed (or other invasive plant species discovered), they were removed from the site. The protocol for invasive/exotic plant removal follows.

1. Purple loosestrife is pulled from the ground and if the plant was not in flower or in seed, it is left onsite. If the plant is in flower or seed, it will be pulled, bagged and removed from the site. It is virtually impossible to eradicate purple loosestrife once it is established.

2. *Phragmites* is treated in July-August, later in the growing season, with 25% Rodeo by a licensed MA applicator. Each plant is cut a few inches from the ground between two nodes and 25% Rodeo is injected in the hollow stem. The superior segment of the stem is bagged and disposed in a dumpster offsite. The portion of the site where the *Phragmites* was removed is flagged for future

examination to be certain there was no re-growth. Numbers of plants treated and removed are recorded to maintain qualitative/quantitative information to monitor and document the success of the eradication.

3. Depending on the area of the Japanese knotweed growth, the plants are either cut a few inches from the ground and a mist of 25% Rodeo applied if there is a large plot of plants or 25% Rodeo is injected into the hollow stem if there are only a few plants. As with *Phragmites*, Rodeo is applied by a licensed MA applicator with the proper protective procedures. If the Japanese knotweed is in flower or seed the upper portion of the plant is bagged and removed from the site. Since Japanese knotweed growth habits differ from *Phragmites*, individual shoots are not counted but relative size of the patch is noted to monitor effectiveness of the herbicide treatment. The site of the infestation is flagged and checked during the periodic monitoring to ascertain the removal was successful.

4.0 2006 MONITORING PROGRAM RESULTS AND RECOMMENDATIONS

This section provides an overall annual summary based on several monitoring field inspections conducted by the USACE Habitat Team during the third monitoring year in 2006 in the Late Spring/Early Summer and Late Summer/Early Fall general time frames following the remediation and wetland restoration at Areas 2 and 3 within Area of Concern (AOC) 57. Field inspections in 2006 were conducted at both Areas 2 and 3 on August 28, 2006 and November 14, 2006. Invasive/exotic control measures were performed at Area 2 on September 18 & 25, 2006 and at Area 3 on September 25, 2006.

A brief description of each of the primary sites, an evaluation of the wetland and adjacent upland relative to meeting performance standards, and recommendations for specific management activities such as exotic plant control and site-specific problems are provided. A copy of the field data/inspection report for each 2006 site visit is included in Appendix A along with the 2005 and 2004 field notes. Representative photographs of Areas 2 and 3 from the 2006 inspections are provided in Attachment B along with the 2005 and 2004 photographs.

4.1 AOC57-Area 2

4.1.1 Performance Standards

Summary: Area 2 consists of a restored upland portion that slopes downward to the restored wetland portion. Both the restored upland and wetland portions of Area 2 attain the respective performance standards. Area 2 is on the south facing slope of a long ridge that borders a large wetland to the south that is part of the Lower Cold Spring Brook watershed.

Upland Portion: Based on the results of the 2006 inspections (as in the 2005 and 2004 inspections), the upland portion met the Performance Standards. The majority of the thirty-four white and/or red oaks planted on the upland slope along with the seven red

maples at the base of the slope where the upland grades into the wetland continue to survive. The dominant ground cover continues to be grass/herbs either present in the original conservation mix or recruited colonizers. These are dominated by tick trefoil, day-flower, rabbit-foot clover, round headed bush clover, golden rod, vetch and sweet fern. The big change on the upland slope is the appearance in numbers and size of a shrub layer to the perennial cover that is starting to become established. Grey birch and especially autumn olive seedlings (an invasive shrub) have become prominent, with the latter often challenging the planted oaks for size.

None of the three exotic/invasive plant species of concern were observed on the upland portion of Area 2. However, the dramatic appearance of the invasive shrub, autumn olive *(Elaeagnus umbellata)*, as a rapid colonizer from the existing adjacent non-forested upland areas has resulted in competiton with the planted oak community and other native species. Autumn olive grows in full sun and does not do well in dense forest environments as it thrives in a variety of soil and moisture conditions and invades open woodlands, filed, grasslands, and disturbed habitats (Somers et al. 2006) A few black locust *(Robinia pseudoacacia)* saplings, an invasive tree that grows in full sun to partial shade, but is intolerant of dense shade, were also observed. Consequently the autumn olive seedlings and saplings were eradicated by cutting at ground level and herbicide (25% Rodeo with Side-kick) was rubbed on the remaining stump surface. A total of 327 autumn olive seedlings/saplings were treated: 200 on September 18, 2006 and 127 on September 25, 2006 along with a few black locust saplings.

As discussed in the 2005 Annual Report, MassDevelopment implemented several corrective measures during 2005 that appear to have mitigated the problems associated with their failed upgradient erosion and sedimentation control measures (i.e. use of Flitrexx SiltSoxx, an erosion control tube that functions as a silt fence alternative). These corrective measures were checked on November 1, 2005 after a period of heavy rains and were observed to be functioning properly.

Because of concerns due to the continued runoff and erosion from the large temporary soil stockpiles piles in the upland immediate north of restoration Area 2, a coir fascia silt barrier and berm formed from the soil fill constructed in 2005 was further enhanced in 2006 by MassDevelopment to ensure that these temporary measures prevent any additional erosion and silt deposition into the restored upland/wetland areas. During several of our inspections in 2006 we observed a large pool of water from the runoff retained behind the berm, however, no additional erosion and sedimentation onto the upland portion of Area 2 was ever observed, and therefore these measures were adequately protecting Area 2.

Wetland Portion: Based on the results of the 2006 inspections (as in the 2005 and 2004 inspections), the wetland portion exceeded the Performance Standards.

There seemed to be greater wet meadow community at the base of the slope during 2006, indicative of the possible seasonal increase in prevailing hydrology or perhaps a longer term trend in the level of the groundwater and/or surface water. Boneset, sensitive fern,

jewel weed, umbrella sedge, soft rush, tussock sedge, cinnamon fern and cattails were present in various areas depending on prevailing hydric conditions. As a part of the original restoration, red maple, alder and silky dogwood seedlings were planted at the base of the slope. Since the onset of our site inspections, silky dogwood, willow, red maple and alder seedling colonizers have appeared at the base of the slope, an indication that more of this wetland could become shrub/shrub community.

There were several areas of standing water throughout the more south facing areas of the wetland. No additional silt deposition on the wetland pool bottom was observed during 2006. Iron bacteria were present on the surface of standing water at the base of the slope creating an iridescent sheen with red ferric oxide floc present on the bottom of some of the pools.

Inspections in 2004 and 2005 detected *Phragmites* which were subsequently flagged and treated. No *Phragmites* was observed during 2006. Purple loosestrife was abundant and several plants directly encountered were pulled within the restored portion. The adjacent wetlands are covered with purple loosestrife and are thus a continuing source to Area 2. It is virtually impossible to eradicate purple loosestrife once established so our objective during the program is to keep it under control by hand removal when directly encountered.

4.1.2 Conclusions and Recommendations

Based on three years of long term adaptive monitoring and maintenance in accordance with the Habitat LTMP (USACE 2007a), both the upland and wetland portions of Area 2 met performance standards at the end of three growing seasons. Consequently we recommend that the Habitat LTMP Program be terminated.

However, to protect our investment of resources to date in a cost-effective manner, we recommend that limited maintenance activities be conducted during one field visit to Area 2 on one day in August-early September 2007 to: 1) confirm that the MassDevelopment eroison and sedimentation contol measures continue to function adequately; 2) continue eradication of the wetland targeted species and autumn olive in the upland; and 3) place fertilize spikes at each planted oak tree in the upland. For maximum effectiveness the eradication of invasive plants is conducted during this time frame since it is at the height of the growing season and before the invasive plant species produce seed.

The intent of these limited efforts is to completely eradicate the *Phragmities* since it has not been observed within the immediate area and to keep the purple loosestrife under control to allow the native wetland vegetation to dominate the vegetative community. Any purple loosestrife directly encountered along will be hand-pulled and left on-site if not in seed and if in seed it will be removed from site for disposal.

To encourage the growth of the planted oaks, fertilizer spikes will be placed at the drip edge of the canopy of each tree along with continued treatment of autumn olive. This

should encourage the growth of the oaks to out-complete the autumn olive and eventually shade and retard autumn olive growth.

4.2 AOC57-Area 3

Summary: Area 3 consists of a restored upland portion that slopes downward to the existing wetland edge. Both the restored upland portion of Area 3 and the existing wetland edge attain the respective performance standards. Similar to Area 2, Area 3 is on the south facing slope of a long ridge that borders a large wetland to the south as part of the Lower Cold Spring Brook watershed.

4.2.1 Performance Standards

Upland Portion: Based on the 2006 inspections (as in the 2005 and 2004 inspections) the upland site exceeds the Performance Standards. Thirteen white and/or red oaks have survived on the upland slope that was planted to be in time similar to the unaffected surrounding conifer/hardwood forest. The upland plant cover, ground and tree cover, is similar to AOC 57 Area 2. Currently the site is covered with an old field species in the mix with naturally seeded colonizers/wanderers.

As in Area 2, the dominant ground cover continues to be grass/herbs either present in the original conservation mix or recruited colonizers. These are dominated by tick trefoil, day-flower, rabbit-foot clover, round headed bush clover, golden rod, vetch and sweet fern, with the addition in Area 3 of ragweed, burdock, oak seedlings, multifloral rose seedlings and pearly everlasting. The big change on the upland slope is the appearance in numbers and size of a shrub layer to the perennial cover that is starting to become established. Grey birch and especially autumn olive seedlings (an invasive shrub) have become prominent, with the latter often challenging the planted oaks for size.

None of the three exotic/invasive plant species of concern were observed on the upland portion of Area 3. However, the appearance of the invasive shrub, autumn olive, as a rapid colonizer from the existing adjacent non-forested upland areas has resulted in competition with the planted oak community and other native species albeit the increase was not as dramatic (dominant) as in Area 2. Consequently the autumn olive seedlings and saplings were eradicated by cutting at ground level and herbicide (25% Rodeo with Side-kick) was rubbed on the remaining stump surface. A total of thirty-nine (39) autumn olive seedlings/saplings were treated on September 25, 2006.

Wetland Edge: Based on the results of the 2006 inspections (as in the 2005 and 2004 inspections), the wetland edge exceeded the Performance Standards. No wetland resource area was restored during remediation of Area 3 but since removal of the silt fence may have disturbed the edge of the Area 3 wetland, this wetland edge is being monitored in accordance with the Habitat LTMP (USACE 2007a). The presence of several large red maple trees several feet from the edge of the toe of the slope is the probable limit of the soil excavation and subsequent site restoration.

In addition to the species observed in the wet meadow and emergent habitat at Area 2, rough leaved aster, tear thumb, jewelweed, turtle head, skunk cabbage and tussock sedge were present at Area 3. The scrub/shrub vegetation present was limited to a few elderberry and silky dogwood. Purple loosestrife was present and interspersed with the above listed vegetation.

As of November 14, 2006 and during all prior monitoring inspections, there was no evidence of erosion from the adjacent upland onto Area 3 as the MassDevelopment erosion and sedimentation control measures continue to function properly. Small shallow areas of standing water were present at the slope toe at the wetland edge. Most of the water at the time of the survey was probably ground water based on the surface presence of an iridescent sheen and a ferric hydroxide floc on the surface of the substrate.

4.2.2 Conclusions and Recommendations

Based on three years of long term adaptive monitoring and maintenance in accordance with the Habitat LTMP (USACE 2007a), both the upland and wetland edge of Area 3 met performance standards at the end of three growing seasons. Consequently we recommend that the Habitat LTMP Program be terminated.

