

**2013 ANNUAL MONITORING REPORT
(REPORT 1)
for
SOUTH ROAD MITIGATION SITE #15**

New Hampshire Department of Transportation
Salem-Manchester IM-0931(205), 10418F
[Related to Federal Project No. IM-IR-93-1(174)0]
Interstate 93 Improvements
Londonderry, New Hampshire

Project Permits:

United States Army Corps of Engineers Permit No. 199201232/NAE-2004-233
New Hampshire Department of Environmental Services Permit No. 2002-02033

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1.0 PROJECT OVERVIEW:

The South Road Mitigation Site #15 is one of five wetland creation sites identified in the 2004 Final Environmental Impact Statement (FEIS), along with an extensive package of land preservation and other mitigation that is intended to compensate for wetland impacts related to the New Hampshire (NH) Department of Transportation (NHDOT) Salem-Manchester Interstate 93 (I93) Widening project. The complete history and additional details of the mitigation package are provided in the separate “Wetland Technical Report - Interstate 93 Improvements Salem to Manchester,” completed in July 2004 by Vanasse Hangen Brustlin, Inc. (VHB 2004) and available through the NHDOT.

The South Road site is approximately 75 acres in size and includes three lots located in Londonderry, NH. Two of the lots are known as Site #14, are accessed from Gilcrest Road, and consist of a former sand pit and undisturbed land containing a portion of Beaver Brook, associated wetlands, and floodplains. Of the two lots that are part of Site #14, the westernmost lot encompasses the former sand pit and is being used for wetland creation (referred to as the north site on related project plans) that began construction in August 2011, but it will not be finished until the spring of 2014. The second lot to the southeast encompasses a reach of Beaver Brook and adjacent wetlands and floodplains, and it has been preserved in an undisturbed state as part of the overall mitigation package. The third lot, known as Site #15, is located on the south side of South Road, and it encompasses a partially disturbed gravel moraine that has been mined and logged in the past, an open farm field, and some forested wetlands. Site #15 is also adjacent to a pond located east of the site and a tributary to Beaver Brook located south of the site. Site #15 was used for wetland creation (referred to as the south site on related project plans) that was completed between August 2011 and June 2012. Please see the aerial and site location plans for the South Road Mitigation Sites (enclosed in Appendix D) taken from the NHDOT Wetland Mitigation Technical Report that depict the location of the three lots relative to the surrounding areas.

The wetland creation activities on the South Road Mitigation Site #15 were completed in June 2012, and they are the subject of this mitigation monitoring report. Although Site #14 is considered part of the overall mitigation plan, it will not be completed until Fall of 2014. Site #14 will not be subject to post-construction monitoring until at least 2014, and it was not reviewed as part of this monitoring period.

Despite some previous disturbances on Site #15, the subject property was considered a good candidate for wetland creation due to availability of the property, and the close proximity to numerous wetlands, a pond to the east, other undeveloped lands surrounding the property, and existing wildlife habitat that includes Blanding's (*Emydoidea blandingii*), wood (*Glyptemy insculptas*), and spotted (*Clemmis guttata*) turtle species. The general intent of the mitigation plan was to provide additional flood storage, provide for flood flow alteration, and create wetland habitat on the mitigation site. The design on Site #15 was intended to create approximately 1.6 acres of wetlands and turtle habitat, in addition to preserving other surrounding areas in an undisturbed state. The existing site where the wetland creation activities were proposed consisted of mainly open relatively level sandy areas that have been previously disturbed to mine sand and gravel material at the site. On the southwest side of the site, an existing 30-foot high gravel moraine with steep side slopes was preserved during construction, and it was densely wooded along the top of the escarpment. The west side of the site consisted of some wooded areas and an open field that were not disturbed. The site is bordered on the north by a narrow strip of

Town conservation land with heavily wooded areas farther north. The site is bordered on the east by a man-made pond that is connected to Beaver Brook and part of a broad floodplain that lies south of the site and south of the gravel moraine. The site was acquired by the NHDOT and was reserved for wetland creation and floodplain storage as part of the larger I-93 Salem-Manchester corridor project. The approximate location of Site #15 is shown on the enclosed Figure 1 - Site #15 Location Map.

The wetland creation activities at the South Road Mitigation Site #15 were monitored in accordance with the regulatory requirements, permit conditions, and success standards established for the project during the design and permitting phases. This monitoring report summarizes the data collected, and it documents the site conditions at the end of the first full growing season (2013) following construction. This report also fulfills the first-year monitoring and reporting requirements for the mitigation site in accordance with the United States Army Corps of Engineers (USACE) Permit No. 199201232/NAE-2004-233 (USACE Permit) and the NH Department of Environmental Services (NHDES) Permit No. 2002-02033 (NHDES Wetland Permit). Copies of the permits are included in Appendix B. Mitigation monitoring inspections and reporting are required according to condition #48 of the NHDES Wetland Permit (see Appendix B) for the first, second, and third years following construction, including a wetland delineation (condition #50) after the fifth year following construction. Other conditions of the NHDES Wetland Permit and the USACE Permit also reinforce related monitoring requirements such as scope, timing, content, and reporting (see Appendix B).

The information was collected for this report on October 16 and 26, 2013 for the end of the first growing season (fall) by Timothy F. McCormick, NH Certified Wetland Scientist and Certified Soil Scientist (CWS #81/CSS #78) of Pathways Consulting, LLC (Pathways), in conjunction with Brendan J. Quigley (CWS #249) of Gove Environmental Services, Inc. (GES). Pathways, on behalf of the NHDOT, also completed extensive monitoring and reporting during the construction period from August 2011 to June 2012, post-construction monitoring following the completion of all work at this site in October 2012, and spring monitoring in May 2013, in accordance with the requirements of the aforementioned permits. Results of this construction and post-construction review were presented in periodic observation reports that are available from the NHDOT.

2.0 MITIGATION DESIGN GOALS:

2.1 General Mitigation Design Goals

The wetland creation activities at the overall South Road Mitigation Site (Sites #14 and #15) were intended to replace lost functions and values of the previously existing wetlands impacted during the 19.8 mile Salem-Manchester I-93 Widening project, including flood storage, flood flow alteration, and biological productivity through wildlife habitat creation and preservation. This general intent was described in the Wetland Mitigation Technical Report entitled "South Road - Londonderry, Sites #14 and #15, Salem to Manchester, IM-IR-93-1(174)0, 10418-C, NH," (Wetland Mitigation Technical Report), prepared by the NHDOT in January 2007 for the project. This Wetland Mitigation Technical Report was based on the overall mitigation package for the I-93 improvements detailed in the VHB 2004 Wetland Mitigation Report prepared for the NHDOT. The preliminary site analysis and design information was utilized by the NHDOT in 2010 to complete the final design and permitting for the specific wetland

mitigation activities on the referenced site as part of the NHDOT Salem-Manchester 0931(205), 10418F project.

According to the NHDOT Wetland Mitigation Technical Report (NHDOT, 2007), the general goal of the wetland creation design and construction was to provide several important benefits to the surrounding natural environment and communities. The specific functions and values provided by the South Road Mitigation Site include the following:

- Flood Flow Alteration (Flood Storage) - create basin-like morphology to increase available flood flow storage, runoff attenuation through restriction of an outlet to limit the rate of discharge, peak flow desynchronization within the localized areas that are part of the broader Spicket River watershed, and establishing persistent wetland vegetation and limited open water areas to slow runoff rate; and
- Enhance Biological Productivity (including Wildlife Habitat) - enhance current biological productivity within areas near Beaver Brook by creating variable shaped wetlands, open water and bare sand areas with a range of cover types and wetland zones, encourage the creation of turtle nesting habitat, and incorporate muck moat areas and aggressive thorn-bearing vegetation around the perimeter to discourage ATV and other access.

2.2 Final Design and Construction Constraints

The final design of the South Road Mitigation Site (Sites #14 and #15) represented in the NHDOT Project Plans incorporated many specific design constraints outlined in the Wetland Mitigation Technical Report, as well as those identified during the design and permitting process. These design constraints were intended to address many site-specific factors and guide the site construction in a manner that would maximize the potential for the site to achieve the overall wetland functions and values. The following is a listing of these important design constraints that were part of the final design and construction:

- Grade the site to appropriate elevations to achieve intended mix of wetlands zones, including deep and shallow emergent, scrub-shrub and forested, and uplands, including forest and bare sand cover that will provide turtle habitat and enhance surrounding wildlife habitat;
- Installation of features on the site that will discourage ATV intrusion including “boggy” muck moat filled with thick organic material, and dense thorn-bearing vegetation around the site perimeter;
- Grading designed to intercept groundwater at elevations based on previous monitoring;
- Grading designed to intercept flood waters from the adjacent Beaver Brook and associated floodplains only during flood events without incorporating direct surface water connections to Beaver Brook and the man-made pond;
- Minimize side slopes to 1:10 or less, where possible, to preserve the integrity of wetland zones;
- Phase the wetland creation in the mitigation area concurrently with the highway construction to facilitate excavation and salvage of wetland humus and topsoil for use on the mitigation site;

- Minimize compaction of underlying soils during construction;
- Sequence construction activities to facilitate appropriate timing of site stabilization and planting, limit sedimentation and erosion, and reduce the need for dewatering;
- For wetland zones, utilize wetland topsoil of adequate depth (12 inches) and composition to meet minimum organic requirements (9 to 21 percent) per the USACE guidelines;
- Minimize clearing and the removal of mature trees around the site perimeter to preserve existing vegetation buffers and supplement buffers with additional screening plantings, where possible;
- Preserve open sand and sparsely vegetated areas in and around created zones where possible;
- Utilize appropriate plantings from the list of suitable species with preference for native plant species and those found in nearby wetland habitats;
- Utilize appropriate seed mixes for wetland and upland zones;
- Seed immediately after topsoil application to facilitate rapid vegetative growth;
- Include provisions for installing a temporary irrigation system that will be maintained for two (2) years following landscape installation;
- Salvage topsoil and wetland humus from appropriate areas for restoration of the wetland and upland areas of the site;
- Salvage coarse woody debris (e.g., stumps and logs) and rocks from the site and utilize in wetland zones;
- Follow the NHDOT standards for erosion and sediment control;
- Prevent invasive species from being brought to the site by screening wetland soils and other materials imported to the site;
- Minimize the spread of invasive species already present on the site by preventing disturbance in these areas, where possible, and remediating areas where disturbances are necessary; and
- Install adequate barriers, gates, and/or signage to limit site access.

2.3 Construction Process

The wetland creation on South Road Mitigation Site #15 was constructed by Severino Trucking Co., Inc. under contract with the NHDOT, utilizing the NHDOT Project Plans entitled “NHDOT Construction Plans, Federal Aid Primary Project, Federal Project No. IM-0931(205), NH Project No. 10418-F, Wetland Mitigation Site L-8, L-8 Ext., & L-12, and South Road Improvements, Town of Londonderry, County of Rockingham,” dated November 18, 2010. Copies of these plans are provided in Appendix C for reference. The NHDOT Project Plans included all work required for construction of the overall South Road Mitigation Site, including wetland creation at Site #15, such as clearing, invasive plant remediation, excavation, grading, filling, special wetland soil placement, upland and wetland seeding and planting, erosion and sediment control, site restoration, and other incidental work.

As mentioned in Section 1.0 of this report, the NHDOT retained Pathways in August 2011 to review the final design and perform extensive monitoring and reporting during the construction period from August 2011 to June 2012, to assist

the NHDOT with implementing the design and construction in accordance with the requirements of the permits. In accordance with the requirements of the permits, a pre-construction meeting was held on June 10, 2011 with the Interdisciplinary Oversight Team (IOT), consisting of NHDOT representatives and regulatory agency representatives (USACE, NHDES, NHNH, and others), to review the mitigation site prior to the start of the construction phase. During our general design review, several noteworthy changes, as described below, were incorporated into the mitigation construction to address NHDOT, regulatory agency, and contractor input; varying and/or unexpected site conditions; material and plant availability; and construction methodologies:

- During excavation of the muck moat, the proposed subgrade elevation was raised approximately two (2) feet from the previously specified elevation of 215 to 217 due to excessive standing water in the partially excavated muck moat as a result of high water levels in the adjacent man-made pond. Since the finished grade in the muck moat was not adjusted, this change also reduced the depth of the special wetland soils in the muck moat from approximately five (5) feet to three (3) feet. This adjustment limited the extent of dewatering and facilitated drier conditions for completion of excavation and placement of special wetland soil.
- Any clearing and excavation specified on the NHDOT Project Plans for the existing sand moraine at approximate Sta. 51+00 LT and 52+00 LT was minimized to prevent destabilization of the existing sand slopes.
- Minor substitutions were incorporated into the NHDOT Item 644.22 - Shrub/Forest Wetland Seed Mix and NHDOT Item 644.70 - Upland Seed Mix specified in the NHDOT Project Plans (Sheet 122), due to lack of availability for specific seed in the mixes. Since the NHDOT reviewed the final seed submittals, we were not given the opportunity to confirm some of the specific substitutions, but this information is available from the NHDOT, as needed. For Item 644.22 used in the planned wetlands and on the muck moat slopes, Gray Birch and Speckled Alder were replaced with other shrub species, and the suggested alternatives included Silky or Red Osier Dogwood, Elderberry, Arrowwood, Pepperbush, and Steeplebush. These areas were also supplemented with NHDOT Item 644.62 - Wet Basin/Meadow Seed, including Autumn Bentgrass, American Mannagrass, Woolgrass, Fox Sedge, Fringed Sedge, Soft Rush, and Rattlesnake Grass, with annual rye grass to assist with early growth and erosion control. We are not aware of any changes to Item 644.70 used on the upland areas.
- No substitutions were necessary for the specified plant species.
- Although not specified on the NHDOT Project Plans, plant species were planted within appropriate areas according to moisture tolerance for each species. Species appropriate for wetter conditions, such as Speckled Alder and Silky Dogwood, were planted in the lower saturated areas of the slopes, while species more suitable for drier conditions, such as Arrowwood or Cockspur Hawthorn, were planted higher up on the slope.
- Due to excessive standing water in the muck moats, all specified wetland plants (excluding upland species Cockspur Hawthorn, Blackberry, and Pitch Pines) were installed on the muck moat slopes between the toe at the finished muck moat surface (elevation 220) and the top of the slope or first grade break (ranging from 222 to 225). While this work was generally the

intent of the proposed plantings, extending this zone to the top of the slope resulted in plantings higher up on the slope than depicted on the NHDOT Project Plans.

- No shrubs, trees, or seeding were installed on the side slopes around the turtle nesting island in the central portion of the site between Sta. 50+50 to 51+00 RT, which was intended to preserve bare sand slopes for turtle access to the nesting mound.
- More Silky Dogwood and Speckled Alder plantings were placed on the slope between Sta. 50+00 to 51+00 LT, due to the fact that this shallow slope was saturated and presented a good opportunity to establish shrubs within this wetland area. Some extra Blackberry shrubs were planted between Sta. 53+00 to 54+00 LT to compensate for the lack of other shrubs in this area.
- Plantings specified for the relatively level connection from the turtle island to the berm between Sta. 50+00 to 50+50 RT were concentrated along the eastern slope near Sta. 50+00, to preserve the sand surfaces for turtles and increase the density of the plantings to form a more prominent barrier to access onto the island.
- Although not specifically detailed on the NHDOT Project Plans, the contractor was directed to install most of the thorn-bearing Cockspur Hawthorn and Blackberry plants on the existing berm between the muck moat and existing pond and at Sta. 50+00 to 51+00 LT, to discourage ATV access across this berm and into the site from the south.
- Most of the Pitch Pine plantings were installed in the openings of the existing treeline near Sta. 50+00 to 51+00 LT (south) and Sta. 52+50 (west) to help discourage access to the site through these areas and to increase screening.
- Some Pitch Pine, Cockspur Hawthorn, and Blackberry plantings were concentrated on the north side of the site along the new chain link fence to increase screening.
- Additional boulders were added along the South Road frontage to the existing line of boulders in prominent openings to increase the barrier and further discourage ATV access to the site.

3.0 MONITORING REQUIREMENTS AND SUCCESS STANDARDS:

During the preliminary environmental review, design, and permitting phases of the project, a number of general requirements, protocols, and success standards were developed for monitoring of the wetland creation activities at the Baggett Mitigation Site. Many of these requirements have been outlined in the NHDOT Wetland Mitigation Technical Report, as well as the USACE and NHDES permit conditions.

In general, the NHDOT Wetland Mitigation Technical Report contained guidance on the long-term monitoring requirements, including timing, regulatory requirements, performance standards, reporting requirements, and contingency planning for remedial actions. Most of the critical monitoring guidance has been incorporated into the USACE and NHDES permit conditions, with the exception of the success standards, which are outlined below for the purpose of this report.

The following specific standards of success and performance criteria were proposed in the NHDOT Wetland Mitigation Technical Report, and they are very similar to the five

success standards established by the USACE for mitigation sites, which are, therefore, appropriate for this evaluation:

1. *The site has the hydrology, as demonstrated with well data collected at least weekly from March through June or other substantial evidence, to support the designated wetland type.*
 - a. *The proposed hydrology has been met at the site.*
 - b. *The percentage of the site meeting the projected hydrology levels is identified.*
 - c. *Areas that are too wet or too dry are identified along with suggested corrective measures.*

2. *The proposed vegetation diversity and/or density goals for woody plants from the plan are met. This should be at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for the proposed forested cover types, that are healthy and vigorous and are at least 18 inches tall in 75% of each planned woody zone AND at least the following number of non-exotic species, including planted and volunteer species. Volunteer species should support functions consistent with the design goals. To count a species, it should be well represented on the site (e.g., at least 50 individuals of that species per acre).*

<u># Species Planted</u>	<u>Minimum # Species Present (volunteer and planted)</u>
2	2
3	3
4	3
5	4
6	4
7	5
8	5
9 or more	6

Vegetative zones consist of areas proposed for various types of wetlands (shrub swamp, forested swamp, etc.). The performance standards for density can be assessed using either total inventory or quadrat sampling methods, depending upon the size and complexity of the site.

3. *The following items apply:*
 - a. *Each mitigation site has at least 80% areal cover, excluding planned open water areas or planned bare soil areas (such as turtle nesting), by noninvasive species.*
 - b. *Planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes.*
 - c. *Planned scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species.*
 - d. *For the purpose of this success standard, invasive species of hydrophytes are:*

*Cattails – **Typha latifolia**, **Typha angustifolia**, **Typha glauca**;
 Common Reed – **Phragmites australis**;
 Purple Loosestrife – **Lythrum salicaria**;
 Reed Canary Grass – **Phalaris arundinacea**; and
 Buckthorn – **Rhamnus frangula**.*

4. *Common reed (Phragmites australis), Purple Loosestrife (Lythrum salicaria), Russian and Autumn Olive (Elaeagnus spp.), Buckhorn (Rhamnus spp.), Japanese knotweed (Polygonum cuspidatum), and/or Multiflora rose (Rosa multiflora) plants at the mitigation site are being controlled. For this standard, small patches must be eliminated during the entire monitoring period. Large patches must be aggressively treated and the treatment documented.*
5. *All slopes, soils, substrates, and constructed features within and adjacent to the mitigation site are stable.*

Since this report represents the first year following construction, it was too early in the long-term monitoring period to provide definitive conclusions relative to the success and performance criteria. However, these criteria were used during the current monitoring period as a basis for evaluating our latest field observations, data, conclusions, and recommendations for the mitigation site relative to the overall success and mitigation goals. These criteria shall also continue to be used during future monitoring periods as a basis for evaluating the overall success of the mitigation site, observing and documenting changes from previously observed conditions, identifying trends, and determining the need for future remedial and/or corrective actions.

4.0 SUMMARY DATA:

There were three visits to the mitigation site for this first year monitoring report, including May 30, 2013 (spring review), October 16, 2013 and October 26, 2013 (fall review). The following sections describe our observations during these visits.

4.1 Spring (May 30, 2013) Observations

The May 2013 site visit was intended to document the general site conditions observed during the spring of the first growing season following construction that was completed in June 2012. The goal of the spring 2013 site visit was to review the current spring conditions on the mitigation site, and to establish “baseline” information that would be utilized for evaluation of the site during the more detailed fall 2013 monitoring period.

Our spring monitoring efforts included a general review of the species, health, coverage, and diversity of vegetation present on the site within each planned wetland and upland zone; identifying general limits of various zones; documenting the extent of standing water and saturated soils in each wetland zone; reviewing the general stability of soils, slopes, and other constructed features of the site; recording evidence of wildlife on the site; and observing new and existing invasive species areas.

Several photographs were taken around the site that could be used to track progress during each future monitoring period.

The following is a summary of the general observations made during the spring monitoring period, as documented in our previous September 4, 2013 report:

- **Turtle Nesting Area (Island)** - This area appeared to be functioning as designed, and the ground surface consisted of mainly bare sand with little

vegetation. The soils on the mound, flat areas, and side slopes appeared to be stable with no evidence of erosion. The slopes around the perimeter of the island were densely vegetated as intended, and there was some vegetation on the flat connection to the east, including sedges, rushes, and grasses. The soil in the flat connection was also inundated with six (6) inches of water (approximate elevation 222.5) and the soils appeared to be hydric. There was some evidence of turtle activity, and also other small mammal tracks on the sand surfaces. Limited invasive Purple Loosestrife was also noted around the perimeter.

- **Muck Moat Area (Planned Shrub/Forested Wetland)** - Areas appeared to be functioning as designed, deterring ATV access to the turtle nesting island. However, the muck moat seemed to be developing as a palustrine open water (POW) or aquatic bed (PAB) wetland, rather than a palustrine scrub-shrub (PSS) or palustrine forested (PFO) wetland as planned. The muck moat was inundated to a depth of 2.5 feet above the finished grade (approximate elevation 222.5), and the water surface was at the same level as the adjacent pond to the east. The soils were assumed to be hydric based on the standing water and types of vegetation present. Significant vegetation was observed in the muck moats that consisted primarily of Cattails and water-dependent species such as Pondweed, Water Smartweed, Water Arum, and Water Lily. Some frogs, turtles, and ducks were observed in this area.
- **Scrub/Shrub Transition Area (Planned Shrub/Forested Wetland)** - Areas appeared to be functioning as designed. The area seemed to be developing as palustrine scrub-shrub (PSS) wetlands on the upper portions of the slope with a narrow band of palustrine emergent (PEM) wetlands, despite being designed as a palustrine scrub-shrub (PSS) or palustrine forested (PFO) wetland. The soils were assumed to be hydric to near the top of the slope based on the vegetation present. Along the lower fringe areas near the current water level, the vegetation consisted primarily of Cattails, sedges, rushes, and some emergent grasses. On the higher portion of the slopes, vegetation consisted of shrubs and other herbaceous vegetation typical of PSS wetlands such as Red Osier Dogwood, Arrowwood, Speckled Alder, Switchgrass, Deer Tongue Grass, Smartweed, Clover, and Birdsfoot Trefoil, including many species that were planted during construction. Some invasive Purple Loosestrife was also noted in these areas. The slopes also appeared to be stable with no evidence of erosion.
- **Upland Areas (Planned Slope Stabilization and Site Restoration)** - Areas have been densely vegetated with a number of trees, shrubs, and other herbaceous vegetation such as Gray Birch, Sweet Fern, Oak, Asters, Primrose, Cockspur Hawthorn, and Blackberry, including many species that were planted during construction. Some of the species intended for the scrub-shrub transition area described above were also found in the upland areas near the top of the slope, including Red Osier Dogwood, Meadowsweet, Arrowwood, Switchgrass, Deer Tongue Grass, Smartweed, and Birdsfoot Trefoil. Limited invasive Purple Loosestrife was also noted in these areas. The soils were assumed to be non-hydric. Although some limited erosion was noted on the sand esker southwest of the muck moat and the berm on the east side of the moat, most upland areas appeared to be stable. Some evidence of wildlife was noted in some areas of the site,

including several prominent animal tracks across the existing berm between the muck moat and the pond east of the site.

- The general health, coverage, and diversity of vegetation were good in most areas of the site and some new volunteer species were noted.
- Although the constructed features (fence, boulders) intended to discourage access to the site appeared to be working, some ATV tracks were noted on the south and west sides of the site.
- There was a substantial amount of debris scattered around the site, including trash, wood, and metal construction stakes, and construction fence and silt fence.
- The gravel access road appeared to be stable.
- Invasive Purple Loosestrife and Oriental Bittersweet were noted in limited areas of the site.
- Some evidence was noted of wildlife usage, including fox, avian species, insects, and amphibians.

4.2 Fall (October 16 and 26, 2013) Observations

During our October 2013 site visits, we reviewed the mitigation site to collect information and observations on the general site conditions, the overall mitigation design goals, and success standards set forth herein. We also conducted plant counts, vegetation observations, and soil evaluations at six (6) vegetation plots (specifically abbreviated as VEG-1 through VEG-6, respectively, in this report) located along the previously established construction baseline within the various planned wetland/upland zones on the mitigation site. We also performed a general review of the health and diversity of vegetation present on the site within each planned wetland and upland zone; identifying general limits of and changes to various zones; documenting the extent of standing water and saturated soils in each wetland zone; reviewing the general stability of soils, slopes, and other constructed features of the site; recording evidence of wildlife on the site; and observing new and existing invasive species areas.

The six (6) vegetation plots were located as necessary to evaluate vegetation at one plot within each planned wetland and upland zone on the site. The vegetation plot locations were identified in the field with wooden stakes, wetland flagging, and metal tags with corresponding labels, to assist with future use. Please note that we were unable to access VEG-4 due to high water levels in the muck moat; thus, this plot was not staked in the field. Each vegetation plot location was referenced to the established baseline used during construction, and the plots and baseline are depicted on Figure 2 - 2013 South Road Mitigation Site #15 Monitoring Plan included at the end of this report for reference.

Results of the vegetation and soil evaluations from the fall of 2013, as well as observations regarding site hydrology, limits of planned wetland zones, and other general conditions, are discussed in more detail in the following sections.

Photographs were also obtained from various viewpoints on the site that can be used to track progress during each future monitoring period. These photographs have been included in Appendix A at the end of this report.

4.3 Vegetation

This was the first comprehensive review following construction, and also the first opportunity to collect detailed data from the six (6) vegetation plots established during the fall 2013 monitoring efforts. Five (5) of the vegetation plots were accessible for data collection due to reasonable water levels within the site, except for VEG-4 located in the center of the muck moat and under water. Data were estimated for VEG-4 from a point near Sta. 202+90 approximately 40 feet away. The vegetation plots were initially evaluated using the methodology in the USACE “1987 Wetlands Delineation Manual, Technical Report Y-87-1,” dated January 1987 (1987 Wetland Manual) and the subsequent USACE “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0),” dated January 2012 (2012 Regional Supplement) for determining plant composition and hydrophytic vegetation, and then evaluated relative to the defined success standards.

The six (6) vegetative plots (VEG-1 to VEG-6) were established to obtain data from at least one plot within each of the planned wetland and upland zones on the mitigation site. Plant counts, species composition, and other vegetation observations were recorded on data sheets for each vegetation plot in accordance with the aforementioned USACE documents. Shrub vegetation was counted within a 15-foot radius, while herbaceous vegetation was counted within a 5-foot radius at the three vegetation plots. Table 1 - Summary of Vegetation Plot Data (2013), included at the end of this report, provides the results of the vegetation observations for each of the six (6) vegetation plots reviewed. No formal wetland delineation or determination of wetland limits was required during this monitoring period, but may be required in the future.

The following is a summary of the specific vegetation observations at each plot:

Vegetation Plot No. 1 (VEG-1): VEG-1 is located at transect Sta. 200+76 RT 30' within the planned shrub/forested upland area identified on the NHDOT Project Plans for slope stabilization (see Site Photograph No. 10 in Appendix A). As a result of the clearing and grading completed during construction, this area appeared to be more comparable to the adjacent scrub-shrub wetland transition zone than an upland area. The vegetation at this plot included a substantial herbaceous layer and many shrubs. The herbaceous layer was dominated by 35% Shallow Sedge (*Carex lurida*)(OBL) and 30% Pointed Broom Sedge (*Carex scoparia*)(FACW), with 10% Deer Tongue Grass (*Panicum clandestinum*)(NI) and 10% Soft Rush (*Juncus effuses*)(FACW+). The shrubs were dominated by Speckled Alder (*Alnus rugosa*)(FACW+) and Sweet Fern (*Comptonia peregrina*)(NI) with several Arrowwood (*Viburnum recognitum*)(FACW-). Most of the non-invasive vegetation observed at this plot (except for the invasive Purple Loosestrife) was part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 2 (VEG-2): VEG-2 is located at transect Sta. 202+03 RT 60' on the existing berm between the existing pond and muck moat within the planned shrub/forested upland area identified on the NHDOT Project Plans for slope stabilization (see Site Photograph Nos. 11 and 19 in Appendix A). The vegetation at this upland plot included a substantial herbaceous layer and many shrubs, including a number of shrubs planted as an access barrier along the berm.