However, to protect our investment of resources to date in a cost-effective manner, we recommend that limited maintenance activities be conducted during one field visit to Area 2 on one day in August-early September 2007 to: 1) continue eradication of the wetland targeted species and autumn olive in the upland; and 2) place fertilizer spikes at each planted oak tree in the upland. For maximum effectiveness the eradication of invasive plants is conducted during this time frame since it is at the height of the growing season and before the invasive plant species produce seed.

To encourage the growth of the planted oaks, fertilizer spikes should be placed at the drip edge of the canopy of each tree along with continued treatment of the invasive shrub, autumn olive. This should encourage the growth of the oaks to out-complete the autumn olive and eventually shade and retard autumn olive growth. Any purple loosestrife directly encountered will be hand-pulled and left on-site if not in seed and if in seed it will be removed from site for disposal to keep the purple loosestrife under control to allow the native wetland plants to dominate the vegetative community.

4.3 Summary of Area 2 and 3 Conclusions and Recommendations Based on 2004-2006 Monitoring

Based on the results of our three years of long term adaptive monitoring and maintenance in accordance with the Habitat LTMP (USACE 2007a) as documented in this report, the upland and wetland portions of both Areas 2 and 3 met performance standards at the end of three growing seasons. Consequently we recommend that the Habitat LTMP Program at AOC 57 be terminated.

However, to protect our investment of resources to date in a cost-effective manner, we recommend that limited maintenance activities be conducted during one field visit to Areas 2 and 3 on one day in August-early September 2007 to implement the recommendations in Sections 4.1.2 and 4.2.2., respectively.

Upon completion of the field activities a brief letter report with photo-documentation will be completed by the USACE Habitat Team and transmitted electronically to the Devens BRAC Document Distribution List. The report will summarize the field activities performed and provide recommendations, if any, along with justification for any future limited maintenance activities.

5.0 REFERENCES

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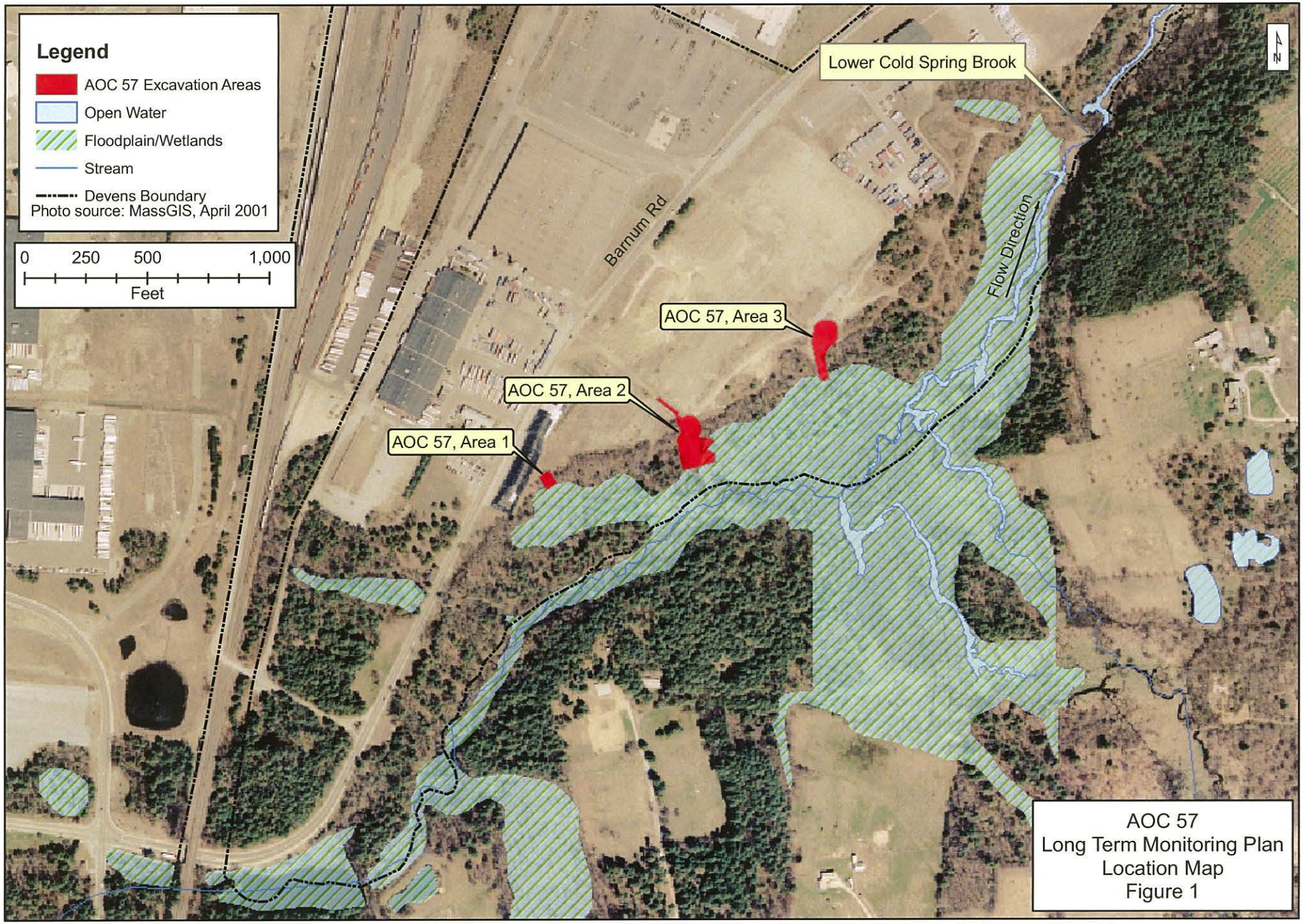
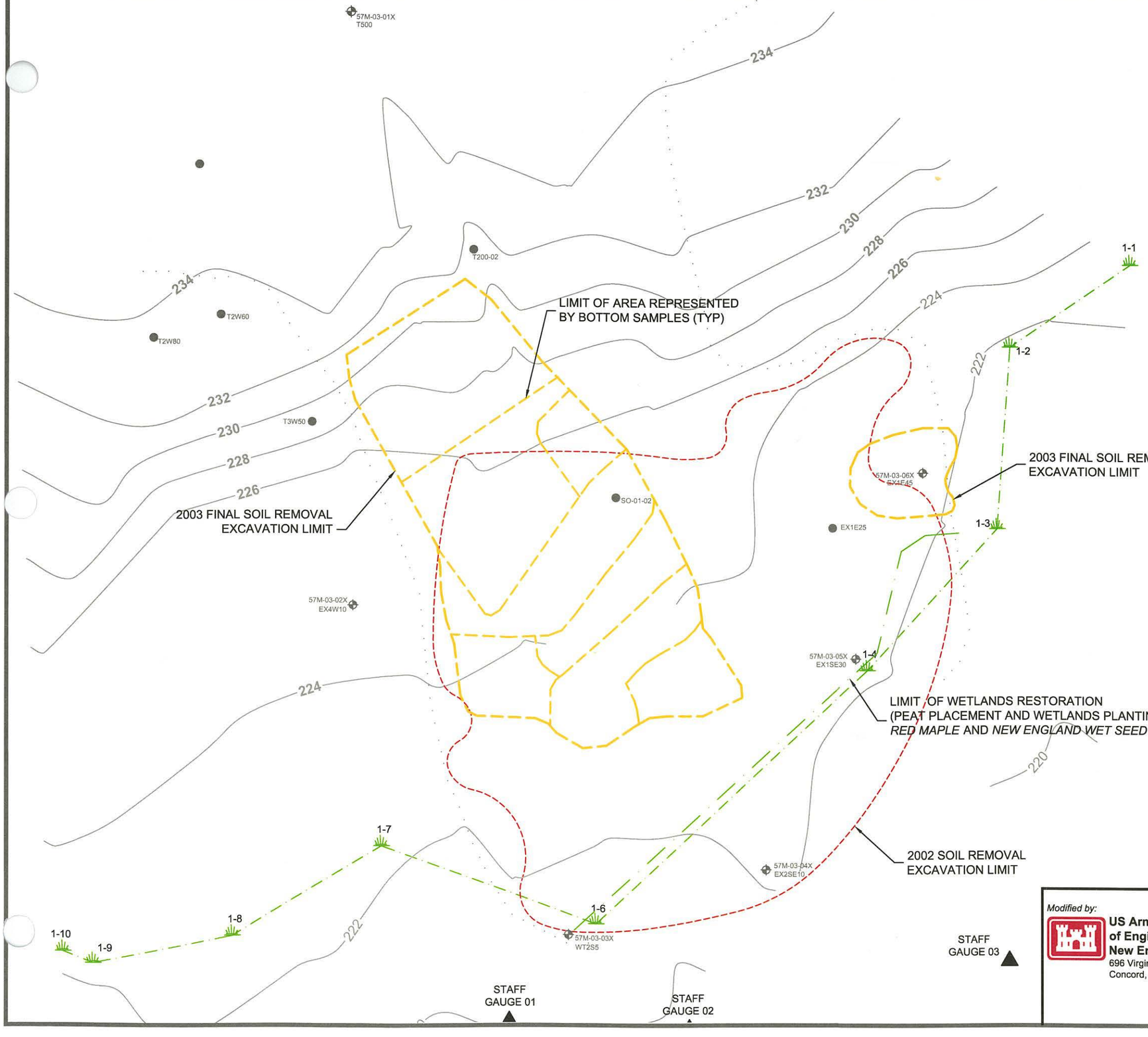

Legend
AOC 57 Excavation Areas
Open Water
Floodplain/Wetlands
Stream
Devens Boundary
Photo source: MassGIS, April 2001
0 250 500 1,000
Feet
Lower Cold Spring Brook
Barnum Rd
Flow Direction
AOC 57, Area 3
AOC 57, Area 2
AOC 57, Area 1
N
AOC 57
Long Term Monitoring Plan
Location Map
Figure 1



LEGEND

- SPOT ELEVATION (FINAL GRADE DEC 2003)
- FINAL EXCAVATION LIMIT (2003)
- APPROXIMATE DEPTH OF EXCAVATION FROM ORIGINAL GRADE (FT) (2002 & 2003)
- WETLAND STAFF GAUGE INSTALLED DEC. 2003 (ZERO=220 FT. MSL)
- 12-INCH CMP SUMP INSTALLED DEC 2003
- SIDEWALL COMPOSITE SAMPLE
- TREE LINE
- WT3 — GEOPROBE BORING LOCATION
- 12-In. CORRUGATED METAL PIPE SUMP
- 1-1 — WETLAND FLAG ID
- 228 — SURFACE CONTOURS (PRE-EXCAVATION)
- SO-01-02 — GEOPROBE/HOLLOW STEM AUGER SOIL BORING
- 57M-03-06X / EX1E45 — NEW MONITORING WELL
  MONITORING WELL No. IS 57M-XX-XXX
  SOIL BORING No. EX1E45
- LIMIT OF CONTI EXCAVATION (2002)
- LIMIT OF FLAGGED WETLANDS

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

1. THIS SITE PLAN WAS DEVELOPED FROM A SITE PLAN COMPLETED BY HOWE SURVEYING ASSOCIATES, Inc. AND A SURVEY PERFORMED BY CONTI ENVIRONMENTAL, Inc.
2. CONTI ENVIRONMENTAL Inc. TAPE-MEASURED THE GEOPROBE EXPLORATION LOCATIONS, SUMP LOCATIONS, AND APPROXIMATE EXISTING OPEN EXCAVATION, USING ESTABLISHED WETLAND FLAG LOCATIONS 1-7 AND 1-2 AS BASE POINTS.
3. SPOT AS-BUILT ELEVATIONS AND STAFF GAUGES SURVEYED BY CONTI DECEMBER 2003 (ELEVATIONS IN FT MSL).