The herbaceous layer was dominated by 30% Deer Tongue Grass (*Panicum clandestinum*)(NI), 25% Crabgrass (*Digitaria sanguinalis*)(FACU-), and 15% Small White Aster (*Aster vimineau*)(FAC). The shrubs were dominated by Cockspur Hawthorn (*Crataegus crus-galli*)(NI) and Blackberry (*Rubus allegeniensis*)(FACU-), with many Swamp Rose (*Rosa palustris*)(OBL) and Sweet Fern (*Comptonia peregrina*)(NI). Some of the herbaceous vegetation and most of the shrubs observed at this plot were part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 3 (VEG-3): VEG-3 is located at transect Sta. 202+50 RT 50' in the planned bare sand area connecting the turtle nesting mound to the upland berm along the east side of the site (see Site Photograph Nos. 11 and 12). This area was designated for no planting to provide potential turtle habitat. The vegetation was very sparse and consisted of 65% bare sand with a minimal herbaceous layer and no shrubs. The herbaceous layer at this plot was dominated by 20% Spikerush (*Eleocharis spp.*)(OBL), 10% Soft Rush (*Juncus effuses*)(FACW+), and a small amount (5%) of Barnyard Grass (*Echinochloa crusgalli*)(FACU). Some of the herbaceous vegetation observed at this plot was part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 4 (VEG-4): VEG-4 is located at transect Sta. 203+30 in the middle of the constructed muck moat and within the planned scrub-shrub/forested wetland area. As stated earlier in this report, we were unable to observe this point directly because of the high water level in the muck moat, so the data were approximated from a point approximately 40 feet south of the plot along the same transect line. This area consisted of open water, but it appeared to be dominated by 85% Burreed (*Sparganium spp.*)(OBL), an aquatic perennial species typically found in a shallow marsh wetland environment. We also noted some Water Lily and Pickerel Weed in areas near the plot. The vegetation observed at this plot was not part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 5 (VEG-5): VEG-5 is located at transect Sta. 203+80 on the muck moat side slope and within the planned scrub-shrub/forested wetland area (see Photograph No. 13). Since this plot was located on the transitional slope between the muck moat and the upland, a larger 30-foot (measured perpendicular to the slope) by 80-foot (measured parallel to the slope) quadrat was utilized for this particular plot in order to count vegetation in the narrow strip along the slope. The vegetation at this plot included a substantial herbaceous layer and many trees and shrubs. The herbaceous layer was dominated by Soft Rush (*Juncus effuses*)(FACW+) and 25% unidentified grasses (UNK), and a significant number of other herbs including 15% invasive Cattails (*Typha latifolia*)(OBL), 15% Deer Tongue Grass (*Panicum clandestinum*)(NI), 10% Red Clover (*Trifolium repens*)(FACU-), 10% Cinquefoil (*Potentilla spp.*)(UNK), Shallow Sedge (*Carex lurida*)(OBL), and 2% invasive Purple Loosestrife (*Lythrum salicaria*)(FACW+). The woody stem layer was dominated by a pioneer tree species, Gray Birch (*Betula populifolia*)(FAC), along with a few shrubs, including Silky Dogwood (*Cornus amomum*)(FACW), Arrowwood (*Viburnum recognitum*)(FACW-), and Speckled Alder (*Alnus rugosa*)(FACW+). Some of the herbaceous vegetation and most of the shrubs and trees observed at this plot were part of the proposed planting list and/or specified seed mix.

Vegetation Plot No. 6 (VEG-6): VEG-6 is located at transect Sta. 204+00 within the planned shrub/forested upland area identified on the NHDOT Project Plans for slope stabilization (see Site Photograph No. 14 in Appendix A). This plot was located in an area that was disturbed during construction, so no shrubs and trees were noted at this plot, although we noted a few pioneer species, such as Gray Birch (*Betula populifolia*)(FAC) beginning to populate the surrounding area. The vegetation at this upland plot included a substantial herbaceous layer, dominated by 40% Shallow Sedge (*Carex lurida*)(OBL), 20% Soft Rush (*Juncus effuses*) (FACW+), and 20% Lance-leaved Goldenrod (*Euthamia graminifolia*)(FAC), along with 5% Deer Tongue Grass (*Panicum clandestinum*)(NI), 5% Red Clover (*Trifolium repens*)(FACU-), and 5% Birdsfoot Trefoil (*Lotus corniculatus*) (FACU-). Some of the herbaceous vegetation observed at this plot was part of the proposed planting list and/or specified seed mix.

The following Table A (based on detailed data in Table 1 – Summary of Vegetation Plot Data (2013) included at the end of this report) summarizes the density for woody plant species and areal coverage calculated for each vegetation plot we observed in 2013:

Table A - Plant Density and Areal Coverage at Vegetation Plots (2013)

Vegetation Plot No.	Planned Wetland Cover Type	Density of Woody Stems Per Acre	Density of Trees Per Acre	Overall Areal Coverage of Herbaceous Layer (%)	Areal Coverage of Non-Invasive Hydrophytes in Herbaceous Layer (%)
VEG-1	Shrub/Forested Upland	739	0	100	88
VEG-2	Shrub/Forested Upland	1,786	0	98	19
VEG-3	Sandy Unvegetated Area	0	0	35	30
VEG-4	Scrub-Shrub/Forested Wetland (PSS/PFO)	0	0	85	85
VEG-5	Scrub-Shrub/Forested Wetland (PSS/PFO)	1,294	862	117	45
VEG-6	Shrub/Forested Upland	0	0	99	80
AVERAGE FOR ALL PLOTS		637 stems/acre	144 trees/acre	89%	58%
AVERAGE FOR 2 WETLAND PLOTS*		647 stems/acre	431 trees/acre	101%	65%
AVERAGE FOR 5 SHRUB/FORESTED PLOTS**		764 stems/acre	172 trees/acre	100%	63%

*Note: Only VEG-4 and VEG-5 were considered planned wetlands in these average calculations, yet other plots (i.e., VEG-1, VEG-3, VEG-6) may be developing into wetlands. VEG-3 was not considered a planned wetland or forested area since it was designed as unvegetated bare sand.

**Note: Shrub/Forested plots included areas where shrub and tree cover were anticipated, either planned upland shrub/forested or scrub-shrub/forested (PSS/PFO) wetland cover types, excluding VEG-3.

In general, the vegetation plot results indicated that hydrophytic vegetation (i.e. plants with a FAC wetland status or drier, according to the 1988 U.S. Fish and Wildlife Services' National List of Plants that Occur in Wetlands: Northeast Region 1) was present at all six (6) of the vegetation plots observed. VEG-1 was dominated by 88% non-invasive hydrophytic vegetation in the herbaceous layer

and mostly hydrophytic shrubs, despite the fact that this area was planned as upland shrub-forest cover, and landscaped with standard upland loam and upland seed mix during construction. VEG-2, also planned as upland shrub-forest cover, was dominated by non-hydrophytic vegetation in the herbaceous and shrub layers, as could be expected for the planned upland area along the existing berm. VEG-3 was located in the area planned for bare sand cover. Although this plot contained minimal overall vegetation consistent with the planned cover type, most of the vegetation present was hydrophytic. VEG-4 was planned as a palustrine scrub-shrub/forested (PSS/PFO) wetland, and was dominated by hydrophytic vegetation, even though the type of vegetation observed was more typical of aquatic shallow marsh areas (PAB wetlands) than the planned PSS/PFO cover type. VEG-5 was located on the side slopes of the muck moat and planned as a palustrine scrub-shrub/forested (PSS/PFO) wetland. While some hydrophytic herbaceous and shrub vegetation was observed at this plot, the vegetation was dominated by non-indicator species and upland vegetation, which was unexpected relative to the planned PSS/PFO cover type. VEG-6 was dominated by 80% non-invasive hydrophytic vegetation in the herbaceous layer, despite the fact that this area was also planned as upland shrub-forest cover.

It should be noted that the planned scrub-shrub/forested (PSS/PFO) wetland areas represented by VEG-4 and VEG-5 (and/or other plots that may be trending toward PSS/PFO wetlands despite different planned cover types), may ultimately become PFO wetlands, but the current observations are more indicative of PAB, PEM, or PSS wetlands, due to the minimal presence of tree species typical of PFO wetlands. The continued survival and growth of tree species will ultimately determine whether this trend toward PFO is realized.

As summarized in Table A above and Table 1 – Summary of Vegetation Plot Data, included at the end of this report, all of the vegetation plots except VEG-3 (planned as bare sand cover) exhibited substantial herbaceous layers, while the wetlands represented by VEG-1, VEG-2, and VEG-5 also contained many woody stem plants and some juvenile trees, comparable to what would be expected in these planned shrub/forested and/or PSS/PFO wetland areas. While minimal vegetation was observed at VEG-4, it was anticipated due to the fact that the high water levels prevented the intended planting and seeding during construction. We also expected to find more trees and shrubs at VEG-6, but it appeared that the construction disturbances may have hindered vegetation development at this plot to date. On an overall basis, many of the planted shrubs and trees have survived and appeared to be healthy, and many of the herb species included in either the proposed planting list or seed mixes were also observed at the time of our review.

The average areal cover of the herbaceous layer for all vegetation plots observed was approximately 89%. The average herbaceous cover for the two planned PSS/PFO wetland plots (VEG-4 and VEG-5) was slightly higher at 101%. The average herbaceous cover for the five planned shrub/forested and PSS/PFO plots was also higher at 100%. These are both positive indicators in the development of planned shrub/forest and PSS/PFO wetland cover for these areas at this early stage. When considering only the average areal cover of non-invasive hydrophytic vegetation in the herbaceous layer, the averages were considerably lower at 58%, 65%, and 63%, respectively, which was mostly due to the presence of a substantial percentage of non-hydrophytic vegetation at VEG-2 and VEG-5.

As a general note, the herbaceous coverage is generally expected to decrease as shrubs and trees mature in the shrub/forest upland and/or PSS/PFO zones, but future monitoring will be critical in reviewing this trend on the site.

The density of the woody stems was calculated for each plot. The average density of woody plants for all vegetation plots observed was approximately 637 stems/acre, while the average woody stems for the two PSS/PFO wetland plots was slightly higher at 647 stems/acre. While the average woody stems were substantially higher for the five (5) planned shrub/forest and PSS/PFO plots, this average was impacted by a high number of woody stems at VEG-2 (1,786 stems/acre), yet the other plots contained a much lower number of woody stems. Bear in mind that these averages are also impacted by VEG-6 where no shrubs or trees were observed, but could be expected in the future. Also, it may make sense to exclude VEG-3 and VEG-4 from this analysis during future monitoring, since neither of these plots can be expected to develop considerable woody stems due to the type of cover at these plots (bare sand and shallow marsh).

Trees were only observed at the VEG-5 plot, but the average tree density was very high (862 trees/acre) at this early stage of monitoring, and this result is consistent with the planned PSS/PFO wetland for this plot. During the monitoring period, all trees observed on the site were less than 18 inches tall, and the tree development was generally minimal over most of the site. Since tree development is expected within other zones, additional plots may be necessary in other areas to adequately gauge tree growth in the future. Although the tree component of the woody plant density is only critical for the planned PFO wetland areas relative to the success standards, this factor will ultimately determine the type of wetland that develops in each zone. The establishment of trees within the overall site will also be a factor in meeting the goal for overall naturalization and habitat development on the site. [Please note that the defined standard of success for this mitigation site requires counting all trees that are greater than 18" tall. Also, to maintain consistency with the methodology used in this report, it is recommended that Willow (*Salix spp.*), Red-Osier Dogwood (*Cornus sericea*), and Speckled Alder (*Alnus rugosa*), or other similar species are excluded from future tree counts when calculating trees/acre densities, since all these species typically have many stems, as opposed to a single stem, or trunk, that is more characteristic of a tree.]

In addition to the specific observations and plant counts provided above for each vegetation plot location, the following general vegetation observations were noted for each zone within the mitigation site:

- **Turtle Nesting Area (Island)** - As observed during the spring visit, the ground surface in this area still consisted of mostly bare sand with very little vegetation on and around the turtle nesting mound (see Site Photograph Nos. 1, 4, 5, 6, 11, and 12 in Appendix A). Vegetation from adjacent seeded areas has not yet spread substantially onto these areas. The soil in the flat sand areas appeared to be hydric, and the vegetation included mostly hydrophytic vegetation, with some non-indicator species. The vegetation that was present on the turtle nesting area primarily consisted of small clumps of Switch Grass (*Panicum virgatum*), Slender Flat-sedge (*Cyperus filiculnris*), Clover (*Trifolium spp.*), and occasional

Primrose (*Primula spp.*). Since this area was not seeded or planted during construction, the areas appeared to have re-vegetated naturally. Although we observed some vegetation last spring, including Smartweed (*Polygonum spp.*), Soft Rush (*Juncus effuses*), and Clover (*Trifolium spp.*), these species were not as prevalent during the fall monitoring period. Limited invasive Purple Loosestrife was also noted around the perimeter of the turtle nesting island.

- **Muck Moat Area (Planned Shrub/Forested Wetland)** - Similar to the spring observations, the muck moat appeared to be functioning as a PAB wetland based on the type of vegetation and high water levels present in this zone, as opposed to a PSS/PFO wetland as planned (see Site Photograph Nos. 2, 10, and 13 in Appendix A). The vegetation observed in the muck moat areas was indicative of an aquatic bed regime, and consisted of a significant number of Burreed (*Sparganium spp.*)(OBL) plants with some Pickerel Weed (*Pontederia cordata*), Water Lilies (*Nymphaeaceae spp.*), Pondweed (*Potamogeton spp.*), Mermaid-weed (*Proserpinaca palustris*), Water Smartweed (*Polygonum amphibium*), and Water Arum (*Calla palustris*). The edges of the muck moat contained significant concentrations of Cattails (*Typha latifolia*)(OBL) in some areas.
- **Scrub/Shrub Transition Area (Planned Shrub/Forested Wetland)** - This zone represented the transitional slope between the edge of the muck moat and the upland areas between elevation 220 and 222. This area appeared to be developing as PSS wetlands with a narrow band of PEM wetlands within several inches of the toe of the slope near the water line, similar to the spring observations (see Site Photograph Nos. 2, 3 and 13 in Appendix A). While hydric soils and wetland indicator vegetation appeared to cover most of the muck moat slopes, some slope areas generally above an elevation of 222.0 appeared to be developing as uplands. Although the transition areas were planned as a PSS/PFO wetlands and the potential for PFO wetlands still existed, the continued tree development will determine whether any PFO wetlands are eventually established. The overall vegetation coverage in this zone appeared to be very dense and no significant bare spots were noted.

The upper portion of the slope in this area consisted of a mix of hydrophytic herbaceous and shrub vegetation typical of PSS wetlands and some non-hydrophytic vegetation more often found in upland areas. The shrub vegetation appeared to be healthy along the higher portions of the slope and included a number of shrub species from the planting list such as Red Osier Dogwood (*Cornus stolonifera*), Meadowsweet (*Spiraea latifolia*), Speckled Alder (*Alnus rugosa*), Arrowwood (*Viburnum recognitum*), and Swamp Rose (*Rosa palustris*). Sweet Fern (*Comptonia peregrine*) was the only volunteer shrub species found on the higher portion of the slope. The herbaceous vegetation included mostly volunteer plant species not part of the planting list or seed mixes, such as Switchgrass (*Panicum virgatum*), Old Witch Grass (*Panicum capillare*), Deer Tongue Grass (*Panicum clandestinum*), Red Clover (*Trifolium repens*), Alsike Clover (*Trifolium hybridum*), Smartweed (*Polygonum spp.*), Bristly Foxtail (*Setaria spp.*), Lance-leaved Goldenrod (*Euthamia*

graminifolia), Rabbitsfoot (*Trifolium Arvense*), Goldenrod (*Solidago spp.*), and Birdsfoot Trefoil (*Lotus corniculatus*). Purple Loosestrife (*Lythrum salicaria*) was also found growing in this area.

Along the lower portion of the slope near the current water level, we observed similar vegetation as found in the spring, including mostly emergent species such as Cattails (*Typha latifolia*), Soft Rush (*Juncus effuses*), Woolgrass (*Scirpus cyperinus*), Canada Rush (*Juncus Canadensis*), Spikerush (*Eleocharis spp.*), Nodding Beggarticks (*Bidens cernua*), Smartweed (*Polygonum spp.*), and several other species of sedges (*Carex spp.*) and rushes (*Juncus spp.*). Some of the rush and sedge species were part of the plant list and/or seed mixes specified for this area. Purple Loosestrife was also present in this area, and appeared to have increased since the spring.

- **Upland Areas (Planned Slope Stabilization and Site Restoration)** - The upland areas included the upper portion (generally above elevation 222.0) of muck moat slopes created during excavation and the adjacent areas surrounding the muck moat (excluding the turtle nesting island). These areas were treated with standard loam, seeded with upland seed mix (NHDOT 644.70), and planted with upland trees and shrubs, as specified on the NHDOT Project Plans.

Our observations during the fall monitoring period indicated that the planted tree and shrub vegetation in the northern upland areas between the chain link fence and the muck moat was not growing very successfully due to previous disturbances during construction, similar to the specific observations noted above for VEG-6 at Station 204+00 (see Site Photograph No. 14 in Appendix A). Despite this lack of tree and shrub growth, a healthy herbaceous layer of vegetation and several Grey Birch (*Betula populifolia*) trees were noted in this area.

The vegetation in the upland areas on the south, west, and east sides of the muck moat, including the existing berm between the mitigation site and the man-made pond, appeared to be very successful with a healthy mix of trees, shrubs, and herbaceous species. We also noted some shrub species intended for the PSS/PFO wetland transition areas growing within some of the upland areas on the upper portion of the muck moat slopes, including Redosier Dogwood (*Cornus stolonifera*), Meadowsweet (*Spiraea latifolia*), Speckled Alder (*Alnus Rugosa*), Arrowwood (*Viburnum dentatum*), and Swamp Rose (*Rosa palustris*). Other herbaceous plants observed in the upland areas on the slopes included Switch Grass (*Panicum Virgatum*), Old Witch Grass (*Panicum capillare*), Deer Tongue Grass (*Panicum clandestinum*), Red Clover (*Trifolium pratense*), Alsike Clover (*Trifolium hybridum*), Smartweed (*Polygonum spp.*), Bristly Foxtail (*Setaria spp.*), Lance-leaved Goldenrod (*Euthamia graminifolia*), and Rabbitsfoot (*Trifolium Arvense*). Most of the tree and shrub species observed within the upland areas were part of the planting list and/or seed mixes, while most herbaceous vegetation appeared to be volunteer species. Only limited Purple Loosestrife (*Lythrum salicaria*) was found to be growing in the upland areas.

The upland areas above the top of the slope were populated by Gray Birch (*Betula populifolia*), Sweet Fern (*Comptonia perigrina*), Oak (*Quercus spp.*), Goldenrod (*Solidago spp.*), Aster (*Asters spp.*), Primrose (*Primula spp.*), Cockspur Hawthorn (*Crataegus crus-galli*), and Blackberry (*Rubus allegheniensis*). The most successful portion of the upland area appeared to be along the existing berm east of the muck moats. While it was not clear why the vegetation in this area has been so successful, it could be due, in part, to the fact that this area is exposed to afternoon sunlight from the west and was heavily planted during construction, while the other areas to the south and west are shaded somewhat by the existing sand esker and treeline around the site.

We also noted that the wetland transition area to the southeast of the muck moat appeared to extend farther south beyond the top of the slope than previously planned, and is developing more as a PSS/PFO wetland than upland. This result may be due to the broader gradual slope created in this area during construction and higher water levels at the site than previously anticipated.

The following general vegetation observations were noted at the mitigation site, relative to overall species composition, presence of volunteer species, and invasive species:

- The mitigation site contained a considerable amount of vegetation diversity, including over fifty-one (51) total species, observed during the fall 2013 monitoring period. We observed over forty-seven (47) desirable, non-invasive plant species (excluding Cattails, Purple Loosestrife, Autumn Olive, and Oriental Bittersweet) on the mitigation site, including twenty-seven (27) species within the six (6) vegetation plots. Species composition for individual vegetation plots are listed in Table 1 – Summary of Vegetation Plot Data (2013), included at the end of this report. The overall species observed on the mitigation site are listed in Table 2 – List of Observed and Volunteer Species (2013), included at the end of this report. Approximately 25% of the observed non-exotic and non-invasive species within the overall site, and 33% within the vegetation plot areas were included on the proposed planting schedule on the NHDOT Project Plans (Appendix C) or part of the seed mix utilized on the mitigation site, while the remaining species (75% overall and 67% at plots) were believed to be volunteer species. Within the herbaceous layer, nearly all (92%) of the observed plants appeared to be volunteer species not on the proposed planting schedule or listed in the seed mix. The most non-invasive volunteer species were noted at VEG-2 and VEG-6. All but one (Sweet Fern) of the trees and shrubs observed at the vegetation plots were part of the proposed planting schedule.
- As mentioned above, some populations of invasive/undesirable species were noted vegetation plots VEG-1 and VEG-5, including Purple Loosestrife (*Lythrum salicaria*) and Cattails (*Typha angustifolia*) (see Site Photograph Nos. 10 and 13 in Appendix A). The average areal coverage of invasive/undesirable species within the herbaceous layer was calculated for each vegetation plot and summarized in Table B below. Outside the vegetation plots, higher concentrations of Purple Loosestrife

and Cattails were also observed in other areas of the site, including along the slopes of the muck moat (see Site Photograph Nos. 1 through 3). It is possible that invasive plants may have been introduced to the site through organic soils imported during construction. We also observed some Oriental Bittersweet (*Celastrus orbiculatus*), a invasive species, along the perimeter of the mitigation area near the northeast end of the chain link fence. Similar to our spring 2013 observations, we also noted at least three Autumn Olive (*Elaeagnus umbellate*) on the berm at the south side of the site, even though several plants had been removed by hand from the same area in the spring.

The following Table B summarizes the invasive/undesirable species and approximate percentage of herbaceous cover observed at each vegetation plot in 2013:

Table B – Invasive/Undesirable Species Area I Coverage at Vegetation Plots (2013)

Vegetation Plot No.	Invasive/Undesirable Species Type	Areal Coverage of Herbaceous Layer (%)
VEG-1	Purple Loosestrife	1
VEG-2	-	-
VEG-3	-	-
VEG-4	-	-
VEG-5	Cattails/Purple Loosestrife	15/2
VEG-6	-	-

4.4 Soil

During the fall monitoring period (October 2013), soil observations were made at four (4) of the six (6) vegetation plots (VEG-1, VEG-2, VEG-3, and VEG-6). Soil observations were not possible for VEG-4 and VEG-5 at the time of our fall monitoring due to high water levels in the muck moat. Soil profile descriptions were also recorded at each vegetation plot in accordance with standard wetland delineation techniques and the Regional Supplement. Preliminary determinations were made regarding the presence of hydric soils according to the New England Hydric Soils Technical Committee “Field Indicators for Identifying Hydric Soils in New England,” dated 2004, 3rd Edition (Field Indicators for Identifying Hydric Soils in New England) and the US Department of Agriculture, Natural Resource Conservation Service “Field Indicators of Hydric Soils in the United States,” dated 2010, Version 7.0 (Field Indicators of Hydric Soils in the United States).

The following soil observations were made at four (4) of the six (6) vegetation plots, including VEG-1, VEG-2, VEG-3, and VEG-6:

Soil observations for VEG-1 (Sta. 200+76 RT 30’):

Depth	Horizon/Description
0" - 17"	Ap ; Very Dark Grayish Brown; 10YR 3/2 Fine sandy loam (saturated)
17" - 20"	Bg ; Olive Brown 2.5Y 4/3 medium sand; loose single grain; loose; many large prominent redox concentrations; saturated to the surface
	Note: Water entering hole at 16" at the time of the investigation

Soil observations for VEG-2 (Sta. 202+03 RT 60):

Depth	Horizon/Description
0" - 20"	Ap ; Very Dark Grayish Brown 10YR 3/2 to Very Dark Brown 10YR 3/3 gravelly fine sandy loam to fine sandy loam (fill material); massive; firm in places due to compaction; no redox

Soil observations for VEG-3 (Sta. 202+50 RT 50):

Depth	Horizon/Description
0" - 12"	Gg ; Dark Grayish Brown 10YR 3/2 to Very Dark Gray 10YR 3/1 medium sand; loose; single grained (saturated) many large prominent 7.5 YR 4/4 concentrations and Gray 2.5 Y 5/1 depletions
	Note: Saturated to 4" from surface at the time of the investigation.

Soil observations for VEG-4 (Sta. 203+30 RT 0):

Depth	Horizon/Description
	Soils not reviewed at this location. Standing water above ground surface during time of investigation.

Soil observations for VEG-5 (Sta. 203+80 RT 0):

Depth	Horizon/Description
	Soils not reviewed at this location.

Soil observations for VEG-6 (Sta. 204+00 RT 0):

Depth	Horizon/Description
0" - 15"	Ap ; Dark Brown; 10YR 3/3 gravelly; fine sandy loam; friable; massive (disturbed soil)
15" - 20"	2Ab ; Very Dark Grayish Brown 10YR 3/2; gravelly; fine sandy loam; massive, friable (old "A" horizon mixed); no redox or water

Based on the design and construction of the mitigation site, it was anticipated that hydric soils would develop, at a minimum, within the two (2) planned PSS/PFO wetland zones represented by VEG-4 and VEG-5, with non-hydric soils at the other planned upland plots. While the high water levels at these two plots generally supported this assumption, saturated soils were also found at VEG-1 and VEG-3, generally indicating that the hydric soil developing may be more extensive than originally anticipated for the mitigation site and may increase the amount of wetland areas.

Our soil data collected from test holes at the vegetation plots supported the general trends described above, and varying stages of development were noted at each plot. Soil profiles observed at VEG-1 (see Site Photograph No. 15 in Appendix A) within the planned upland zone and VEG-3 (see Site Photograph No. 17 in Appendix A) within the planned unvegetated bare sand zone, exhibited saturation and prominent redoximorphic features, both indicative of hydric soils. While these observations were consistent with the hydrophytic vegetation noted above at these two plots, the soil trends differ distinctly from the upland cover

types planned for these areas. The hydric soil observed at VEG-1, in particular, suggested that the PSS/PFO wetland zone may extend farther south into the upland than originally planned. The soil profiles at VEG-2 (see Site Photograph No. 16 in Appendix A) and VEG-6 (see Site Photograph No. 18 in Appendix A) within the planned upland zones, did not exhibit any prominent redoximorphic features or a hydric regime and appeared to be non-hydric. The soil observations at VEG-2 were consistent with the non-hydrophytic vegetation that dominated this area according to the vegetation observations noted above. While the non-hydric soils observed at VEG-6 were consistent with the planned upland cover type, this area was dominated by hydrophytic vegetation, suggesting that there is some potential that hydric soil conditions may develop in this area. Disturbed fill materials were also noted in this soil profile, and future monitoring is necessary to confirm whether hydric soils eventually develop at this location.

Although soil profiles were not reviewed at VEG-4 and VEG-5, the high water levels and substantial hydrophytic vegetation observed in these two areas generally support the assumption that the soils may be hydric, or have the potential to become hydric, and future monitoring in these areas will be critical in identifying the soil trends in these areas.

Due to the abrupt grade changes created during construction, the boundary between hydric and non-hydric soils was anticipated to be more distinct than our observations actually indicated (e.g., hydric soils in planned upland plots VEG-1 and VEG-3). If similar soil observations are obtained in the future, additional soil test holes may be needed in other areas of each planned zone to confirm the extent of hydric soils, especially along the limits between planned wetland and upland areas.

4.5 Hydrology

According to the NHDOT Wetland Mitigation Technical Report, the hydrology for this site is provided primarily through high groundwater and supplemented by flood waters during peak events by the adjacent man-made pond and nearby Beaver Brook floodplain. The creation of new wetlands on the mitigation site was intended to be accomplished by excavating the site to replicate groundwater elevations of the adjacent natural wetlands and surface waters, so a detailed water budget analysis comparing water inflow to outflow was not deemed necessary during the design. However, groundwater levels were monitored over a three-year period from 2000 to 2003 at six (6) observation wells installed on or near Site #15 during the early design phase of the project. These observation well locations are labeled as “Well #3” to “Well #8” on Sheet 16 of the NHDOT Project Plans. The data obtained during this monitoring period for the observations wells indicated an approximate groundwater elevation of 221 to 223 at the site during the growing season, and an approximate surface water elevation of 216 to 221 in the man-made pond, and the full set of data is available in the NHDOT Wetland Mitigation Technical Report. The site design was based on an anticipated surface water elevation of 220, “muck” surface elevation of 220, and upper elevation limit of 222 for PSS/PFO wetland zones at the mitigation site. Although it would have been helpful to utilize these observation wells to track groundwater elevations during post-construction review, the wells were decommissioned at some point prior to the construction at Site #15, and they were not available during our fall 2013 monitoring visits.

Throughout the construction and post-construction site review at the mitigation site, we recorded the approximate elevations of the water surface in the muck moat and the adjacent pond. The water surface elevation ranged from 221.0 to 222.5, and was typically the same within the muck moat and the adjacent pond. During the May 2013 (spring) monitoring period, the water surface elevation was approximately 222.5, the highest level observed throughout our entire review of the site. As a result of the high water level, the standing water in the muck moat was approximately 2.5 feet deep and the flat sandy areas of the turtle nesting island were covered with at least six (6) inches of water. During the October 2013 monitoring period, the water surface was slightly lower at an approximate elevation of 222.0, corresponding to a standing water depth of approximately 1.5 feet in the muck moat, even though the flat sandy areas of the turtle nesting island were not inundated (see Site Photograph No. 11 in Appendix A).

In general, the water level at the site was very dependent on the amount of recent precipitation and water level in the adjacent pond. Without any direct outlet or other outflow, the water level in the muck moat also appeared to remain high for weeks after significant periods of wet weather. The higher water condition in May 2013 and lower water condition in October 2013 seemed to be consistent with the amount of precipitation that occurred in the surrounding areas prior to the respective site visits. In fact, we verified the recorded precipitation amounts for several local weather sources. For the spring of 2013, the actual monthly precipitation amounts recorded at the local Salem weather station “KNHSALEM12” for March (1.32 inches) and April (1.95 inches) were well below normal monthly averages recorded by the NH State Climate Office (NHSCO) for the historical period of 1981 to 2012, while May (5.34 inches) was considerably higher than the normal monthly average. The NHSCO recorded historical monthly averages for March, April, and May were 4.27, 3.97, and 2.92, respectively. For the fall 2013, the actual monthly precipitation amounts for August (4.50 inches) and September (3.39 inches) were near normal monthly averages, while October (0.95 inches) was considerably less than the normal monthly averages. The NHSCO recorded historical monthly averages of 4.50, 3.39, and 4.67 inches for August, September, and October, respectively. Furthermore, the majority of the rainfall recorded in the period from mid-September to mid-October prior to our monitoring visits occurred during storm events on September 22, 2013 (0.77 inch of precipitation) and October 6 to 7, 2013 (0.63 inch). In summary, the actual monthly rainfall amounts for the month preceding the spring and fall monitoring periods seemed to explain why the water levels at the site were much higher in May 2013 than in October 2013.

Based on these observations, it appeared that wetland zones on the mitigation site were providing a substantial amount of storage capacity for stormwater runoff and were allowing the slow movement of flow through the site. Although the water surface elevation within the muck moat was generally within the range of groundwater elevations recorded at the observation wells prior to construction, the inundation within the muck moat was more indicative of open water (POW) and/or shallow marsh (PAB) wetlands, than PSS/PFO wetlands intended in the design. The water levels in the adjacent pond also appeared to be consistently higher than expected when compared to the previous data at the observation wells. While the site grading was functioning to maintain an adequate level of

inundation to support wetlands, the collective hydrologic conditions observed between the start of construction and the 2013 monitoring period suggest that the type of wetland cover within and around the muck moat may be somewhat different than planned for the site. However, the consistently higher water levels may also increase the overall amount of wetlands on the site, which would be a positive result of the conditions observed on the site. Outside of the lower muck moat areas, the observed water levels and soil saturation appeared to be consistent with the expected levels relative to the planned PSS/PFO wetland types on the transitional slopes.