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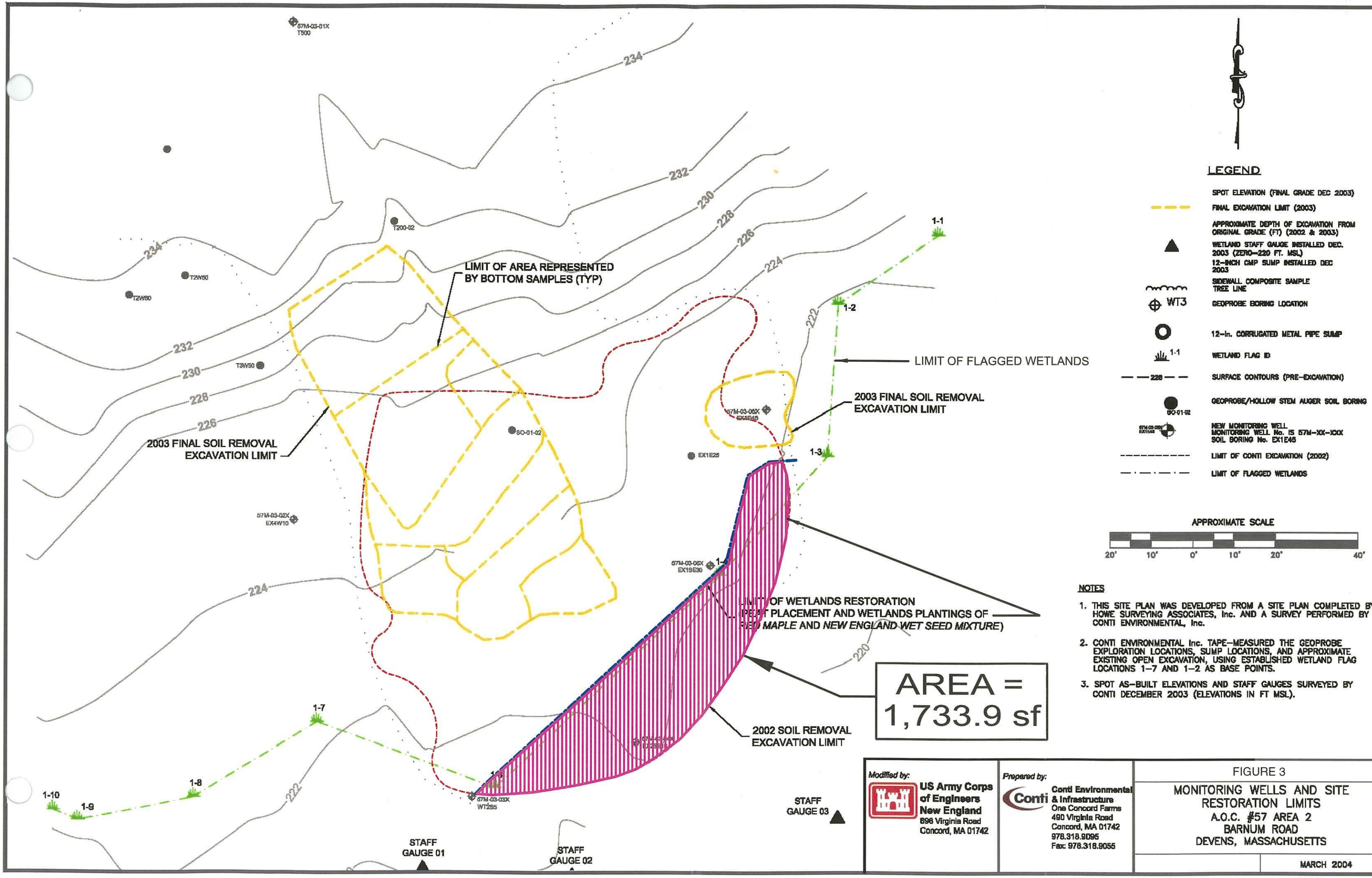
FIGURE 2

MONITORING WELLS AND SITE RESTORATION LIMITS
A.O.C. #57 AREA 2
BARNUM ROAD
DEVENS, MASSACHUSETTS

MARCH 2004



LEGEND

- SPOT ELEVATION (FINAL GRADE DEC 2003)
- FINAL EXCAVATION LIMIT (2003)
- APPROXIMATE DEPTH OF EXCAVATION FROM ORIGINAL GRADE (FT) (2002 & 2003)
- WETLAND STAFF GAUGE INSTALLED DEC. 2003 (ZERO=220 FT. MSL)
- 12-INCH CMP SUMP INSTALLED DEC 2003
- SIDEWALL COMPOSITE SAMPLE
- TREE LINE
- WT3 — GEOPROBE BORING LOCATION
- 12-In. CORRUGATED METAL PIPE SUMP
- 1-1 — WETLAND FLAG ID
- 228 — SURFACE CONTOURS (PRE-EXCAVATION)
- SO-01-02 — GEOPROBE/HOLLOW STEM AUGER SOIL BORING
- 57M-03-05X / EX1E45 — NEW MONITORING WELL. MONITORING WELL No. IS 57M-XX-XXX SOIL BORING No. EX1E45
- LIMIT OF CONTI EXCAVATION (2002)
- LIMIT OF FLAGGED WETLANDS

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

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2. CONTI ENVIRONMENTAL Inc. TAPE-MEASURED THE GEOPROBE EXPLORATION LOCATIONS, SUMP LOCATIONS, AND APPROXIMATE EXISTING OPEN EXCAVATION, USING ESTABLISHED WETLAND FLAG LOCATIONS 1-7 AND 1-2 AS BASE POINTS.
3. SPOT AS-BUILT ELEVATIONS AND STAFF GAUGES SURVEYED BY CONTI DECEMBER 2003 (ELEVATIONS IN FT MSL).

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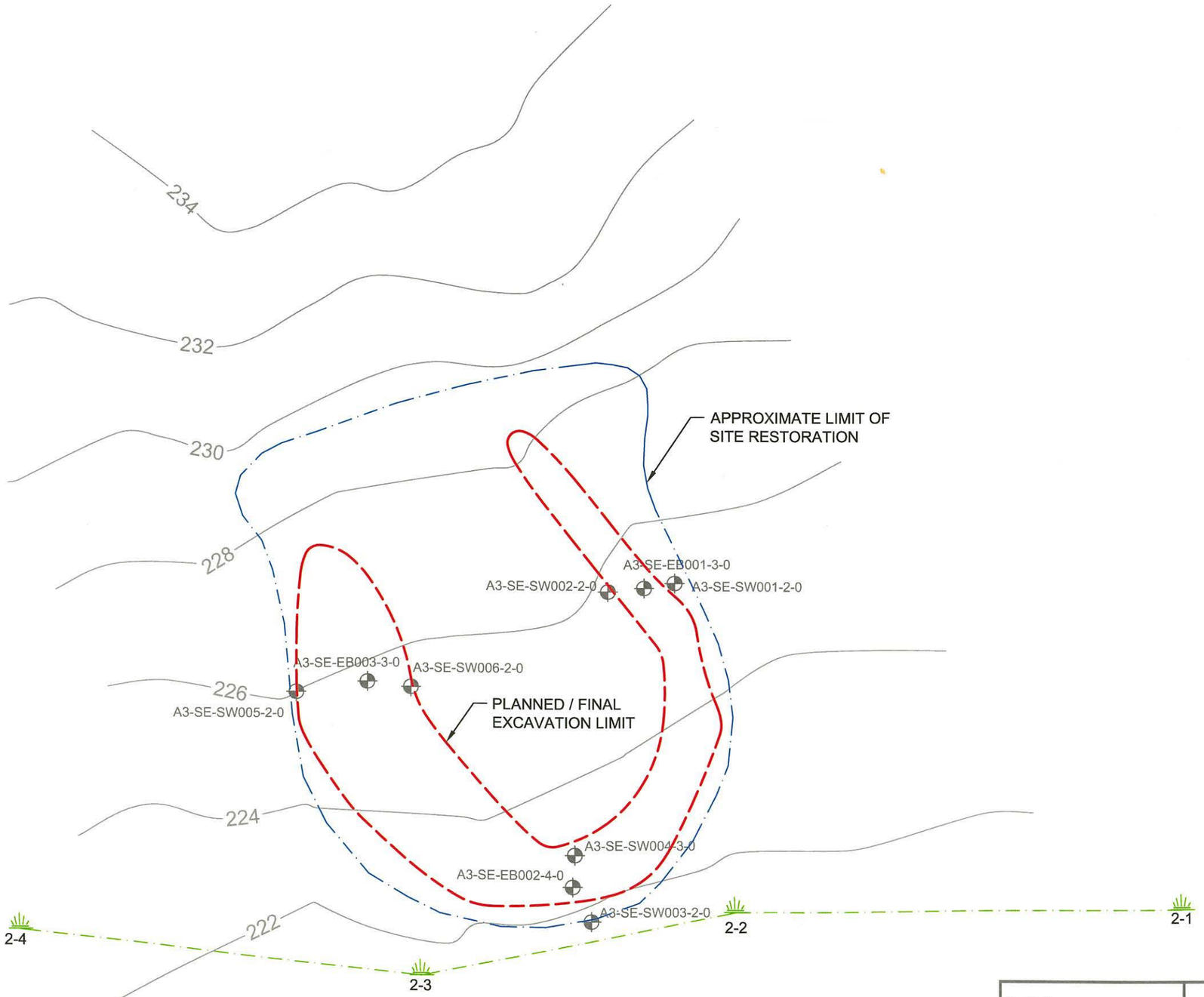
FIGURE 3

MONITORING WELLS AND SITE RESTORATION LIMITS
A.O.C. #57 AREA 2
BARNUM ROAD
DEVENS, MASSACHUSETTS

MARCH 2004



LEGEND

	APPROXIMATE DEPTH OF EXCAVATION FROM ORIGINAL GRADE (FT) (2002 & 2003)
1-1	WETLAND FLAG ID
228	SURFACE CONTOURS (PRE–EXCAVATION)
	LIMIT OF FLAGGED WETLANDS
A3-SE-SW001-2-0	CONFIRMATION SAMPLE LOCATION

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

1. THIS DRAWING WAS DEVELOPED FROM A SITE PLAN COMPLETED BY HOWE SURVEYING ASSOCIATES, Inc. AND FIELD MEASUREMENTS PERFORMED BY CONTI ENVIRONMENTAL, Inc.

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FIGURE 4

MONITORING WELLS AND SITE RESTORATION LIMITS
A.O.C. #57 AREA 3
BARNUM ROAD
DEVENS, MASSACHUSETTS

MARCH 2004

APPENDIX A

Area of Contamination 57 (AOC 57) Field Inspection Notes

In Chronological Order (2006, 2005 & 2004)

Description of Wetland Vegetation Designation Used in Field Notes

There is no single, correct, indisputable, sound ecological definition of wetlands since wetlands exist as a continuum between wet and dry environments (Cowardin et al. 1979). One of the three attributes of a wetland is the particular type of vegetation this wetland is able to support. Plants that are found in the wetland areas where the roots are submerged and the plants can grow are called hydrophytes. The U.S. Fish and Wildlife Service have published a list of more than 2500 species of vascular plants that occur in wetlands, in this case from Maine through Virginia and west to Ohio and Kentucky (Reed 1988). These plants are listed using their scientific name followed by their common name and published in a *National List of Scientific Plant Names*. Each plant is given a regional indicator status along with information on the plant habit, where it lives, and general distribution. This system provides four categories to determine this plant's ability to live in a wetland. These categories according to Tiner (1988) are:

1. Obligate (OBL) greater than 99% occurrence in wetlands;
2. Facultative Wetland (FACW) 66-99% occurrence in wetlands;
3. Facultative (FAC), 33-66% occurrence in wetlands; and
4. Facultative Upland (FACU), 1-33% occurrence in wetlands.