4.6 Wetland Zones

The mitigation site primarily included two planned wetland zones, the muck moat and the transitional side slopes around the muck moat, and each zone was specifically designed as a palustrine scrub-shrub (PSS) and palustrine forested (PFO) wetlands. All other areas of the site, including the bare sand areas of the turtle nesting island, were planned as uplands. The planned wetland zones on the mitigation site were identical according to the NHDOT Wetland Mitigation Technical Report, and the NHDOT Project Plans and permits for the mitigation site, and there did not appear to be any changes made during the design or permitting process that affected the wetland areas or limits on the site. Furthermore, no changes were made during construction that would impact the wetland areas or limits. As such, the actual long-term development of each wetland zone will be greatly dependent on the trends observed in vegetation, soil, and hydrology over the extended monitoring period.

Since no formal wetland delineation or mapping of wetland limits was required during the 2013 review, we did not determine accurate limits for the planned wetland and upland zones. However, we did observe several minor trends or changes in several areas that indicated the wetland type, area, and/or limits may be somewhat different than designed and constructed. Once a detailed wetland delineation has been completed during future monitoring, the magnitude of changes to planned wetland areas should be more evident.

The following additional information was based on the latest fall 2013 review and observations contained in other sections of this report, and provides a general assessment of the development and classification of the planned wetland areas on the mitigation site:

- **Turtle Nesting Island** - This area represents the central island surrounded on the north, south, and west sides by the muck moat, and it consists of the constructed sand mound and bare sand areas graded around the mound. Although this area was graded during construction, it was not seeded or planted. Based on the limited site review and observations, the sand mound and flat sandy areas around the mound would likely be classified as uplands. While mostly hydrophytic vegetation and hydric soils were present at VEG-3 and on the eastern portion of the island connecting to the upland, these areas still consisted of mostly bare sand. On this basis, they did not yet meet the criteria for classification as PSS or other wetlands, despite the early indication that they may be trending toward this

classification. Future monitoring at VEG-3 and other portions of this area will be necessary to confirm whether this trend continues.

- **Muck Moat Area (Planned Shrub/Forested Wetland)** - This area represents the lowest portion of the excavated muck moat at elevation 220 that was planned as a PSS/PFO wetland. This area was filled with special wetland soil but was not seeded or planted due to high water levels throughout the construction period. Based on the limited site review and observations, this area would likely be classified as a PAB wetland where significant vegetation was present with some POW wetlands in bare areas. The consistent inundation observed throughout the construction and monitoring periods to date suggests that this area will continue to develop with an aquatic regime, and it is not likely to become a PSS/PFO wetland as planned. The continued survival and development of the aquatic vegetation may also be the determining factor for how much of this area remains a PAB wetland or becomes a POW wetland.
- **Scrub/Shrub Transition Area (Planned Shrub/Forested Wetland)** - This area represents the transitional slopes between the muck moat and adjacent uplands generally between elevation 220 and 222 that were planned as PSS/PFO wetlands. This area was graded at an approximate 3:1 slope, treated with standard upland loam, and seeded and planted with mostly wetland species. Based on the limited site review and observations, these slope areas would likely be classified as PSS wetlands with a narrow band of PEM wetlands within several inches of the slope toe near the water line. Due to the lack of tree development, none of these areas met the criteria for a PFO classification. We also noted some differences in soil saturation and types of vegetation (hydrophytic vs. non-hydrophytic) from the lower to upper portion of the slopes, which suggested that some variance can be expected in the boundaries between PEM and PSS wetlands or PSS and upland areas across the transitional slopes.
- **Upland Areas (Planned Slope Stabilization and Site Restoration)** - This area represents the planned upland areas generally above elevation 222. While all upland areas were treated with standard upland loam and upland seed mix, some wetland plants were installed on the upper portions of the muck moat slopes, with mostly upland species planted on the flatter upland areas surrounding the muck moat. Based on the limited site review and observations, these areas exhibited mostly upland characteristics, with a few notable exceptions in areas that may be developing as PSS/wetlands. Hydric soils and hydrophytic vegetation dominated the area to the southeast of the muck moat near VEG-1, indicating that the PSS wetlands may be migrating into the uplands in this area. Hydrophytic vegetation was also noted in the area north of the muck moat near VEG-6, but the soils were non-hydric, suggesting that PSS wetlands may also migrate into this upland area if suitable conditions remain.

Although accurate limits have not yet been determined for the various wetland zones, we estimated the areas for each zone in order to provide a preliminary basis for future comparison. The following Table C provides a preliminary

comparison of the estimated wetland zone areas that currently exist on the site to the planned/designed wetland areas:

Table C - Preliminary Comparison of Planned Versus Estimated Wetland Cover Areas

Area Comparison				
Wetland Cover Type	Elevation Range	2007 Concept Design Per NHDOT Wetland Mitigation Technical Report (acres)	2010 Final Design Per NHDOT Plans and Permits (acres)	2013 Fall Monitoring Estimate (acres)
Palustrine scrub-shrub (PSS) and/or forested (PFO)	220 to 222	1.0	1.0	0.15*
Palustrine aquatic bed (PAB)	220±	-	-	0.8**
Palustrine emergent (PEM)	221±	-	-	0.05***
Total Wetland Area (PSS+PFO+PAB+PEM)		1.0	1.0	1.0
Upland (Turtle Nesting Habitat)	Above 222	0.6	0.6	0.6****
Total Site Area		1.6 acres	1.6 acres	1.6 acres

(Table based on Figure 2 - 2013 South Road Mitigation Site #15 Monitoring Plan)

*Note: No site areas currently meet criteria as PFO wetlands due to the presence of only limited juvenile trees, but PSS wetlands may become PFO as trees develop and mature.

**Note: This area represents the muck moat that is currently developing as a PAB wetland despite being planned as a PSS/PFO wetland.

***Note: This area accounts for the narrow band of PEM wetlands developing around the perimeter of the muck moat near the water level, planned as PSS/PFO wetlands.

****Note: This area would potentially decrease if the PSS/PFO wetlands continue to develop on the eastern portion of the turtle nesting island.

Although the wetland zone limits and calculated areas may not be precise, they do provide a meaningful and reasonably accurate basis for comparing current wetland zone areas and limits with the planned mitigation design.

The following is a summary of our assessment of the wetland zone boundaries and area comparisons depicted in Table C above:

- Although no PEM wetlands were planned as part of the concept or final mitigation designs, the lower portion of scrub/shrub transition area appeared to be developing as PEM wetlands in a narrow band around the muck moat, and this area was estimated to be approximately 0.05 acre. These PEM areas were located within planned PSS/PFO areas. Since the overall wetland area did not appear to change substantially, the PSS/PFO area was reduced by this same amount for the purpose of the current calculations.
- For comparative purposes, it is assumed that the PSS wetland areas are the same as the PFO wetland areas at this time, since the PFO areas are not expected to develop until more substantial tree growth is established. On this basis, the PSS wetlands currently developing on the muck moat slopes and small portions of the planned upland areas may eventually develop into PFO wetland areas once more substantial tree growth has

been established in these areas. This is also the reason the fall 2013 monitoring results do not yield any PFO wetlands at this point in the monitoring period.

- The actual PSS/PFO wetland area of 0.15 acre is substantially less than the planned PSS/PFO area of 1.0 acres mainly due to the PAB wetlands developing in the muck moat areas instead of the planned PSS/PFO wetlands. Although the actual area of the PSS/PFO wetlands may gradually increase if the migration into uplands continues in the slope transition areas, the overall area of PSS/PFO wetlands is not expected to reach the planned PSS/PFO acreage as long as the muck moat continues to develop as PAB wetlands. In either case, the decreased area of PSS/PFO wetlands is not expected to have any considerable impact on the overall functions and values of the mitigation site.
- The exterior limits of the PSS/PFO wetland areas around the muck moat appear to be generally at a similar elevation and location as the design, with the exception of the upslope migration noted in several locations. Consequently, the upslope migration of PSS/PFO wetlands would be considered a benefit to the mitigation site, as it would result in an increase in the overall wetland areas by replacing areas previously planned as uplands.
- The overall wetland area of 1.0 acre, calculated by summing all wetland areas, was the same as the total design wetland area of 1.0 acre. This area may increase in the future if the upslope migration of PSS/PFO wetlands and the development of wetlands on the turtle nesting island continues, but we have not accounted for this change in calculations to date. While a minimal decrease in bare sand surfaces in the turtle nesting area is not ideal, it is not expected to have a substantial impact on the habitat available to turtles, as long as the decrease is not substantial. Since this trend will potentially increase the overall wetland area on the site, this developing trend would be a beneficial result relative to the overall goals of the mitigation site.

4.7 Other Observations

Other observations were made during our site visits regarding the general site conditions, wildlife evidence, and human usage of the mitigation site, as follows:

- We observed some evidence of turtle activity and egg predation in two locations on the sand mound within the turtle nesting area (see Site Photograph Nos. 5 and 9 in Appendix A). We also found some evidence of white-tailed deer (see Site Photograph No. 4 in Appendix A) and other animals (see Site Photograph No. 6) on the sand mound. We also noted an animal burrow on the upper slope of the sand esker south of the muck moat (see Site Photograph No. 8).
- We continued to note the presence of two prominent animal tracks (possibly from beaver) extending across the existing berm between the man-made pond and the muck moat at the southeast side of the site (see Site Photograph Nos. 2 and 3). This area should continue to be monitored in the future to gauge potential wildlife impacts to the site.
- While impacts from fox, beaver, and deer were not obvious on the site, this issue should continue to be monitored in the future. Although there did not appear to be as many avian species utilizing the mitigation site in

the fall as noted in the spring, we did observe a hawk flying overhead. This discrepancy could also be due to the late-season timing of the visit or weather conditions.

- No evidence of significant erosion was noted on the sand mound or other surfaces within the turtle nesting area.
- The gravel access road surface appeared to be stable with no signs of erosion or settling.
- Most areas within the mitigation site appeared to be stable, with no evidence of erosion or sediment deposits. The only exception noted was some continued erosion on the sand esker south of the muck moat where some erosion had been observed during previous monitoring visits (see Site Photograph No. 7).
- The mitigation design originally called for the placement of “logs, stumps, and boulders as hiding, perching, or loafing sites for wildlife.” As previously noted, there was little or no woody debris or statically-placed stumps, etc. placed around the site to provide the habitat diversity intended in the plan.
- No new ATV tracks or other evidence of adverse usage were observed on the site in the fall, despite some evidence noted in the spring. The muck moats around the turtle nesting area appeared to be serving the intended purpose of preventing ATV usage within the mitigation site. The additional boulders placed at potential access points along South Road and the chain link fence on the north side of the site also appeared to be discouraging ATV access to the site.
- Despite our recommendations provided in the spring of 2013, there was still a substantial amount of miscellaneous debris scattered around the site, including trash, wood and metal scraps, remnants of orange construction fence and silt fence, wood and metal stakes, etc., that we understood would be removed from the site by the completion of construction. This trash should be collected and removed from the site to promote a more aesthetic natural appearance. The watering system was also still on the site and should be removed now that the vegetation is well established. We also noted a substantial amount of garbage (couch, pillows, etc.) near the east end of the site access drive that should be collected and removed.

5.0 CONCLUSIONS AND RECOMMENDATIONS:

5.1 Conclusions

Based on the data collected and observations made during our recent 2013 site visits, the following conclusions are provided relative to the current conditions and previously defined standards of success for the mitigation site:

- Based on the first year observations, the planned wetland areas appear to be achieving the intended functions and values in accordance with the mitigation design goals.
- The wetland areas within the muck moat and contiguous slopes are generally functioning as designed. The topography created by the grading was encouraging hydrophytic vegetation and varying degrees of saturation for a diverse wetland population, as evident by the development of PAB, POW, and PEM wetlands in addition to the anticipated PSS/PFO

wetlands. The grading design of the mitigation site appears to provide adequate flood storage and runoff attenuation potential for the localized watershed area encompassing the sites. Although this flood storage did not appear to be utilized to date due to the lack of a direct connection to the adjacent man-made pond and Beaver Brook floodplain, the retention of runoff and groundwater flows within the muck moat seem to be serving the intended functions for water quality treatment and groundwater recharge. Even at the early stage in development, the site appears to be providing varied wetland and upland habitats for vegetation and wildlife. While the consistently higher water levels observed in the muck moat prevented the intended planting and planned PSS/PFO wetland development, the vegetation has begun to adapt to the more consistent inundation, which has not had a substantial impact on vegetation diversity.

- The water levels observed during 2013 varied considerably from the spring to fall monitoring periods, but they were consistent with the water levels observed during the construction period, within the range expected from the past groundwater monitoring performed during the design process, and in line with the variances in precipitation that occurred leading up to the monitoring period. Water levels and the degree of soil saturation in the muck moat appeared to be ideal for supporting the PAB and PEM wetland areas developing within or near the average water level, and adequate for supporting the PSS/PFO wetlands developing on the adjacent slopes, yet consistent hydrology in the future will dictate whether hydric soils and hydrophytic vegetation continue to develop within the planned PSS/PFO areas on higher portion of the slopes, and where the boundary is ultimately located between wetlands and uplands.
- The presence of hydrophytic vegetation and hydric soils at VEG-1 indicated that this area is developing as PSS wetlands, despite being located in a planned upland area. The lack of tree growth at VEG-1 did not yet support a PFO classification. The lack of hydrophytic vegetation and hydric soils at VEG-2 indicated that this area is developing as upland as planned. The predominately bare sandy surfaces observed at VEG-3 indicated that this area is developing as unvegetated upland turtle habitat as planned, but the presence of some hydrophytic vegetation and hydric soils suggest that some portion of this area has the potential to become PSS or other wetlands. Although high water levels prevented detailed vegetation and soil observations at VEG-4, this area appeared to be dominated by aquatic plant species typical of shallow marsh wetland environments. These vegetation observations, combined with the inundation, suggest that this area is developing as PAB wetlands (or POW wetlands in portions that lack vegetation), as opposed to the planned PSS/PFO wetlands. The high water levels also prevented detailed soil observations at VEG-5. However, the presence of varied vegetation at VEG-5, including hydrophytic vegetation, some non-indicator species, and many trees, indicated that this area was developing as PSS/PFO wetlands with a narrow band of potential PEM wetlands near the water level, comparable to the planned PSS/PFO wetlands for this area. While the limited tree development noted in this area would not yet support a PFO classification, the presence of many trees does suggest a trend toward PFO. The non-hydric soils observed at VEG-6 indicated that this area would be classified as uplands as planned, even though the presence of

mostly hydrophytic vegetation suggested that this area has the potential to become PSS/PFO wetlands, depending on the extent of future tree growth and hydric soils that develop.