This is the classification system and these are the symbols used in this report to describe the vegetation found in the wetland and upland areas at the various restored wetland and upland sites at Devens. It is the frequency of the presence of these plants that is used to measure whether the wetland and the upland restoration has attained the stated Performance Standards. Obligate and Facultative Wetland plants are almost always found in wetlands and are therefore the best vegetative indicators of wetlands. In addition to the above classification and to better characterize the facultative categories, a positive sign (+) is placed after the FACW to indicate a plant on the wetter side of FACW, and a negative sign (-) for a plant on the drier side of FACW. As a relevant example, wool grass, *Scirpus cyperinus,* a common floral constituent of Devens wetlands is classified as a FACW+, indicating it should be found in a slightly wetter habitat than umbrella sedge, *Cyperus strigosus*, that is classified as FACW. This describes the terminology used to characterize habitat as wetland or upland based on their percent vegetative cover.

Citations are provided in Section 5.0 References.

2006

FIELD NOTES-MONITORING OF DEVENS HABITAT RESTORATION SITES
August 28, 2006 and September 18 & 25, 2006

CENAE Crew: August 28, 2006 - Pete Trinchero and Judi Johnson; September 18 & 25, 2006 - Bob Davis and Mike Penko

AOC 57 Area 2

Site Description/Overview/Background - The monitoring site visit was conducted on August 28, 2006 due an injury to one of the co-investigators after completion of several monitoring inspections in July 2006 at the Devens Consolidated Landfill (DCL) being conducted concurrently with the AOC 57 Habitat LTM Program. Based on the results of this monitoring visit, the Habitat LTMP Eradication Team returned on September 18 & 25, 2006 to initiate and complete the treatment of the invasive shrub, autumn olive.

The removal of chemical waste from an upland and wetland required an upland and wetland restoration. The restored upland gently slopes to the restored wetland. The existing adjacent upland slopes that were not part of the remediation are forested with a conifer/hardwood mix. At the upland edge of the slope many autumn olive shrubs were observed that were out-competing the planned vegetative community. The wetland restoration is contiguous with an extensive existing wetland complex. The actual area of wetland restoration is now indistinguishable from the adjacent wetlands. At the top of the slope just to the north, is an extensive upland area that is presently being used for the temporary storage of large exposed piles of soil for fill. To the west of Site 2 is a large storm water containment basin constructed as part of their Barnum Road Storm Water Improvement Project. Photographs were taken at the prescribed sites.

GENERAL DESCRIPTION OF UPLAND
Site 2 is closest to the recently constructed storm water containment basin on Barnum Road and is protected from upgradient erosion by recent 2006 improvements in the erosion and sedimentation barrier constructed by MassDevelopment in 2005. The vegetated slope extends down to the wetland restoration. Minor erosion problems in the upland just north of the restoration that have historically negatively impacted the restoration have been subsequently addressed.

Substrate (organic/cultural debris, erosion, etc) - The substrate is a mix of coarse sand, fines with an increasing amount of plant debris.

Plant Community Planned to be Established - The slope was originally planted with a light tolerant conservation mix to provide maximum coverage and minimize erosion control. Thirty-four red and white oak saplings were planted on the upland slope. The planned long term cover for the upland was an oak mature forest.

Plant Community Recorded at Meandering Survey - The dominant ground cover continues to be grass/herbs either present in the original conservation mix or recruited colonizers. These are dominated by tick trefoil, day flower, rabbit foot clover, round headed bush clover, golden rod, vetch and sweet fern. The big change on the upland slope is the appearance in numbers and size of a shrub layer to the perennial cover. Grey birch and especially autumn olive seedlings have become prominent, often challenging the planted oaks for size.

Cover on at Least 75% of Upland Area: Yes/No = Yes, this site definitely attains this criterion.

Description in light of the Planned Community - In terms of the final climax community, oak forest, the increasing dominance of a shrub community, is not unexpected.

Invasive/Noxious Plant Species (Presence/Absence/Control - None of the species listed/identified as targeted invasive plants in the Habitat LTMP were present. However, the dramatic appearance of the invasive shrub, autumn olive, as a rapid colonizer from the existing upland areas has created an environment that will ultimately challenge the survival of the planted oak community. A couple of black locust seedlings also were present. They would also be a threat to the survival of the planted oaks.

Evidence of Animal Community - Deer browse/sign and several raided turtle nests, probably snapping turtles, with discarded eggs were present on the upland slope.

Problems With in Mitigation Area - The appearance of a large number of autumn olive/black locust seedlings is a problem for the planned restoration. These species have a growth rate that is much faster than the oak and present a challenge to the survival of the planned vegetative community. Because of runoff and erosion from the large temporary piles of fill in the upland north of the restoration, a coir fascia silt barrier and berm formed from fill was constructed by MassDevelopment in 2005 with further improvements in 2006 as a temporary measure to stop additional erosion and silt deposition into the restored upland/wetland areas. There was a large pool of water form the runoff behind the berm observed during both the August and November 2006 field inspections after periods of heavy rain, however, no additional erosion or sedimentation was observed as the aforementioned corrective measures were adequately protecting Area 2.

We also observed piles of household trash at the upland edge of the site that should be removed and disposed properly by the land owner.

Suggested Corrective Measures for the Upland Site - The autumn olive seedlings were cut at ground level. Herbicide was rubbed on the remaining stump surface. A total of 327 autumn olive seedlings were treated: 200 on September 18, 2006 and 127 on September 25, 2006. It is suggested future autumn olive herbicide treatment occur earlier

in the growing season before the appearance of the fruit. One black locust seedling was similarly treated.

GENERAL DESCRIPTION OF THE WETLAND

The wetland restoration is a microcosm of wetland types that merges into the extensive wetland area to the south. There are two hydric sources for this wetland community, groundwater seeping from the base of the upland slope and the surface water supplied by the adjacent wetland as part of the Lower Cold Spring Brook watershed.

Standing Water (Presence/Absence/Description) - There were several areas of standing water throughout the more south facing areas of the wetland. There was no additional silt deposition on the pool bottom as of this date. Iron bacteria were present on the surface of standing water at the base of the slope creating an iridescent sheen with red ferric oxide floc present on the bottom of some of the pools.

Classification of Wetland Type/Cowardin Classification - In a small area there were several wetland communities present which varied along the base of the upland slope, from wet meadow, palustrine shrub/scrub and emergent.

Plant Community Recorded at Meandering Survey - There seemed to be greater wet meadow community at the base of the slope, indicative of the possible increase in the level of the groundwater or surface water. Boneset, sensitive fern, jewel weed, umbrella sedge, soft rush, tussock sedge, cinnamon fern and cattails were present in various areas depending on hydric conditions. As a part of the original restoration, red maple, alder and silky dogwood seedlings were planted at the base of the slope. Since the onset of site visits, silky dogwood, willow, red maple and alder seedling colonizers have appeared at the base of the slope, and indication that more of this wetland could become shrub/shrub community.

Indigenous Wetland Plants Cover on at Least 75% of Area: Yes/No = Yes, more than attains criterion.

Exotic/Noxious Plant Species-Presence/Absence/Control - Several past visits have detected *Phragmites* which were subsequently flagged and treated. No *Phragmites* was observed. There was many purple loosestrife identified. Several plants were pulled but not all the plants. The adjacent wetlands are covered with purple loosestrife and are thus a continuing source to Area 2. It is virtually impossible to eradicate purple loosestrife once established so our objective during the program is to keep it under control by hand removal to allow the native wetland vegetation to dominate the community.

Evidence of Animal Community- Many adult amphibians were present especially in the emergent vegetation.

Problems within Mitigation Area - Purple loosestrife is abundant and should be removed by hand when directly encountered during the program to allow the native wetland vegetation to dominate.

Suggested Corrective Measures for Wetland Site – Continued removal of purple loosestrife as suggested above, however, pulling the purple loosestrife is labor intensive. In the long-term, this site may be ideal for the release of *Galerucella* beetles as a natural biological control for the loosestrife. The beetles would not completely eradicate the loosestrife, but control it so the loosestrife would not become the monoculture seen throughout New England. Beetles released would take several growing seasons to become established, but the control would most likely be permanent.

FIELD NOTES-MONITORING OF DEVENS HABITAT RESTORATION SITES
August 28, 2006 & September 25, 2006

CENAE Crew: August 28, 2006 - Pete Trinchero and Judi Johnson; September 25, 2006 - Bob Davis and Mike Penko

AOC 57 Area 3

Site Description/Overview/Background -The monitoring site visit was conducted on August 28, 2006 due an injury to one of the co-investigators after completion of several monitoring inspections in July 2006 at the Devens Consolidated Landfill (DCL) being conducted concurrently with the AOC 57 Habitat LTM Program. Based on the results of this monitoring visit, the Habitat LTMP Eradication Team returned on September 25, 2006 to initiate and complete the treatment of the invasive shrub, autumn olive, at Area 3.

The AOC 57 Area 3 upland restoration is about 1000 ft east of AOC 57 Area 2. The upland restoration is similar in extent to Area 2 but no wetland restoration was required at Area 3. However, the wetland edge is being monitored as explained in the Habitat LTMP since it may have been disturbed by placement and removal of the slit fence. The large stockpiles of soil immediately present upgradient of the Area 2 restored upland do not extend completely to the restored Area 3 upland, and the access road to Area 3 is sufficiently lower than the restoration site so runoff from the upland does not flow onto the restoration site but flows to the west where it threatens Area 2. Photographs were taken at the required stations and other areas of interest.

GENERAL DESCRIPTION OF UPLAND
Similar to Area 2, it is on the south facing slope of a long ridge that borders a large wetland to the south. The unaffected surrounding slopes are conifer/hardwood forested.

Substrate (organic/cultural debris, erosion, etc) - Similar to Area 2 but Area 3 has not subject to the episodes of erosion down the slope into the wetland restoration. The erosion control has been removed from the top of the slope and not replaced. The substrate has a minimal amount of organic matter, and is primarily coarse sand and fines.

Plant Community Planned to be Established - Conservation mix applied for initial stability. Currently the site is covered with an old field species in the mix with naturally

seeded colonizers/wanderers. Red and white oak were planted to be in time similar to the surrounding conifer/hardwood forest.

Plant Community Recorded at Meandering Survey - See description for Area 2, with the addition of ragweed, burdock, oak seedlings, multifloral rose seedlings and pearly everlasting.

Cover on at Least 75% of Upland Area: Yes/No = Yes.

Description in light of the Planned Community - A sere community with the conifer/hardwood forest the planned final community.

Invasive/Noxious Plant Species (Presence/Absence/Control) - No targeted species were identified. However, as with the conditions at Area 2, the presence of autumn olive has become more noticeable and dominant on the slope. There are many seedlings and a couple of mature plants on and adjacent to the upland slope.

Evidence of Animal Community - Several raided snapping turtle nests were on the upland slope.

Problems With in Mitigation Area - As with Area 2, the explosive growth of autumn olive threatens the planned community for the upland restoration site. The growth rate of autumn olive is much more rapid than the planted oaks on the slope. The autumn olive will interfere and/or inhibit red/white oak growth.

Suggested Corrective Measures for Upland Site - It is suggested the autumn olive be eradicated as soon as possible. The Eradication Team returned to the site on September 25. Each stem was cut at the ground surface and herbicide was applied to the cut surface. A total of 38 stems were cut and treated. Fertilizer spikes should be placed at the drip zone of the oaks planted on the upland slope to stimulate growth.

GENERAL DESCRIPTION OF THE WETLAND

No wetland restoration was required at Area 3. Since the installation and removal of the silt fence may have disturbed the wetland edge, monitoring was limited to a narrow strip of wetland at the toe of the slope. The presence of several large red maple trees several feet from the edge of the toe of the slope is the probable limit of the soil excavation and subsequent site restoration.

Standing Water (Presence/Absence/Description) - Small shallow areas of standing water were present at the slope toe. Most of the water at the time of the survey was probably ground water based on the surface presence of an iridescent sheen and a ferric hydroxide floc on the surface of the substrate.

Classification of Wetland Type/Cowardin Classification - Wetland types in the narrow restoration area consisted of wet meadow, emergent habitat with a small amount of shrub/scrub.

Plant Community Recorded at Meandering Survey - In addition to the species observed in the wet meadow and emergent habitat at Area 2, rough leaved aster, tear thumb, jewelweed, turtle head, skunk cabbage and tussock sedge were present at Area 3. The scrub/shrub vegetation present was limited to a few elderberry and silky dogwood. Purple loosestrife was present and interspersed with the above listed vegetation.

Indigenous Wetland Plants Cover on at Least 75% of Area: Yes/No = Yes.

Exotic/Noxious Plant Species-Presence/Absence/Control - Purple loosestrife was present.

Evidence of Animal Community - Many amphibians were present.

Problems within Mitigation Area - The only recorded problem was the presence of purple loosestrife.

Suggested Corrective Measures for Wetland Site - Purple loosestrife was pulled from these sites on previous site visits. A similar treatment is required. This treatment is time consuming and may be a waste of effort since purple loosestrife is ubiquitous in the extensive wetland to the south. As recommended for Area 2 in the long-term, it is suggested the beetle, *Galerucella*, be released onsite. This beetle, over several growing seasons, should control the purple loosestrife.

FIELD NOTES-MONITORING OF DEVENS HABITAT RESTORATION SITES
November 14, 2006

CENAE Crew: Bob Davis and Pete Trinchero

AOC 57 Area 2

Site Description/Overview/Background - This inspection occurred after a heavy killing frost making a detailed vegetative description of herbaceous plants impossible but not required since this information was obtained during the August 28, 2006 inspection. The primary purpose of this visit was to:

1. Monitor the success of the autumn olive eradication efforts completed in September; and
2. Determine the conditions of the berm that protects the upland and the wetland restoration from potential silt laden runoff from the large temporary piles of soil fill stored in the upland just north of the restoration.

The cleanup of an area of chemical contamination required upland and wetland restoration. Site 2 is the more westerly site adjacent to a recently constructed drainage retention basin. Site is previously described. Photographs were taken at the prescribed stations. Areas of problems or interest were also photographically recorded.

GENERAL DESCRIPTION OF UPLAND

The restored area is a small portion of an east west facing ridge that is bordered to the south by an extensive wetland. The original vegetative cover was a mixed conifer/hardwood stand which remains on the areas of the ridge not affected by the restoration.

Substrate (organic/cultural debris, erosion, etc; - No change from prior inspection.

Plant Community Planned to be Established - A forested climax community is the ultimate goal of this upland restoration.

Plant Community Recorded at Meandering Survey – No change from prior inspection.

Cover on at Least 75% of Upland Area: Yes/No = Yes, the upland restoration successfully attains the criterion.

Description in light of the Planned Community - No change from prior inspection.

Invasive/Noxious Plant Species (Presence/Absence/Control) - There was no stump/stem re-growth visible from any of the 327 autumn olive plants treated in September 2006 at this site. Leaves were no longer present on the woody vegetation so identification of additional autumn olive plants was difficult, but none were seen. The treated stumps will be observed for additional growth during the inspection.

Evidence of Animal Community - Deer sign visible over the upland site.

Problems With in Mitigation Area - There were large pools of runoff impounded behind the temporary berm. Significant amounts of silt have been trapped behind the berm. The berm has been breached in several places with the silt and plant debris captured behind the silt curtain. However, no additional sedimentation onto the upland was observed.

We also observed additional household trash added to the west end of the Area 2 upland restoration that should be removed by the property owner.

Suggested Corrective Measures for Upland Site – Continue to monitor the effectiveness of the erosion and sedimentation control measures implemented by MassDevelopment to prevent additional erosion from the temporary soil stockpiles into Area 2. It is suggested future autumn olive herbicide treatment occur earlier in the growing season before the appearance of the fruit.

To encourage the growth of the planted oaks, fertilizer spikes should be placed at the drip edge of the canopy of each tree along with continued treatment of autumn olive. This should encourage the growth of the oaks to out-complete the autumn olive and eventually shade and retard autumn olive growth. Wire cages may be required on the planted oak to

prevent deer browse. Once the oak attained sufficient size the wire cages can be removed.

GENERAL DESCRIPTION OF THE WETLAND

A mix of wetland types at the base of the slope created after the removal of contaminated soils as previously described in prior inspection.

Standing Water (Presence/Absence/Description) - Pools of standing water that become more numerous and deeper as the restored area merges imperceptibly into the extensive, existing wetland to the south.

Classification of Wetland Type/Cowardin Classification - As described in prior inspection.

Plant Community Recorded at Meandering Survey - As described in previous surveys. The killing frost rendered some of the herbaceous wetland vegetation unidentifiable.

Indigenous Wetland Plants Cover on at Least 75% of Area: Yes/No = Yes, exceeds the stated criterion.

Exotic/Noxious Plant Species-Presence/Absence/Control - *Phragmites* has been historically eradicated at this site during 2004 and 2005. These flagged areas were examined in 2006 and no recent growth was present. Many purple loosestrife plants have colonized the Area 2 wetland from the adjacent bordering vegetated wetlands. In the long-term the use of beetles as an effective biological control should be considered if warranted rather than pulling the plants as a short-term measure.

Evidence of Animal Community - Ubiquitous deer sign was present.

Problems within Mitigation Area - Purple loosestrife is becoming dominant in the emergent wetland.

Suggested Corrective Measures for Wetland Site - Control of the purple loosestrife is required to prevent the establishment of a monoculture in the emergent community. A major effort will be required to pull the plants, at best a temporary solution. It is strongly suggested that *Galerucella* beetles be released into the site to initiate long-term biological control.

FIELD NOTES-MONITORING OF DEVENS HABITAT RESTORATION SITES

November 14, 2006

CENAE Crew: Bob Davis and Pete Trinchero

AOC 57 Area 3

Site Description/Overview/Background - The site visit occurred after a heavy killing frost so the determination of vegetative cover is limited, however, observations of the herbaceous plant community were obtained during the prior inspection. The primary purpose of the inspection was to monitor the eradication efforts of September 25, 2006. Photographs were taken at the required stations.

The upland restoration is similar in extent to Area 2 but no wetland restoration was required at Area 3. However, the wetland edge is being monitored as explained in the Habitat LTMP since it may have been disturbed by placement and removal of the slit fence. It is about 1000 feet east of AOC 57 Area 2.

GENERAL DESCRIPTION OF UPLAND -
The upland is described in the previous inspection.

Substrate (organic/cultural debris, erosion, etc) - No change since previous site visit.

Plant Community Planned to be Established - As described in previous data sheets.

Plant Community Recorded at Meandering Survey - Much of the herbaceous cover is absent due to the effects of the freeze.

Cover on at Least 75% of Upland Area: Yes/No = Yes.

Description in light of the Planned Community – No change.

Invasive/Noxious Plant Species (Presence/Absence/Control) - No additional problem species were observed. Since most of the leaves were not present due to the frost, a subsequent visit during the middle of the growing season will be required to verify this observation.

Evidence of Animal Community - Deer browse was present on the upland slope, especially on the planted oaks.

Problems With in Mitigation Area - No additional autumn olive was observed.

Suggested Corrective Measures for Upland Site - Suggest fertilizer spikes are placed at the base of the planted oak at drip line. Wire cages may be required on the planted oak to prevent deer browse. Once the oak attained sufficient size the wire cages can be removed.

GENERAL DESCRIPTION OF THE WETLAND -
The wetland is described in the previous inspection.

Standing Water (Presence/Absence/Description) - As described in previous visits.

Classification of Wetland Type/Cowardin Classification - As described in previous visits.

Plant Community Recorded at Meandering Survey - As described in previous visits. Because of heavy frost, most of the surface biomass of the herbaceous vegetations was absent.

Indigenous Wetland Plants Cover on at Least 75% of Area: Yes/No = Yes.

Exotic/Noxious Plant Species-Presence/Absence/Control - The frost-killed remains of purple loosestrife was observed throughout the wetland.

Evidence of Animal Community - None observed.

Problems within Mitigation Area - The continued presence of purple loosestrife requires control.

Suggested Corrective Measures for Wetland Site - Previous control efforts have required the pulling of the purple loosestrife and disposal offsite if the plant was in seed. It is suggested that the beetle *Galerucella* be introduced at both Areas 2 and 3 for a more permanent and cost-effective control of purple loosestrife.

2005

Field Notes – Monitoring of Devens Habitat Restoration Sites
14 July 2005

CENAE Crew: Bob Davis, Pete Trinchero, Mike Penko, and Ben Loyd

AOC 57 AREA 2

Site Description Wetland and upland portions; site restoration has been degraded since 2004 due to erosion from offsite upgradient upland haul road, shallow wetland-upland slope interface is choked with silt (see photos), erosion, silt deposition east side of upland slope

General Description of Upland
Substrate (organic/cultural debris, erosion, etc)- little organic material on slope, erosion on east side, west side more stable, sandy silt. Runoff from construction offsite has eroded and deposited silt along the eastern border of the upland restoration.

Plant Community to be Established – red maple and white and/or red oaks planted, slope stabilized with herbs, forbs and ground cover.

Plant Community Recorded at Meandering Survey- red maple at base of slope, white, red oak on slope, herbs, forbs as ground cover, coneflower, vetch, dog tick fleabane, rabbit's foot clover, sweet fern, red maple seedlings, other wanderers self seeded from surrounding area

Invasive/Noxious Plant Species (Presence/Absence/Control)-Absent

Evidence of Animal Community- deer browse present on oaks/red maple; turtle nests observed, probably snapping or painted, nests raided by skunk and/or raccoon.

Upland plant Cover – portions of east slope does not meet 75% cover criterion, west side of upland meets criterion

Suggestion upland improvement- restore soil/reseed areas devoid of groundcover, provide protection from deer predation with wire cages placed around trees. Deploy vole protectors for the planted tree seedlings.

General Description of Wetland - shallow wetland pools at base of slope becoming clogged with silt, pools on east side of restored wetland most impacted, west side has greater growth of wetland vegetation.