- Although there appeared to be a distinct line indicating a change from wetland to upland on the slope transition around the perimeter of the muck moat, the presence of wetland indicators at VEG-1, VEG-3, and VEG-6 suggested that the wetlands may be migrating upslope into planned upland in some areas of the site. This issue was most evident near VEG-1 on the southeast corner of the muck moat, and to a lesser extent on the eastern side of the turtle nesting area (near VEG-3) and north of the muck moat (VEG-6). This trend would clearly be beneficial because it would result in increasing the overall area of wetlands on the site, assuming it continues. As a side note, the vegetation observations at VEG-1 and VEG-5 indicated that these areas were developing as PSS wetlands, and this current PSS wetland classification is an expected interim condition for PFO wetlands until tree species fully develop.
- The general wetland limits appeared to match the planned wetland design areas and boundaries closely, with the exception of the upslope progression of wetlands southeast of the muck moat. The total wetland area of 1.0 acre (including PSS/PFO, PEM, and PAB areas) that appeared to exist on the site during the 2013 review matched the design wetland area. As long as the site conditions continue to support the wetland development, this overall wetland area should not change substantially in the future, even though an increase is possible due to the potential PSS/PFO development southeast and north of the muck moat and on the eastern portion of the turtle nesting island. In this case, an increase in the overall wetland area would increase the ability of the mitigation site to achieve the intended functions and values.
- Of the six (6) vegetation plots established on the site, the stem densities for woody plants exceeded the standards for success criteria of 500 stems per acre for VEG-1 (739 stems per acre), VEG-2 (1,786 stems per acre), and VEG-5 (1,294 stems per acre). We did not observe any woody stem plants at VEG-3, VEG-4, and VEG-6. While the lack of woody vegetation was anticipated at VEG-3 since it was within the planned unvegetated upland area, this result was unexpected for VEG-6 within a planned shrub-forest cover. Despite the fact that VEG-4 was planned as PSS/PFO wetlands, the water conditions clearly prevented the growth of woody vegetation, which was also expected based on the conditions observed. The average woody stem count for all plots observed, 637 stems per acre, still exceeded the success standard, despite the lack of woody vegetation noted at several plots. The average woody stem count for the two planned PSS/PFO plots (VEG-4 and VEG-5) was calculated at 647 trees per acre, slightly under the standard, despite the fact that no woody vegetation was expected at VEG-4 based on the water conditions.
- The calculation methodology for the tree portion of woody stem counts excluded several plant species (Willow, Silky Dogwood, Red Osier Dogwood, and Speckled Alder), and this methodology should be replicated during future monitoring to ensure consistency in comparison of the tree calculations. Regarding the tree portion of the woody stem counts, trees were only observed at vegetation plot VEG-5 within the planned PSS/PFO area, but this plot contained approximately 862 trees per

acre, well above the success standard of 350 trees per acre. The average tree density for the two (2) PSS/PFO plots (VEG-4 and VEG-5) was calculated at 431 trees per acre, also above the success standard. For the five (5) plots planned as either shrub/forest cover or PSS/PFO wetlands, the average tree density was calculated at 172 trees per acre, well below the success standard. Despite the fact that trees were not observed at several of the plots where anticipated, our observations indicated that trees were, at a minimum, healthy and surviving within some areas outside the designated vegetation plots. Although the trees counted at VEG-5 were not large enough to be considered “trees” according to the Regional Supplement (i.e. greater than 3" diameter at the breast height and greater than 3.28 feet tall), they appeared to be surviving and growing enough to meet the tree size defined in the success standards.

- While we did note the presence of some healthy and thriving trees at the VEG-5 plot, the current observations are more indicative of PSS wetlands in the interim condition, and the continued development of the tree component will ultimately determine whether these wetland areas achieve a PFO classification. In fact, due to the expected slow growth rate of trees, the conditions of a PFO wetland may not actually be realized within the monitoring period. This distinction should be identified in future monitoring efforts.
- Identifying future trends in the densities of woody stem and tree species as plants grow, mature, and spread at the planned shrub/forest and/or PSS/PFO wetland plots will be an important factor in determining the type of wetlands developing on the mitigation site, whether the mitigation goals are met, and whether the vegetation is healthy and flourishing.
- The average areal cover of the herbaceous layer for all six (6) vegetation plots on the mitigation site was approximately 89%, exceeding the overall success of a minimum of 80% areal cover. The average areal cover of the herbaceous layer for the two (2) plots (VEG-4 and VEG-5) within the PSS/PFO wetland areas also exceeded the overall success standard. Only VEG-5 contained a notable percentage of invasive hydrophytic vegetation (15% Cattails and 2% Purple Loosestrife) in the herbaceous layer. When considering only non-invasive hydrophytic vegetation, the average areal cover for all plots of 58% did not meet the success standard of a minimum of 60% areal cover for non-invasive hydrophytes in planned PSS and PFO cover types. However, the non-invasive herbaceous hydrophytic vegetation cover exceeded the success standard for plots within planned scrub-shrub and forested cover types including VEG-1 (88%), VEG-4 (85%) and VEG-6 (80%), but were below the standard at VEG-2 (19%) and VEG-5 (45%) due to high concentrations of non-hydrophytic vegetation. VEG-3 was also below the standard, but it was within a planned unvegetated area, so this issue was expected. VEG-4 (planned as PSS/PFO wetland but expected to be PAB wetland) would have exceeded the success criteria whether compared to the standard of 60% for planned PSS/PFO or 80% for planned PEM cover types.
- On a longer-term basis for planned PSS and/or PFO wetlands, herbaceous coverage is expected to decrease as planted shrubs and trees mature and form a canopy over ground cover. Since this is only the first year of monitoring, it was not clear from our observations whether this trend has

started, and future monitoring will be instrumental in tracking this development.

- As a general note, the 2013 observations did not indicate any substantial changes in the general design limits for the planned wetland zones, although there is some potential that the exterior wetland limits (i.e., between PSS/PFO and upland areas) around the muck moat could change according to future hydrologic, soil, and vegetation influences. Similarly, other minor shifts could also occur in other areas of the site (e.g., decrease in PSS/PFO area due to lack of hydric soils, upslope/downslope migration of PEM or PSS limits), but it was too early in the site development to identify such changes. Future monitoring during the growing season may help define the trends of the wetland areas and provide a more definitive limit of various wetland cover types. As long as the potential shifts do not decrease the overall area of wetlands, no substantive impact on the overall functions and values of the mitigation site would be expected.
- Although the site appeared to have at least 75% establishment of wetland vegetation with each zone, and is functioning as intended in accordance with condition #30 of the NHDES Wetland Permit, more detailed future monitoring is still needed to confirm that this condition is met by the end of the second growing season, as stated in the permit.
- Only limited concentrations of invasive/undesirable Cattails (*Typha latifolia*) and some Purple Loosestrife (*Lythrum salicaria*) were noted at two (2) of the plots. Invasive species accounted for only a small percentage of the herbaceous cover observed at VEG-1 (1%) and VEG-5 (17%). However, higher concentrations of Cattails and Purple Loosestrife were observed in other areas outside the plots, especially on the lower portion of the slopes around the muck moat. Since the end of construction, the invasive populations have increased steadily and could be impacting the development and diversity of other types of vegetation in these areas. These areas should be monitored closely and corrective actions taken as necessary to limit spreading. Some populations of Oriental Bittersweet (*Celastrus orbiculatus*) and Glossy Buckthorn (*Rhamnus frangula*) were also noted in several areas of the site, such as along the northeast end of the chain link fence and southern end of the existing berm. These invasive species also warrant close monitoring in future years to ensure that they do not continue to spread and/or impact the site.
- A significant amount of vegetation diversity was noted on the mitigation site. The highest percentage of volunteer species appeared to be within the herbaceous layer at VEG-2 and VEG-6, while nearly all the shrubs and trees noted at each plot were part of the proposed planting and/or seeding schedules. While greater diversity in the shrub and tree species on the site would be desirable, it may take multiple growing seasons to develop. In the interim, the level of diversity observed on the site, at a minimum, appeared to meet the general goals of the mitigation site at this stage of development.
- The turtle nesting area appeared to be functioning as planned. While minimal evidence of turtle usage was noted, it is hosting other wildlife. The unvegetated sandy areas planned for turtle habitat on the mound and surrounding island appeared to be stable, but some plant species were beginning to colonize the bare sand areas. It is possible that the presence

of vegetation and other grazing wildlife could be discouraging usage by turtles, which was not clear from our limited review of the site.

Regardless, it seems warranted to consider removal of the vegetation on the sandy areas if it will help preserve the viability as turtle habitat.

- Additional erosion was noted on the existing sand esker slope south of the muck moat. Although the erosion was noted prior to the start of construction and has still not reached a severe condition, it should be monitored frequently to ensure that the existing sand slopes remain stable and transported sand does not result in filling, erosion, or impacts to the muck moat and slopes downgradient of this area.
- All other site areas appeared to be stabilized, and there was no evidence of erosion or sediment deposits on the mitigation site.
- The considerable amount of trash, garbage, and construction debris that remains on the site continues to impact the aesthetics of the site and should be addressed.
- Based on our limited site visits, there was no indication of frequent human usage of the site for either passive or active recreation, and the fencing and boulders appeared to be serving the intended purpose. While it is a good sign, the site should continue to be monitored in the future to identify and address usage of the site to prevent potential negative impacts.
- Various forms of wildlife appeared to be using the mitigation site.
- The site generally lacked woody debris, stumps, logs, and boulders that were intended to enhance the available wildlife habitat on the mitigation site according to the original design. While this may not have a significant impact on the overall value of the mitigation site, the placement of additional woody debris should still be considered to enhance the site habitat in the future.

5.2 Recommendations

Based on our observations and conclusions in this report, we provide the following recommendations:

- Monitoring should continue in accordance with the project permits in order to document the development of the plant communities, hydric soil development, identify trends in wetland zones, and gauging the overall mitigation site conditions relative to the same standards of success. Monitoring should be done in the late spring and early fall, and it should use the same vegetation plot locations, soil observation points, photograph locations, and reporting format so that future data can be compared with the data collected in 2013. According to the permits, the next required monitoring period would be in the second year following construction, or 2014.
- In order to reach more definitive conclusions on the boundary between the various wetland zones, future monitoring should include several visits throughout the growing season, and/or properly timed site visits, in order to review these transitional areas more thoroughly during several phases of vegetation growth and hydrologic conditions. It may also be appropriate to review additional vegetation plots and soil test holes specifically located along the boundary where a potential shift in wetland/upland limits has been observed, and map the limits to determine the change in wetland area.

- We recommend that future monitoring include mapping of the wetland zones on the mitigation site for comparison of actual to planned wetland cover types and areas to the 2013 South Road Mitigation Site #15 Monitoring Plan provided with this report, and to track subsequent changes.
- Future monitoring, data collection, and calculations should utilize similar criteria established in this report, including the tables for data comparison, calculation of vegetation stem counts, and herbaceous cover data and convention for the tree portion of woody stem counts to ensure consistency in assessment of various vegetation measures that could impact the potential tracking of wetland development.
- In order to track the successional development of wetland areas from PSS to PFO, a broader review of the site, including conducting tree counts and identifying tree species outside the vegetation plots, should be considered during future monitoring.
- Since the muck moats are still considered wetlands, the development of PAB wetlands instead of planned PSS/PFO wetlands in these areas is not viewed as a significant issue at this time. On the positive side, the addition of PAB wetlands to the mitigation site may actually increase the overall vegetation and habitat diversity on the mitigation site and provide some benefit to the turtle populations in this area. However, the muck moats were not planted or seeded during construction with any vegetation species suitable for the aquatic regime that is developing, despite the fact that it was discussed during our construction review. While some volunteer species have become established, the installation of additional aquatic/emergent species should be considered in the near future to enhance the vegetation diversity and assist with keeping invasive species, such as Cattails, at bay.
- The high concentrations of invasive/undesirable species within some areas of the site, including primarily Cattails (*Typha latifolia*) and Purple Loosestrife (*Lythrum salicaria*), may already be impacting the development and diversity of vegetation on the site. To a lesser extent, the continued presence of Oriental Bittersweet (*Celastrus orbiculatus*) and Glossy Buckthorn (*Rhamnus frangula*) may also be an issue. These areas should be monitored closely to determine whether corrective actions should be undertaken in the near future to help control the spread (i.e. hand-pulling, mechanical, and/or biological, etc.). We also recommend that the site be periodically monitored to gauge the density of invasive plants and identify any longer-term trends (e.g., increase or decrease) relative to invasive plant density and location, which may dictate whether additional measures are critical for controlling invasive plants. If future impacts are evident, an invasive species control plan should also be developed and implemented on an annual basis to target those species found at the mitigation site.
- Future monitoring should also investigate any bare spots or areas prone to erosion and/or sediment deposits, specifically including the sand esker slopes and the berm east of the muck moat, since the stability of these areas have the potential to impact the functions and values of the mitigation site.

- The NHDOT may want to consider removal of the vegetation and/or adding additional sand on turtle nesting island to preserve habitat potential.
- While use of the site by a number of wildlife species is a positive sign, the presence of fox, beaver, and deer should continue to be monitored in the future to identify and prevent related impacts to the site conditions, vegetation, and/or turtle populations.
- The placement of additional woody debris should be considered to enhance the site habitat in the future.
- All remaining trash, garbage, and construction debris should be removed from the site to promote a more aesthetic appearance. The watering system utilized to support planted and seeded vegetation can be removed from the site since the vegetation has been adequately established and appears to be self-supporting.
- Although human usage of the site was not a significant problem during 2013, the frequent use for target shooting, ATV operation, and other recreational activities was clearly an issue in the past. The mitigation site should be monitored closely to identify any increase in usage and related impacts. Any future corrective actions to curb human usage should be discussed with the IOT before implementation.