Standing Water (Presence/Absence/Description) standing water 3-4"deep, silted in pools on east side with at least 3 inches of fine silt covering roots

Classification of Wetland Type- Cowardin Classification- emergent, shrub/scrub

Plant Community Recorded at Meandering Survey-red maple seedlings, willow, silky dogwood, jewel weed, sensitive/cinnamon fern more toward west side, tussock sedge

Exotic/Noxious Plant Species -Presence/Absence/Control- *Phragmites* treated by the injection technique with Rodeo according to protocol. Two small areas with *Phragmites* were discovered, 3 shoots treated on east side of wetland, most likely remnants of a clump of *Phragmites* treated in Fall 2004. On the west side of the wetland in the vicinity of the well cover 26 shoots of *Phragmites* were cut and treated. Several clumps of purple loosestrife were hand pulled from the shallow wetland pools and bagged for offsite disposal. There is extensive purple loosestrife cover in adjacent wetland areas making it difficult to control in AOC 57.

Indigenous Wetland Plants Cover on at Least 75% Area: Yes/No- Yes.
Description: There are several inches of finely divided silt covering the roots of wetland plants (*Typha, Glyceria, Carex*) in the east facing pools at the upland/wetland interface. Whether these plants survive and or the silt deposition continues will determine continued successful compliance in the wetland area of the restoration. The greater the distance from the east portion of the restoration, the greater degree of wetland plant cover.

Evidence of Animal Community A few aquatic insect larvae visible in shallow pools, green frog adults observed, bullfrog vocalizations, with no larvae observed. No animals were visible in the more highly silted pools.

Problems within Mitigation Area
Continued silt migration with surface runoff from the construction activity associated with the building of the silt basin. An inadequate effort at the creation of a soil berm to divert surface flow was attempted, but flows bypassed the berm and undercut the straw-filled coir fascia.

Suggested Corrective Measures
Surface runoff flows around and under the coir fascia, proceeding down the east side of the wetland. The only corrective action taken as of July 14, 2005 since this problem was originally reported in October 2004 was the placement of a few front-end loader buckets of fill in front of the inadequate silt barrier, which ultimately adds to the erosion. To correct this serious problem, the slope must be changed so runoff is not directed toward AOC 57 Area 2 but to the silt basin created by MassDevelopment to contain the runoff from the upland. The bare substrate in the area in front of AOC 57 should be covered with biodegradable cotton or jute matting and vegetated.

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Field Notes - Monitoring of Devens Habitat Restoration Sites
14 July 2005

CENAE Crew: Bob Davis, Pete Trinchero, Mike Penko, and Ben Loyd

AOC 57 AREA 3

Site Description Restored site area consisted of all upland habitats that slope downward and adjacent to an existing bordering vegetated wetland as in Area 2. Albeit no wetland restoration was required at Area 3, the transition zone between the upland and wetland is also being monitored.

General Description of Upland
Substrate (organic/cultural debris, erosion, etc)- little organic material on slope, sandy loam, small area of erosion on east side of the upland site. Because of the lack of construction activity by MassDevelopment in the upland immediately north of the restoration site, no direct erosion or sedimentation was observed onto Area 3. The straw filled erosion control tube remains across the upland limit of the site and was observed to be functioning properly.

Plant Community to be Established – red maple and red and/or white oak seedlings planted, slope seeded with upland mix and stabilized with herbs, forbs.

Plant Community Recorded at Meandering Survey- red maple at bottom of slope, White and/or red oak on slope, herbs, forbs as ground cover such as dog tick fleabane, rabbit's foot clover, sweet fern, red maple seedlings as volunteers from surrounding

forest are present over the entire slope, other volunteers. Volunteers, assisted by adequate rainfall, have re-vegetated many of the small bare areas that were observed in 2004. Several small under vegetated areas remain.

Invasive/Noxious Plant Species (Presence/Absence/Control)-None observed.

Evidence of Animal Community- deer browse on oaks/red maple,

Attain performance Standards- yes, with at least 75% cover

Suggestions for Improvement- reseed bare areas, wire cages around planted trees to limit deer browse, vole protectors for planted maple/oaks.

General Description of Wetland - shallow wetland pools at the base of the upland slope that extend for a short distance to a slight vegetated berm that merges to the extensive existing shrub/scrub that is continuous with AOC 57, Site 2. The wetland area being monitored is limited to this narrow wetland at the base of the slope.
Standing Water (Presence/Absence/Description) standing water 2-3"deep at the base of the upland slope

Classification of Wetland Type- Cowardin Classification- emergent, shrub/scrub

Plant Community Recorded at Meandering Survey- a healthy assemblage of typical wetland plants with no evidence of silt deposition from upland. This assemblage includes wool grass, tussock sedge, soft bulrush, planted/volunteer alder and a few clumps of broad-leaved *Typha.*

Exotic/Noxious Plant Species -Presence/Absence/Control: a few clumps of purple loosestrife were pulled, bagged, and disposed offsite. Purple loosestrife control, although required in the original scope of work for AOC 57, is futile since the surrounding pre-existing wetland that borders AOC 57 Site 2 and 3, has extensive loosestrife cover and seeding from this large reservoir is inevitable.

Indigenous Wetland Plants Cover on at Least 75% Area: Yes/No Yes
Description- well covered, more than exceeds the criterion

Evidence of Animal Community Deer browse

Problems within Mitigation Area -No obvious problem

Suggested Corrective Measures -None required at the time of this inspection.

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Field Notes – Monitoring of Devens Habitat Restoration Sites
22 September 2005

CENAE Crew: Bob Davis, Pete Trinchero, Mike Penko and Ben Loyd with Dave Macdonald (USEPA)

AOC 57 AREA 2

Site Description Wetland, upland; site restoration has been degraded since 2004 due to erosion from offsite upland haul road, shallow wetland-upland slope interface is choked with silt (see photos), erosion, silt deposition east side of upland slope

General Description of Upland -

Substrate (organic/cultural debris, erosion, etc)- little organic material on slope, erosion on east side, west side more stable, sandy silt. Runoff from construction offsite has eroded and deposited silt along the eastern border of the upland restoration. Rivulets are running around the berm, under the silt fence, and down the slope into the wetland.

Plant Community to be Established – red maple and white/red oaks planted, slope stabilized with herbs, forbs and ground cover.

Plant Community Recorded at Meandering Survey- a lot of upland growth since last year, native species are re-establishing, alder, willow, autumn olive, red oak, chickweed, vetch, queen Anne's lace, sweet fern, boneset, cypress, clovers, birch, aster reed canary grass

Invasive/Noxious Plant Species (Presence/Absence/Control) purple loosestrife, black locust. Suggested control measures might include eradication of loosestrife next year, but might not be worth the effort because the area will be shaded out within ten years

Evidence of Animal Community- deer browse

Upland plant Cover – portions of east slope do not meet 75% cover criterion, west side of upland meets criterion

General Description of Wetland- shallow wetland pools at base of slope clogged with silt, pools on east side of restored wetland most impacted, west side has greater growth of wetland vegetation.

Standing Water (Presence/Absence/Description)- standing water 3-4"deep, silted in pools on east side with at least 3 inches of fine silt covering roots

Classification of Wetland Type- Cowardin Classification- emergent, shrub/scrub

Plant Community Recorded at Meandering Survey- red maple seedlings, willow, silky dogwood, jewel weed, sensitive/cinnamon fern more toward west side, tussock sedge

Exotic/Noxious Plant Species -Presence/Absence/Control- purple loosestrife fringing wetland

Indigenous Wetland Plants Cover on at Least 75% Area: Yes/No- Yes, but.....
Description- There are several inches of finely divided silt covering the roots of wetland plants (*Typha, Glyceria, Carex*) in the east facing pools at the upland/wetland interface. Whether these plants survive and or the silt deposition continues will determine continued successful compliance in the wetland area of the restoration. The greater the distance from the east portion of the restoration, the greater degree of wetland plant cover.

Evidence of Animal Community- A few aquatic insects visible in shallow pools, green frog adults observed. No animals were visible in the more highly silted pools.

Problems within Mitigation Area- Continued silt migration with surface runoff from the construction activity associated with the building of the silt basin. A feeble effort at the creation of a soil berm to divert surface flow was attempted, but flows bypassed the berm and undercut the straw-filled coir fascia.

Suggested Corrective Measures- Surface runoff flows around and under the coir fascia, proceeding down the east side of the wetland. The only corrective action taken since this problem was originally reported in October 2004 was the placement of a few front-end loader buckets of fill in front of the inadequate silt barrier, which ultimately adds to the erosion. To correct this serious problem, the slope must be changed so runoff is not directed toward AOC 57, Site 2 but to the silt basin created to contain the runoff from the upland. The bare substrate in the area in front of AOC 57 should be covered with cotton matting and vegetated. The irony is less than 50 yard to the west is a magnificent silt basin built by the organization responsible for the silt in the wetland.

Suggested corrective measures include restoration of soil/reseeding in areas devoid of groundcover, placement of wire cages around the base of trees to provide protection from deer browsing, and deployment of vole protectors for the planted tree seedlings.
****

Field Notes - Biological Monitoring Devens Habitat Restoration Sites
22 September 2005

CENAE Crew: Bob Davis, Pete Trinchero, Mike Penko and Ben Loyd with Dave Macdonald (USEPA)

AOC 57 AREA 3

Site Description -Restored site consists of wetland and upland. Most of the restored site consists of upland with a small area of wetland restoration at the base of the upland slope. As with AOC 57, Site 2, the upland restoration ends to the north at a disturbed construction site and the wetland merges to the south with an extensive palustrine wetland.

General Description of Upland

Substrate (organic/cultural debris, erosion, etc)- little organic material on slope, sandy loam, small area of erosion on east side of the upland site. Just north of the restoration site, there has been historic construction activity but because of the slope there has not been the drainage from the upland that has degraded AOC 57, Site 2. Although there is no large amount of erosion from the upland, there are small areas that have exposed sandy substrate. These areas do not affect the performance standards. A functioning straw filled coir fascia remains across the upland limit of the site.

Plant Community to be Established – red maple/oak seedlings planted, slope seeded with upland mix and stabilized with herbs, forbs.

Plant Community Recorded at Meandering Survey- red maple at bottom of slope, white and red oak on slope planted as part of the restoration continue to grow well on the upland. Herbs, forbs such as dog tick fleabane, rabbit's foot clover, sweet fern exist as ground cover, with many red maple, birch, autumn olive and poplar seedlings growing as volunteers from surrounding forest are present over the entire slope. Volunteers, assisted by adequate rainfall, have re-vegetated many of the small bare areas that were observed in 2004. Several small under vegetated areas remain as mentioned above.

Invasive/Noxious Plant Species (Presence/Absence/Control)-None observed.

Evidence of Animal Community- deer browse on oaks/red maple.

Attain performance Standards- yes, with at least 75% cover

Suggestions for Improvement- reseed bare areas, wire cages to be placed around planted trees to limit deer browse, vole protectors for planted maple/oaks to prevent girdling at he base of the trees.

General Description of Wetland - shallow wetland pools at the base of the upland slope that extend for a short distance to a slight vegetated berm that merges to the extensive existing shrub/scrub, palustrine emergent wetland that is continuous with the wetland that connects to AOC 57, Site 2. The wetland restoration is limited to this narrow wetland at the base of the slope. There has been a single large (3 ft diameter) red maple that was uprooted at the berm where the restoration merged with the existing wetland.