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US Fish and Wildlife Service, Northeast Region 1,” 1988

Vanasse Hangen Brustlin, Inc. 2004, “Wetland Mitigation Report - Interstate 93
Improvements Salem to Manchester,” July 2004

TABLE 1
SUMMARY OF VEGETATION PLOT DATA (2013) - SIX SHEETS

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
1	Shrub/Forested Upland Zone	100	<u>HERBS</u>			
		35	Shallow Sedge	<i>Carex hurida</i>	OBL	
		30	Pointed Broom Sedge	<i>Carex scoparia</i>	FACW	
		10	Deer Tongue Grass	<i>Panicum clandestinum</i>	NI	
		10	Soft Rush	<i>Juncus effuses</i>	FACW+	
		1	Purple Loosestrife	<i>Lythrum salicaria</i>	FACW+	
		1	Smartweed spp.	<i>Polygonum spp.</i>	UNK	
		13	Canada Rush	<i>Juncus canadensis</i>	OBL	Part of seed mix
			Woolgrass	<i>Scirpus cyperinus</i>	FACW+	Part of seed mix
			Unidentified Grass	-	UNK	Part of seed mix
			<u>SHRUBS/TREES</u>			
		5	Speckled Alder	<i>Alnus rugosa</i>	FACW+	739 Woody Stems/acres
		5	Sweet Fern	<i>Comptonia peregrina</i>	NI	0 Tree species (T = tree)
		2	Arrowwood	<i>Viburnum recognitum</i>	FACW-	

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
2	Shrub/Forest Upland Zone	98	<u>HERBS</u>			
	(along existing berm)	30	Deer Tongue Grass	<i>Panicum clandestinum</i>	NI	
		25	Crabgrass	<i>Digitaria sanguinalis</i>	FACU-	
		15	Small White Aster	<i>Aster vimineau</i>	FAC	
		10	Red Clover	<i>Trifolium repens</i>	FACU-	
		10	Cinquefoil	<i>Potentilla spp.</i>	UNK	
		2	Pointed Broom Sedge	<i>Carex scaparia</i>	FACW	
		2	Soft Rush	<i>Juncus effuses</i>	FACW+	
		2	Unidentified Grasses	-	UNK	
		2	Common Ragweed	<i>Ambrosia artemisifolia</i>	FACU	
			<u>SHRUBS/TREES</u>			
		12	Cockspur Hawthorn	<i>Crataegus crus-galli</i>	NI	1,786 Woody Stems/acres
		7	Blackberry	<i>Rubus allegeniesis</i>	FACU-	0 Tree species (T = tree)
		5	Swamp Rose	<i>Rosa palustris</i>	OBL	
		5	Sweet Fern	<i>Componia peregrina</i>	NI	

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
3	Sandy Unvegetated Area (turtle nesting island)	35	<u>HERBS</u>			This area not planted or seeded
		20	Spikerush	<i>Eleocharis spp.</i>	OBL	
		10	Soft Rush	<i>Juncus effuses</i>	FACW+	
		5	Barnyard Grass	<i>Echinochloa crusgalli</i>	FACU	
		65	Sand			
			<u>SHRUBS/TREES</u>			0 Woody Stems/acres
		None				0 Tree species (T = tree)

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
4	Planned Scrub-Shrub/Forested Wetland	85	<u>HERBS</u>			
	(PSS/PFO)	85	Burreed	<i>Sparganium eurycarpum</i>	OBL	Water lily/pickerel weed near plot.
		15	Water	-		
			<u>SHRUBS/TREES</u>			
		None				0 Woody Stems/acres
						0 Tree species (T = tree)

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
5	Planned Scrub-Shrub/Forested Wetland	117	<u>HERBS</u>			Plot located on side slope.
	(PSS/PFO)	35	Soft Rush	<i>Juncus effuses</i>	FACW+	
		25	Unidentified Grass	-	UNK	
		15	Cattails	<i>Typha latifolia</i>	OBL	
		15	Deer Tongue Grass	<i>Panicum clandestinum</i>	NI	
		10	Red Clover	<i>Trifolium repens</i>	FACU-	
		10	Cinquefoil	<i>Potentilla spp.</i>	UNK	
		10	Shallow Sedge	<i>Carex lurida</i>	OBL	
		2	Purple Loosestrife	<i>Lythrum salicaria</i>	FACW+	
			<u>SHRUBS/TREES</u>			
		14	Grey Birch (T)*	<i>Betula populifolia</i>	FAC	1,294 Woody Stems/acres
		2	Silky Dogwood	<i>Cornus amomum</i>	FACW	862 Tree species (T = tree)
		2	Arrowwood	<i>Viburnum recognitum</i>	FACW-	*High number of pioneer species
		2	Speckled Alder	<i>Alnus rugosa</i>	FACW+	
		1	Sweet Fern	<i>Comptonia peregrina</i>	NI	

TABLE 1
SUMMARY OF VEGETATION PLOT DATA

SOUTH ROAD MITIGATION SITE #15
Monitoring 2013 (Year 1)
NHDOT Salem-Manchester 0931(205), 10418F
Londonderry, New Hampshire

December 24, 2013
[Pathways Project No. 12120]

VEGETATION PLOT ID	PROPOSED COVER TYPE	% OF AREAL VEGETATION COVER	COMPOSITION OF PLANTS		INDICATOR STATUS	COMMENTS
			COMMON NAME	SCIENTIFIC NAME		
6	Shrub/Forested Upland Zone	99	<u>HERBS</u>			
		40	Shallow Sedge	<i>Carex hurida</i>	OBL	
		20	Soft Rush	<i>Juncus effuses</i>	FACW+	
		20	Lance-leaved Goldenrod	<i>Euthamia graminifolia</i>	FAC	
		5	Deer Tongue Grass	<i>Panicum clandestinum</i>	NI	
		5	Red Clover	<i>Trifolium repens</i>	FACU-	
		5	Birdsfoot Trefoil	<i>Lotus corniculatus</i>	FACU-	
		2	Unidentified Grass	-	UNK	
		2	Meadow Foxtail	<i>Festuca pretensis</i>	FACU-	
			<u>*SHRUBS/TREES</u>			
						0 Woody Stems/acres
						0 Tree species (T = tree)
						*Area disturbed so shrubs and trees not counted.

TABLE 2
LIST OF OBSERVED AND VOLUNTEER SPECIES (2013)

FIGURE 1
SITE #15 LOCATION MAP

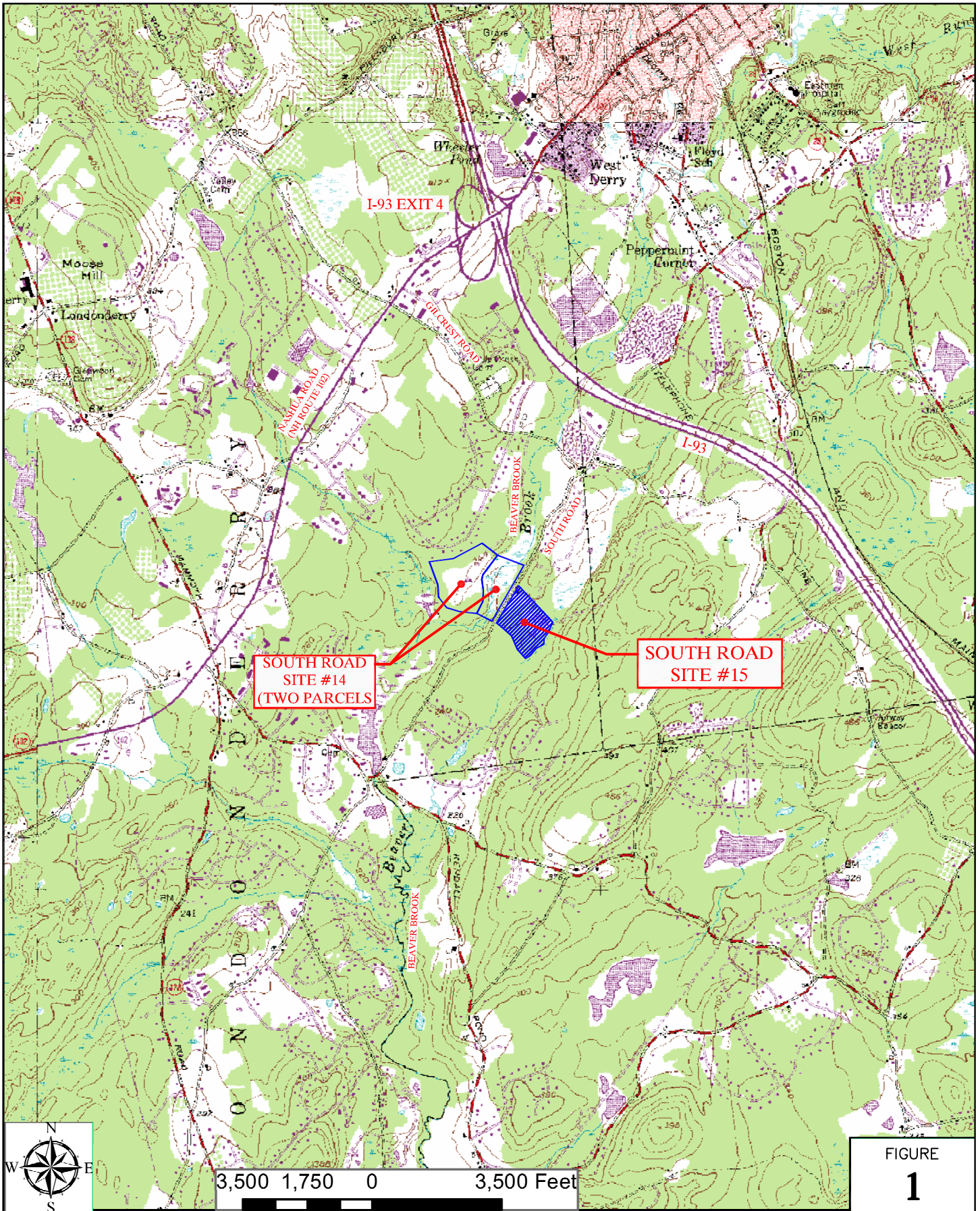


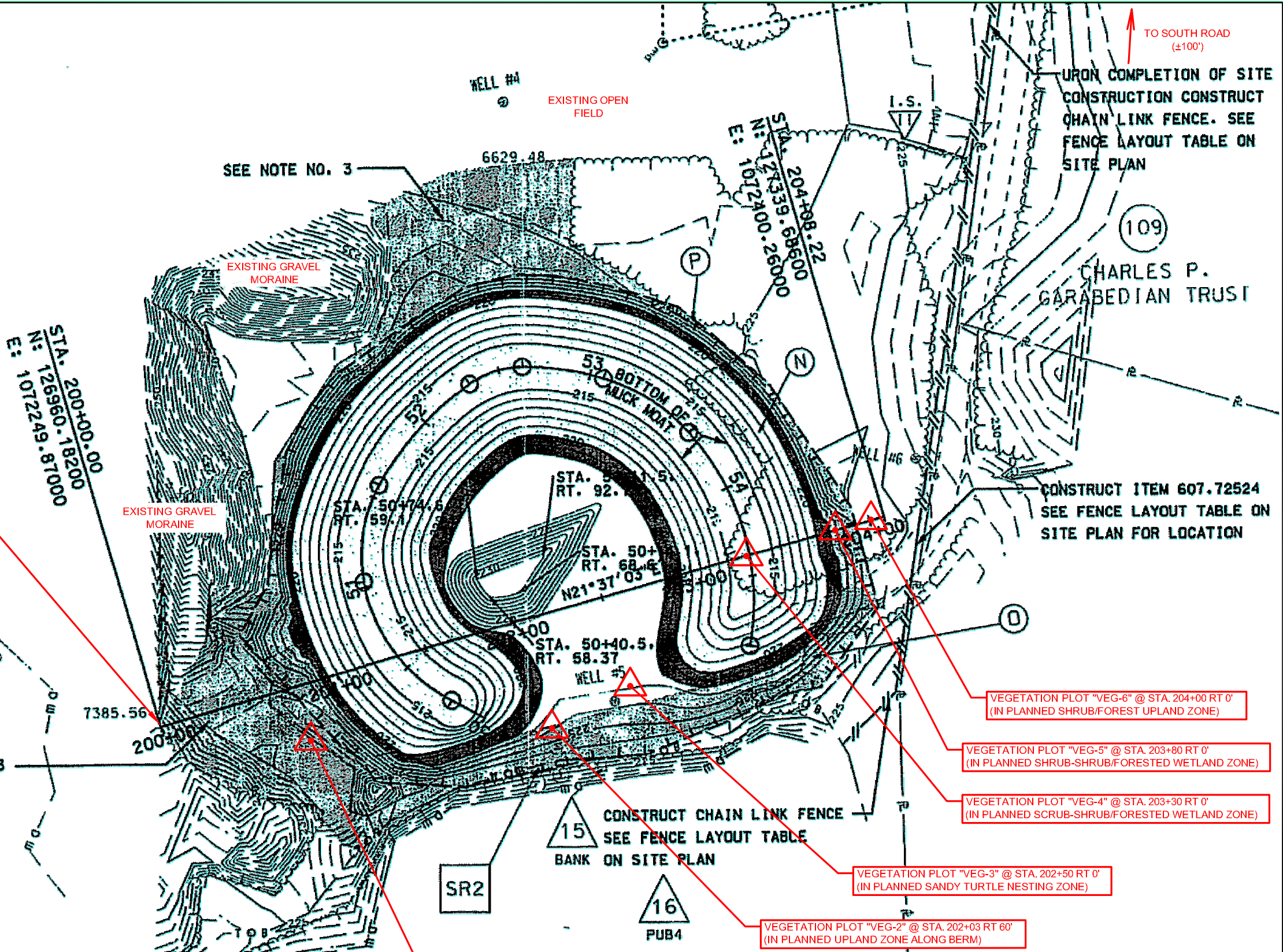
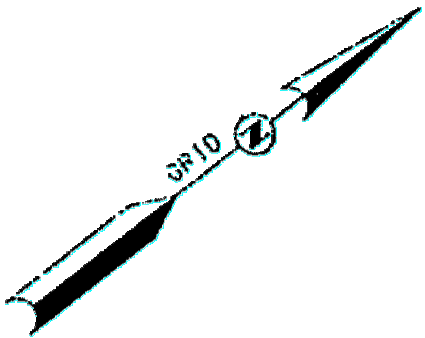
FIGURE
1

Pathways Consulting, LLC
 240 Mechanic Street, Suite 100
 Lebanon, New Hampshire 03766
 (603) 448-2200 FAX: (603) 448-1221

SITE #15 LOCATION MAP FOR
 NHDOT SALEM-MANCHESTER IM-0931(205), 10418F
 SOUTH ROAD MITIGATION SITE #15
 LONDONDERRY, NEW HAMPSHIRE

SCALE: AS SHOWN
 DESIGNED BY: SAW
 DRAWN BY: SAW
 CHECKED BY: SAW
 DATE: 12/24/13
 PROJ. NO. 12120

FIGURE 2
2013 SOUTH ROAD MITIGATION SITE #15 MONITORING PLAN



ORIGINAL CONSTRUCTION BASELINE
USED TO REFERENCE ALL VEGETATION
PLOT LOCATIONS DURING MONITORING

UPON COMPLETION OF SITE
CONSTRUCTION CONSTRUCT
CHAIN LINK FENCE. SEE
FENCE LAYOUT TABLE ON
SITE PLAN

CHARLES P.
GARABEDIAN TRUST

CONSTRUCT ITEM 607.72524
SEE FENCE LAYOUT TABLE ON
SITE PLAN FOR LOCATION

VEGETATION PLOT "VEG-6" @ STA. 204+00 RT 0'
(IN PLANNED SHRUB/FOREST UPLAND ZONE)

VEGETATION PLOT "VEG-5" @ STA. 203+80 RT 0'
(IN PLANNED SHRUB-SHRUB/FORESTED WETLAND ZONE)

VEGETATION PLOT "VEG-4" @ STA. 203+30 RT 0'
(IN PLANNED SCRUB-SHRUB/FORESTED WETLAND ZONE)

VEGETATION PLOT "VEG-3" @ STA. 202+50 RT 0'
(IN PLANNED SANDY TURTLE NESTING ZONE)

VEGETATION PLOT "VEG-2" @ STA. 202+03 RT 60'
(IN PLANNED UPLAND ZONE ALONG BERM)

VEGETATION PLOT "VEG-1" @ STA. 200+76 RT 30'
(IN PLANNED SHRUB/FOREST UPLAND ZONE)

- KEY**
- AREAS OF SPECIAL WETLAND SOIL (ELEVATION 215.00 TO 220.00)
SEED WITH SHRUB/FOREST WETLAND SEED MIX (CONFORMING TO
ITEM 644.22) SUBSIDIARY TO ITEM 646.3
 - AREAS OF SCRUB/SHRUB AND LOAM
(12" DEPTH, SPREAD FROM ELEVATION 220.00 TO 222.00)
PLANTING OF : SILKY DOGWOOD 5' OC
SWAMP ROSE 5' OC
MEADOWSWEET 5' OC
ARROWWOOD 5' OC
SPECKLED ALDER 5' OC
SEED WITH SHRUB/FOREST WETLAND SEED MIX (CONFORMING TO
ITEM 644.22) SUBSIDIARY TO ITEM 646.3
 - AREAS OF SLOPE STABILIZATION AND LOAM
(12" DEPTH, ABOVE ELEVATION 222.00)
PLANTING OF : COCKSPUR HANTHORN 5' OC
BLACKBERRY 5' OC
SEED WITH UPLAND SEED MIX (DECIDUOUS TREES/GRASS SEED)
(CONFORMING TO ITEM 644.70) SUBSIDIARY TO ITEM 646.3
 - AREAS OF NATIVE (EXISTING) SOILS
NO PLANTING OR SEEDING
PITCH PINES WILL BE PLANTED AS DIRECTED BY THE CONTRACT
ADMINISTRATOR.