Standing Water (Presence/Absence/Description)- standing water 2-3"deep at the base of the upland slope

Classification of Wetland Type- Cowardin Classification- palustrine emergent, shrub/scrub

Plant Community Recorded at Meandering Survey- a healthy assemblage of typical wetland plants with no evidence of silt deposition from uplahd. This assemblage includes

wool grass, tussock sedge, soft bulrush, luxuriant jewelweed planted/volunteer alder and a few clumps of broad-leaved *Typha.*

Exotic/Noxious Plant Species -Presence/Absence/Control- a few clumps of purple loosestrife were pulled, bagged, and disposed offsite. Purple loosestrife control, although required in the original scope of work for AOC 57, is probably futile since the surrounding pre-existing wetland that borders AOC 57 Site 2 and 3 has extensive loosestrife cover and seeding from this large reservoir for purple loosestrife invasion is inevitable. No Phragmites observed.

Indigenous Wetland Plants Cover on at Least 75% Area: Yes/No Yes
Description- well covered, more than exceeds the criterion

Evidence of Animal Community- Deer browse

Problems within Mitigation Area- No obvious problem

Suggested Corrective Measures- None required at the time of this inspection.
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Field Notes – Monitoring of Devens Habitat Restoration Sites
1 November 2005

CENAE Crew: Bob Davis, Pete Trinchero and Ben Loyd

AOC 57 AREA 2

Site Description- restored level upland habitats and adjacent wetlands to the south of the roadway leading to the water treatment plant.

General Description of Upland

Substrate (organic/cultural debris, erosion, etc)- a berm of sand/gravel was created with a new silt barrier installed behind, old silt barrier broken up and left in place, previously eroded rivulets filled with rock, previously eroding slope graded and reseeded

Plant Community to be Established- no change

Plant Community Recorded at Meandering Survey- no change
Invasive/Noxious Plant Species (Presence/Absence/Control) - purple loosestrife

Evidence of Animal Community- deer tracks

General Description of Wetland- site visit did not include wetland area

Problems within Mitigation Area- No change.

Suggested Corrective Measures- No change.

2004

Field Notes - Monitoring of Devens Habitat Restoration Sites

16 June 2004

CENAE Crew: Bob Davis, Peter Trinchero, Mike Penko, with John McDowell

AOC 57 AREA 2

UPLAND- seeded, 75% well covered with grass/herbs, 20% spotty cover, 5% bare/eroded; 34 red oak leafed out, about 1.5 " diameter stem, several with stump growth. Animal evidence- snapping turtle egg nest on slope raided by raccoon

Wetland

Water level has dropped, small ponded area at edge, exceeds 75% indigenous wetland cover criterion.

Species observed:

Tussock sedge obl
Lurid sedge obl
Umbrella sedge obl
Wool grass Facwet+
Broad-leaved cattail obl
Soft-stemmed Bullrush obl
Bristle-backed sedge Facwet+
Jewelweed Facwet
Cinnamon fern facwet
Sensitive fern facwet
Phragmites facwet – treated chemically
Purple Loosestrife facwet+ two stems pulled
Honeysuckle fac-
Red maple 7 saplings
Alder seedlings obl

Animal evidence- heard bullfrog, snapping turtle egg, racoon

Actions - Monitor exotics, small area of erosion between rock lined drain chute and wetland, will be scarified/reseeded in the fall. Before winter stakes and silt screen will be removed. The site will be monitored for exotics/invasives, loosestrife and common reed, and removal/herbicide action taken. Phragmites cut at node, stem injected with 25% Rodeo and upper end of the stem, upper end of stem removed and destroyed off site. Pesticide treatment by MA licensed applicator.

AOC 57 AREA 3 = Not Inspected on 16 June 2004.

Field Notes - Monitoring of Devens Habitat Restoration Sites
23 June 2004

CENAE Crew: Bob Davis, Peter Trinchero, with Debbie Acone et al. (see Devens Wetlands Inspection Sign-in Sheet for all present at end of field notes)

AOC 57 AREA 2

Upland- No change since 16 June 2004.

Wetland- Monitored the several herbicide treated stems of Phragmites. Plants are brown and brittle, at this point 100 % effective treatment. One additional new shoot of Phragmites was observed adjacent to the treated stems.

Animal evidence- 3 additional snapping turtle nests were exposed and raided. A leopard frog was observed.

Actions - Additional herbicide treatment required. Silt fence remains and requires removal. Reseeding of bare and mildly eroded areas to be completed in the fall.

AOC 57 AREA 3
This is an area that was overlooked during the previous monitoring. It is about 100 yards east of AOC /2. The site decontamination did not intrude as extensively into the wetland as AOC/2 but the intrusion was more than indicated on the site drawings. Upon examination, it was determined there was sufficient intrusion to include this as a monitoring site. The monitoring indicated this limited wetland area is a successful wetland mitigation by having more than 75 % of the cover native wetland plants.

Upland - There is potential for minor erosion from the adjacent un-vegetated upland area. A small area was observed with several dry rivulets, with the fine material at the bottom of the slope at the wetland edge with the coarse material remaining on the slope. Thirteen of the red oaks that were planted on the upland slope have leafed out. Some shrubs, autumn olive, have reseeded at the upland edge of the mitigated area from plantings just off the site.

Wetland - Personal communication with the Project Engineer indicated the removal activities extended several feet farther into the wetland than originally expected. The silt screen was placed too far into the wetland resulting in a small amount of silt deposited into the wetland proper. A shallow pool area recently dried and was in the process of being vegetated with jewelweed. A narrow swath of wetland vegetation developed in front of the silt screen, at the base of the mitigation. The narrow wetland area possesses more than 75% of the area with native wetland cover, which satisfies the performance standard.

Jewelweed facwet
Species Observed:
Cinnamon fern facwet
Blue flag obl
Silky willow obl
Soft rush facwet+

Action - No exotics visible.
The silt screen will be removed and may be removed anytime since it is no longer needed. Monitoring for exotics will continue. The erosion, although not serious, should be controlled with a fall hydro seeding. A layer of organic material should be applied with the seed to hold sufficient moisture for not only germination but also growth.

ATTENDANCE SHEET-DEVENS WETLANDS INSPECTION
23 June, 2004

Name	Organization	Phone
Debbie Acone	USACE	978-318-8130
Julie Paquette	DEC	978-772-8831
Peter Lowitt	DEC	978-772-8831
Takasmi Tada	BRAC	978-796-2036
Becky DaSilva	MADEP	978-767-2707
Brian Duval	MADEP	508-849-4051
David Salvadore	MADEP	508-767-2842
Ron Ostrowski	MADEV	978-772-6340
John McDowell	USACE	978-772-0159
Lynne Welsh	MADEP	508-849-4007

Pete Trinchero	USACE	978-318-8004
Bob Davis	USACE	978-318-8236
Bart Hoskins	USEPA	617-918-8375
Christine Johnson	USACE	978-318-8125

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Field Notes - Monitoring and Eradication of Exotic/Invasive Plants
24 August 2004

CENAE Wetland Monitoring Team: Robert Davis, Mike Penko and Peter Trinchero
As stated in the AOC 57 Monitoring Plan and in the Post Remediation Inspection Plan, Phragmites australis (common reed), Lythrum (purple loosestrife), and Polygonum (Japanese knotweed) were monitored and eradicated. Herbicide application was by Mike Penko, a MA licensed applicator, according to the procedure described in the monitoring plan. The purple loosestrife was pulled and disposed onsite. Purple loosestrife was not completely removed from all sites because the level of effort required for this removal would exceed the time allotted for Phragmites/Japanese knotweed eradication.

AOC 57 AREA 2

Upland- Because of the relatively wet summer conditions, several of the bare areas of the slope have been vegetated since the last inspection with smartweed, rabbit's foot and red clover. Toward the upper portion of the slope there are several areas that remain not vegetated and that should be scarified, reseeded and covered in the fall. There are a few small areas of erosion that should be treated in a similar manner. The numbers of live, planted maples and oaks remain the same and they were pruned to remove dead growth. Wanderer birch seedlings have seeded from the periphery.

Wetland- Seasonal succession of the established and healthy wetland continues with Joe-Pie-Weed and narrow leaved and rough leaved goldenrod in bloom. The grasses, sedges and cattail are beginning to seed. Shallow pools of standing water remain at the base of the slope. The dead remains of the treated Phragmites are present. No additional Phragmites is present. Several bunches of purple loosestrife were pulled but extensive stands of purple loosestrife were present in adjacent wetlands making future eradication efforts at AOC 57 probably futile. The silt fence remains to be removed at the fall monitoring visit.

AOC 57 AREA 3

Upland- As with **Area 2**, most of the bare patches have grown in with clover and smartweed. Several small areas remain which should be reseeded and covered to prevent future erosion. The planted trees were pruned.

Wetland- No Phragmites observed and several clumps of purple loosestrife were pulled. As with **Area 2**, the purple loosestrife removal may be a futile effort since there were major infestations in surrounding areas. Shallow pools of standing water are present in

the wetland with well established wetland vegetation. The silt fence remains to be removed during the fall monitoring visit.

Field Notes - DEVENS HABITAT LONG TERM MONITORING
30 September 2004

The CENAE Habitat Long Term Monitoring Team of Robert Davis and Peter Trinchero visited the Devens wetland/upland restoration sites on September 30, 2004. As with the spring and summer 2004 visits, goals were to record the progress of the restoration efforts, to monitor the success of the eradication of exotics on previous visits, and to remove silt barriers/fencing that remained on some of the sites. It is important existing silt fence be removed to eliminate barriers to wildlife between upland and wetland habitats, where these animals will find refuge for the winter. Where possible, minor habitat improvements such as erosion control, were noted and planned for implementation at a future visit. Because of the wet late summer/early fall pre-freeze conditions, plant cover was luxuriant.

AOC 57 Area 2

Upland- There has been a degradation of the upland restoration site due to current construction activity north and west of AOC57 immediately adjacent to Area 2. A large silt basin is in the final stages of construction upland/up-gradient of AOC 57. The activity of heavy equipment modifying the topography and spilling of materials such as clay liner, has directed the flow of surface water toward the straw filled conical silt barrier. AOC57 Area 2 is vulnerable because of the topography. The recent heavy and frequent rain has overtopped the silt barrier and eroded the upper end of the site. About six inches of substrate has been eroded down the slope into the wetland area. A thin layer of recently deposited silt was observed within the wetland. This erosion is limited to the eastern portion of the site.

This problem must be corrected prior to the winter freeze to avoid any additional erosion into the wetland, especially by spring runoff. The off-site road will require regrading to channel surface water from AOC 57. The eroded areas should be refilled and seeded.

The steep-sloped upland areas comply with the performance standards of 75% native vegetation cover with no bare areas exceeding 500 square feet. The ground cover is dominated by rabbit foot clover (*Trifolium arvense*), common on arid soils with low nutrient content. The next most dominant ground cover is a variety of smartweed (*Polygonum*). The 34 red oak remain, although a couple of the trees were recently browsed by deer. The growth at the base of the trees was cut back to encourage growth. Recent wanderers to the slope include sweetfern *(Comptonia perigrina)*, birch seedlings, white pine (*Pinus strobus*) and red maple (*Acer rubrum*).

There are small areas on the slope, less than 10 feet in diameter, that are bare and need of cover. Hand broadcast hydro seed mix will prevent additional erosion from these sites.

Wetland - The wetland continues to more than comply with the performance standards of 75% native wetland cover. This restoration is an attractive site, with many of the flora in bloom. At the transition between upland and wetland is a 20 ft swath of yellow Devil's Beggar-ticks in bloom. This monoculture grades into a healthy wetland with amphibian inhabited shallow pools. No additional *Phragmites* remains subsequent to the herbicide treatment. Many clumps of purple loosestrife remain but they remain equally distributed in the restoration. Much loosestrife is present offsite. The majority of the silt fence was removed. Unfortunately there are several areas where the barrier failed. These areas had a second layer of fabric applied above the partially buried lower level. The top application was totally removed but in a few areas the lower buried areas will require removal with a shovel and pick. All support stakes were removed to prevent the barrier from interfering with wildlife migration. The buried fabric will be removed at a subsequent visit. The rolls of discarded silt fence fabric were placed at the edge of the site for removal and disposal (to be arranged with NCRO).

The six red maples planted at the edge of the restoration continue to thrive. In addition to the purple loosestrife, wanderers from the surrounding wetland such as honeysuckle, red maple/birch seedlings and willow continue to appear.

A list of dominant wetland vegetation observed follows.

Common Name	**Genus/Species**	**Wetland Status**
Devil's Beggar-ticks	*Bidens frondosa*	FACW
Wool Grass	*Scirpus cyprinus*	FACW+
Umbrella Sedge	*Cyperus strigosus*	FACW
Tussock Sedge	*Carex stricta*	OBL
Soft-stemmed Bulrush	*Scirpus validus*	OBL
Marsh Purslane	*Ludwigia palustris*	OBL
Cinnamon Fern	*Osmunda cinnamomea*	FACW
Sensitive Fern	*Onoclea sensibilis*	FACW
Broad-leaved Cattail	*Typha latifolia*	OBL
Purple Loosestrife	*Lythrum salicaria*	FACW
Speckled Alder	*Alnus rugosa*	FACW+
Japanese Honeysuckle	*Lonicera japonica*	FAC-
Red Maple	*Acer rubrum*	FAC
Joe-Pie-Weed	*Eupatorium fistulosus*	FACW

Fauna observed consisted of many adult amphibians in the pools. A 12-inch snake of unknown variety was observed in the silt barrier and released.

AOC 57 Area 3

Upland- This area was not impacted by the upland/offsite construction activity. The 13 red oaks were in fine condition. Annual plant growth at the base of the trees was cut. As with Area 2, Area 3 fully complies with 75% native vegetation cover on the upland slope

with no areas of 500 square feet without vegetative cover. There are small areas lacking vegetation that could be scarified and manually hydro seeded. Wanderers from the surrounding upland forest are scattered throughout the slope such as white pine, birch and sweet fern. As with Area 2, this is secondary succession in progress. The current dominant vegetation on this upland slope consists of smartweed, rabbit foot clover, various grasses and sedges.

Wetland- The wetland restoration complies with the requirement of 75% native wetland cover, with only miniscule areas of the wetland lacking cover. No *Phragmites* was recorded at this site, although clumps of purple loosestrife are scattered throughout the restoration area and the existing, surrounding wetland. All the silt fencing and stakes were removed from the site, gathered for removal and disposal (to be arranged with NCRO).

The dominant vegetation observed at the site was similar to that at Area 2 with the following additional flora recorded:

Common Name	**Scientific Name**	**Wetland Status**
Nodding Bur Marigold	*Bidens cornuta*	OBL
Common Burdock	*Arctium minus*	UP
Rough-leaved Goldenrod	*Solidago patula*	OBL
Multiflora Rose	*Rosa multiflora*	FACU
Jewelweed	*Impatiens capensis*	FACW
Small White Aster	*Aster vimineus*	FAC
New York Aster	*Aster novi-belgi*	FACW+

Many amphibians were observed in the wetland pools.

Field Notes - Devens Wetland Restoration Sites
October 13, 2004

On October 13, 2004, the wetland monitoring team consisting of Team Leader Robert Davis, Ben Loyd and Peter Trinchero spent about 4 hours visiting the several Devens wetland restoration sites to remove silt fence, evaluate ongoing exotic plant eradication efforts and to monitor the condition of the restored wetlands. It was critical the silt fence is removed prior to winter since it may act as a barrier to animals accessing winter cover in the wetland.

AOC 57 - Area 2
Silt fence was removed from the edge of the wetland. There were a few areas where the silt fence was buried. Removal of the silt fence in these areas would have disrupted the wetland so the support poles were broken and the fencing was cut at the surface of the ground. Fence was collected and placed at the top of the site for off-site removal. This restoration also more than satisfies the 75% criterion. A small clump of Phragmites was noted just east of the second monitoring well from the east. Purple loosestrife was

observed but not removed due to time restraints. Plant cover for both the wetland and the upland was similar to Site 3. There was significant erosion onto Site 2 as a result of construction activity above the site. This construction was associated with the building of a large silt basin just west and upland of the wetland restoration. The access road created to construct this structure diverts amounts of upland drainage onto the upland slope of AOC 57, Site 2. Although there was a small amount of erosion visible at previous monitoring visits from this upland area, there was erosion under the silt blanket. This increased runoff due to the construction activity resulted in much greater erosion from the upland especially on the east side of the site. The continuation of the erosion, especially during the winter and spring conditions, may impact the wetland vegetation with silt. In addition, the overflow from the newly constructed runoff basin directly flows into the wetland associated with Site 2. The impact of the new runoff basin on the two reconstructed wetlands in AOC 57 is unknown. It may act to prevent silt from entering the wetland, but it may also concentrate nutrients resulting in additional eutrophication of the wetland.

AOC 57 - Area 3

Silt fence was removed from the upland/wetland interface, and placed at the top of the site for off-site disposal. The water level in the wetland area exceeded the levels of the previous visit in August. The wetland restoration remains successful exceeding the 75% wetland plant cover. Fall conditions prevailed with much of the above ground vegetation in seed, dying back or with leaves in fall color. No Phragmites was observed, but several clumps of purple loosestrife were observed and pulled from the ground. Soft rush, broad-leaved cattail, burr reed, cotton grass, tussock sedge, blue vervain, silky dogwood and alder dominated the wetland area. The upland area was well stabilized with no evidence of erosion on the slopes. Red maple and white pine wanderers had colonized the edges of the upland slopes. Ground cover on the upland slopes consisted of rabbit foot clover, cow and bull thistle with many other unidentified grasses and weeds. The conservation mix provided to stabilize the slope is being replaced by colonizing species. There was no loss of red maple and oak saplings planted on the upland.

The wetland team leader subsequently reported these conditions concerning the observed erosion and sedimentation onto AOC57 Area 2 to the USCAE Project Manager for corrective action.

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APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 2: Overview from top of restored upland slope with restored Bordering Vegetated Wetland in the background (August 28, 2006).

AOC 57 Area 2: Close-up of Bordering Vegetated Wetland at base of upland slope (August 28, 2006).

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 2: Upland slope looking north with shrub community dominated by Autumn olive (August 28, 2006).

AOC 57 Area 2: West side of restored upland slope with encroachment of Autumn olive from the adjacent forest on the right (August 28, 2006).

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 3: Restored upland slope with the Bordering Vegetated Wetland edge in the background (August 28, 2006).

AOC 57 Area 3: Upland slope looking north dominated by Autumn olive on the west or right side (August 28, 2006).

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 3: Bordering Vegetated Wetland edge vegetation with standing water (August 28, 2006).

AOC 57 Area 2: Pool of storm water in front of berm installed in 2006 parallel to erosion control tube (top right corner) to well beyond the eastern edge of Area 2 (August 28, 2006)

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 2: Close-up of pool of storm water retained by berm with restored upland portion in top right corner (August 28, 2006).

AOC 57 Area 2: Treatment of Autumn olive cut stumps with herbicide (September 18, 2006).

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 2: Upland slope looking north after treatment of Autumn olive and placement cut shrubs into brush piles for wildlife habitat (September 25, 2006).

AOC 57 Area 2: Planted oak tree after removal of the surrounding Autumn olive shrubs (September 25, 2006).

APPENDIX B

Area of Contamination (AOC) 57 – Photo Log Areas 2 and 3, 2006

AOC 57 Area 2: Pool of storm water in front of berm installed in 2006 parallel to erosion control tube (top right corner) to well beyond the eastern edge of Area 2 (November 14, 2006).

AOC 57 Area 2: Pool of storm water and recent erosion at the eastern edge of Area 2 immediately in front of berm installed in 2006 (November 14, 2006).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3- 2005

AOC 57 Area 2: Bordering Vegetated Wetland at base of upland slope (July 14, 2005).

AOC 57 Area 2: Overview of Area 2 from top of restored upland slope (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Stand of invasive common reed, *Phragmites*, prior to treatment (July 14, 2005).

AOC 57 Area 2: Close-up of vegetation in Bordering Vegetated Wetland (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Erosion of upgradient stockpiled soils onto the restored upland as a result of the failed erosion control tube as observed by the Groundwater LTM Team (May 19, 2005).

AOC 57 Area 2: Immediate corrective action taken by the Groundwater LTM Team to block the undermining by filling with nearby rock (May 19, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Site inspection of the failed erosion control measures at the top of Area 2 by the Restoration Advisory Board (May 23, 2005).

AOC 57 Area 2: Close-up showing the failed section of the erosion control tube and sedimentation from upgradient soil stockpiles (May 23, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Degraded upland area at top of restored slope immediately downgradient of the existing erosion control tube with the newly erected unvegetated berm by MassDevelopment in the background with the soil stockpiles in the far background.

AOC 57 Area 2: Close-up of newly constructed unvegetated berm installed parallel to the erosion control tube that only extended to the eastern edge of the site (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Area immediately below the drainage channel established to protect the slope from erosion and armored with rip rap stone on the east side of the slope showing indications of erosion and sedimentation (July 14, 2005).

AOC 57 Area 2: Close-up of base of established drainage channel to protect upland slope and adjacent wetland from erosion and sedimentation showing indications of erosion and sedimentation (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Observed eroded drainage channel pathway (left to right) from base of the established rip rap drainage channel resulting in observed siltation to the existing bordering vegetated

AOC 57 Area 2: Close-up of a finger scoop of wetland sediment showing the underlying hydric soil (darker color) covered by a layer of fine silt (lighter brown color) as a result of erosion from

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Extension of the unvegetated berm installed parallel to the erosion control tube to well beyond the eastern edge of the site (November 1, 2005).

AOC 57 Area 2: Close-up of the newly installed erosion control tube (red & black stripes) to replace the degraded erosion control tube (orange & black stripes) (November 1, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 2: Upgradient view of unvegetated berm after heavy rains (November 1, 2005).

AOC 57 Area 2: Revegetation of upland slope impacted by erosion and sedimentation.

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 3: Overview of restored upland slope adjacent to Bordering Vegetated Wetland in the background (July 14, 2005).

AOC 57 Area 3: Restored upland slope vegetation and coverage (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2005

AOC 57 Area 3: Close-up of vegetation in Bordering Vegetated Wetland (July 14, 2005).

AOC 57 Area 3: Close-up of standing water in Bordering Vegetated Wetland (July 14, 2005).

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2004

AOC 57 – Area 2: Restoration Work – Silt Fence Removal (July 2004)

AOC 57 – Area 2: Edge of Wetland With Layer of Fine Silt (July 2004)

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2004

AOC 57 – Area 2: Silt Barrier/ Siltation (July 2004)

AOC 57 – Area 2: Siltation on Upland Slope (July 2004)

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2004

AOC 57 – Area 2: Silt Barrier/ Siltation on Upland Slope (July 2004)

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2004

AOC 57 – Area 3: Restoration Work, Silt Fence Removal (July 2004)

AOC 57 – Area 3: Wetland Transition Area (July 2004)

APPENDIX B

Area of Contamination 57 (AOC) - Photo Log Areas 2 and 3 - 2004

AOC 57 – Area 3: Wetland Vegetation (July 2004)

AOC 57 – Area 3: Wetland Vegetation (July 2004)