NOTE:
1. REFERENCE IS MADE TO A PLAN SHEET 16 ENTITLED "PROPOSED
CONDITIONS SOUTH SITE PLAN" PREPARED BY THE HOYLE, TANNER &
ASSOCIATES, INC., DATED 11/18/2010, FOR NHDOT I-93
SALEM-MANCHESTER IMPROVEMENTS, FEDERAL PROJECT NO. IM-0931(205),
NHDOT PROJECT NO. 10418F, LONDONDERRY, NH.

REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

2013 SOUTH ROAD MITIGATION SITE #15 MONITORING PLAN FOR
NHDOT SALEM-MANCHESTER IM-0931(205, 10418F)
SOUTH ROAD MITIGATION SITE #15, SOUTH ROAD, LONDONDERRY, NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: 1" = 60'
DESIGNED BY: SAW
DRAWN BY: SAW
CHECKED BY: SAW
DATE: 12/24/13
PROJ. NO. 12120

FIGURE
2
SHEET 1 OF 1

**APPENDIX A
SITE PHOTOGRAPHS**



Photograph No. 1 (taken 10/16/13): View from near Sta. 202+00 50' RT on east side of the berm looking west toward turtle nesting area.



Photograph No. 2 (taken 10/16/13): View from Sta. 201+50 100' RT looking to the west across the animal trail that connects the existing pond to the mitigation site.



Photograph No. 3 (taken 10/16/13): View from Sta. 202+00 100' RT looking to the west across another animal trail that connects the existing pond to the mitigation site.



Photograph No. 4 (taken 10/16/13): Deer tracks on southeast side of the turtle mound.



Photograph No. 5 (taken 10/16/13): View of turtle mound showing evidence of animal predation on turtle eggs.



Photograph No. 6 (taken 10/16/13): Animal scat on turtle mound.



Photograph No. 7 (taken 10/16/13): View of erosion continuing on existing sand esker slopes southwest of the muck moat.



Photograph No. 8 (taken 10/16/13): View of an animal burrow on the upper slope of the existing sand esker southwest of the muck moat.



Photograph No. 9 (taken 10/16/13): View of additional evidence of turtle egg predation on the south side of turtle nesting area.



Photograph No. 10 (taken 10/26/13): View of Vegetation Plot #1 at Sta. 200+76 RT 30' looking to the northwest toward the turtle nesting area.



Photograph No. 11 (taken 10/26/13): View of Vegetation Plot #2 at Sta. 202+03 RT 60' looking toward Vegetation Plot #3.



Photograph No. 12 (taken 10/26/13): View of Vegetation Plot #3 at Sta. 202+50 RT 50'.



Photograph No. 13 (taken 10/26/13): View of Vegetation Plot #5 at Sta. 203+80 from 25' left looking to the east.



Photograph No. 14 (taken 10/26/13): View of Vegetation Plot #6 at Sta. 204+00 looking south along baseline transect from near chain link fence.



Photograph No. 15 (taken 10/26/13): View of soil test hole at Vegetation Plot #1.



Photograph No. 16 (taken 10/26/13): View of soil test hole at Vegetation Plot #2.



Photograph No. 17 (taken 10/26/13): View of soil test hole at Vegetation Plot #3.



Photograph No. 18 (taken 10/26/13): View of soil test hole at Vegetation Plot #6.



Photograph No. 19 (taken 10/26/13): View of Vegetation Plot #2 at Sta. 202+03 RT 60' from existing berm looking to west toward turtle nesting area.

APPENDIX B
PROJECT PERMITS

DEPARTMENT OF THE ARMY PERMIT

Permittee New Hampshire Department of Transportation

Permit No. 199201232/NAE-2004-233

Issuing Office New England District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

discharge fill material into approximately 77 acres of wetlands and waters within the Spickett River watershed, the Golden Brook watershed, the Beaver Brook watershed, the Little Cohas Brook watershed, and the Cohas Brook watershed in the Merrimack River Basin, to improve the Interstate Route 93 between Salem and Manchester, New Hampshire. The project involves a combination of highway and related infrastructure improvements for the 19.8 mile segment. The main element of the improvement involves widening I 93 from the existing limited access two – lane highway in each direction to a limited access four – lane highway in each direction. The project begins in the town of Salem, near the New Hampshire/Massachusetts state line and extends northerly through Salem, Windham, Derry, Londonderry, and into Manchester, ending at the I 93/I 293 interchange. The layout also includes the reconstruction and reconfiguration of the interchanges along I 93 at Exit 1 (Rockingham Boulevard), Exit 2 (Pelham Road), Exit 3 (NH Route 111), Exit 4 (NH Route 102) and Exit 5 (NH Route 28.) The project is further described on the attached plans entitled "Interstate 93 Improvements Salem To Manchester IM-IR-93-1(174)0,10418-C, in sheets 1 through 8, 1 through 6 and 1 through 29, and dated 8 June 2004.

Project Location:

Merrimack River Basin, Salem to Manchester, New Hampshire

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on 29 MAR 2012. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permit-tee shall ensure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers jurisdiction at the site of the work authorized by this permit. This shall be achieved by including the entire permit in the specifications for work.

(Special Conditions continued on Page 4)

Further Information:

1. **Congressional Authorities:** You have been authorized to undertake the activity described above pursuant to:

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

Section 404 of the Clean Water Act (33 U.S.C. 1344).

Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. **Limits of this authorization.**

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. **Limits of Federal Liability.** In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

- e. Damage claims associated with any future modification, suspension, or revocation of this permit.
4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
- a. You fail to comply with the terms and conditions of this permit.
 - b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
 - c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

William Carr 5/2/07
 (PERMITTEE) *Asst. Director of Project Development* (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Christine Jodrey 3-29-07
 (DISTRICT ENGINEER) (DATE)
 Curtis L. Thalken
 Colonel, Corps of Engineers
 District Engineer

for

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

 (TRANSFEE) (DATE)

(Special Conditions continued from Page 2)

If the permit is issued after the construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. If the permit is issued after receipt of bids or quotes, the entire permit shall be included in the contract or sub-contract as a change order. The term "entire permit" includes permit amendments. Although the permit-tee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.

2. All areas of wetlands and/or waters, which are disturbed during construction, except those authorized herein for permanent impact, shall be restored to their approximate original elevation (but not higher) and condition by careful protection, and/or removal and replacement, of existing soil and vegetation. In addition, if upland clearing, grubbing, or other construction activity results in, or may result in, soil erosion with transport and deposition into a wetland or waterway, devices such as geotextile silt fences, sediment trenches, etc., shall be installed and properly maintained to minimize such impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

3. Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize adverse impacts on waters and wetlands during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

4. No temporary fill (e.g., access roads, cofferdams) may be placed in waters or wetlands unless specifically authorized by this permit. If temporary fill is used, it shall be disposed of at an upland site and suitably contained to prevent its subsequent erosion into a water of the U.S., and the area shall be restored to its original contours (but not higher). During use, such temporary fill must be stabilized to prevent erosion or, in the case of flowing water (rivers or streams), clean washed stone should be used. When temporary fill is placed in wetlands or waters for the purpose of supporting excavation equipment which will perform trenching operations, protective geotextile fabric shall first be placed in two parallel strips, separated by the location and width of the future trench. This does not apply to mats. No temporary fill (e.g. access roads, cofferdams) in any waters or wetlands is authorized by this permit.

5. Mitigation shall be performed in accordance with the attached mitigation plan entitled, "Wetland Mitigation Technical Reports and Plans, NH Interstate 93 Improvement Project Salem-Manchester 10418-C. "

Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 5 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers. The term 'mitigation success' means success as defined in the mitigation plan this permit requires you to implement. Demonstration of success under this permit shall consist of the required

mitigation monitoring, corrective measures, submittal of mitigation monitoring reports, and a final wetland assessment.

6. The MOA on historic properties between the New Hampshire Department of Transportation, the Federal Highway Administration, and the State Historical Preservation Officer and date signed August 8, 2002 is a special condition of this permit and shall be faithfully executed.

7. To demonstrate compliance with condition E-10 of the Water Quality Certification, WQC# 2002-007, approved May 2, 2006 (attached), the permit-tee shall record the levels of road salt used on I-93 and its interchanges between the Massachusetts border and Exit 6 on a monthly basis and shall report such monthly load information to the Corps, EPA and NHDES on a quarterly basis. The permittee shall include in each quarterly report a description of the adaptive management strategies it has implemented for the preceding quarter to optimize the use of de-icing compounds and/or anti-icing compounds and to maximize salt application efficiency.

8. Except where stated otherwise, reports, drawings, correspondence and any other submittals required by this permit shall be marked with the words **"199201232/NAE-2004-233** and shall be addressed to "Policy Analysis and Technical Support Branch, CENAE-R-PT", U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751." Documents which are not marked and addressed in this manner may not reach their intended destination and do not comply with the requirements of this permit.

9. Special condition regarding areas to be protected from development: The NH DOT with the concurrence of the FHWA has agreed to protect approximately 1,000 acres of undeveloped land as part of the mitigation package for the proposed project and both have committed to this course of action in the FEIS and the FHWA ROD. The parcels proposed for protection are enumerated in Section 4.7 of the FHWA ROD at pp.14-15 and 11-12 respectively and depicted in the FEIS at table 4.6-5. The faithful implementation of these commitments is a condition of this authorization and failure to acquire and record conservation easements or restrictive covenants on the enumerated parcels shall be considered a violation of the conditions of this permit and subject the permittee to the enforcement provisions of our regulations. The NH DOT has already acquired interests in some of the parcels enumerated above but there are several remaining parcels yet to be acquired. The NH DOT shall comply with the following conditions:

A. For those parcels already acquired in fee simple, the NH DOT shall place restrictive covenants on the land. For all other interests in land the NH DOT shall ensure that a conservation easement is placed on the parcel with the NH DOT as the grantee. The restrictive covenants or conservation easements shall be recorded in the Rockingham or Hillsborough County Registry of Deeds, as appropriate, and a copy of the recordation shall be sent to the Corps of Engineers within thirty (30) days. The language of the restrictive covenants or conservation easements shall be approved by the Corps, the FHWA and the NH DES before the restrictive covenants or conservation easements are recorded.

B. The conservation easements or restrictive covenants shall enable the site or sites to be protected in perpetuity from future use or development. The conservation easement or restrictive covenants shall expressly allow for the creation, restoration, remediation and monitoring activities required by this permit on the site or sites. It shall prohibit all other filling, clearing, development and other disturbances (including unauthorized motorized vehicle access) on these sites except for activities consistent with the purposes of the conservation easements or restrictive covenants.

C. There shall be no discharges pursuant to this permit until the restrictive covenants or conservation easements on the already acquired parcels have been recorded.

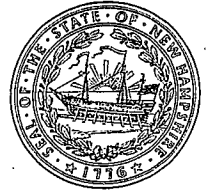
D. Within five (5) years of the issuance of this permit, the NH DOT shall place restrictive covenants or conservation easements on the remaining parcels enumerated in the above referenced documents. A copy of the executed documents shall be provided to the Corps of Engineers within (30) day of recording.

E. All subsequent property transfers are to be made subject to said restrictions or easements. The NH DOT shall reference the restrictive covenants or easements in all transfer deeds. The NH DOT shall provide a copy of the transfer deeds to the Corps of Engineers within thirty (30) days of recording.

F. The NH DOT shall not transfer any fee owned property to another person or entity unless a conservation easement is placed on the property prior to transfer and made subject to the existing restrictive covenant. The Corps of Engineers shall approve the language of the conservation easement.

G. All copies of the executed and recorded easements or restrictive covenants and any subsequent transfer deeds shall be sent to the Corps of Engineers, Regulatory Division, attn: Chief, Policy Analysis and Technical Support Branch, 696 Virginia Road, Concord, MA 01742-2751.

DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

WETLANDS AND NON-SITE SPECIFIC PERMIT 2002-02033

Permittee: Nh Dept Of Transportation, PO Box 483 Concord, NH 03302-0488
Project Location: Rte I-93, Salem /Manchester/Windham/Derry/Londonderry
Waterbody: Unnamed Wetland

Page 1 of 5

NOTE---
CONDITIONS

APPROVAL DATE: 05/02/2011

EXPIRATION DATE: 05/02/2016

Based upon review of the above referenced application, in accordance with RSA 482-A and RSA 485-A:17, a Wetlands Permit and Non-Site Specific Permit was issued. This permit shall not be considered valid unless signed as specified below.

TIME EXTENSION

PERMIT DESCRIPTION: Dredge and /or fill approximately 76 acres of mostly palustrine and riverine wetlands to improve the capacity, efficiency and safety along 19.8 miles of Interstate 93. The existing limited access, two lane highway will be widened to create a limited access four lane highway starting at the Massachusetts/New Hampshire state line in Salem and ending just north of the I-93/I-293 interchange in Manchester. The project includes improvements to five existing interchanges and cross roads, construction of three new Park and Ride facilities at Exit 2, 3 and 5, expanded bus service at Exit 4, and space to accommodate a future rail corridor between the Massachusetts/New Hampshire state line northerly to the Exit 5 interchange.

Compensation for wetland impacts includes: construction of approximately 31 acres of wetlands at five sites; preservation of approximately 1,000 acres of upland and wetland habitat; construction of detention basins and extended treatment swales; a \$3 million contribution to the NHDES Drinking Water Supply Land Grant Program or to a comparable program for funding aquatic resource protection in the Massabesic Lake watershed; and establishment of a \$3.5 million fund for the Community Technical Assistance Program to help area communities plan for growth as a result of the project. NHDOT project #10418-C.

THIS APPROVAL IS SUBJECT TO THE FOLLOWING PROJECT SPECIFIC CONDITIONS:

- 1. The wetland impacts associated with this approval are based on the Amended New Hampshire Department of Environmental Services Wetlands Bureau (hereinafter "NHDES")/Army Corps of Engineers permit application received on August 12, 2004 (hereinafter "the Application").
2. During final design and construction work, wetland impacts that exceed 76 acres as represented in the Application and materials contained in NHDES file, shall require submittal of a permit amendment request to be reviewed and approved by NHDES after consultation with the appropriate local Conservation Commission(s).
3. During final design of the roadway construction plans, a joint review shall be conducted by state and federal resource agencies regarding proposed water quality treatment features such as grass swales or detention basins that may cause additional jurisdictional impacts for construction to confirm need, location, and necessity for a permit amendment.
4. Final design plans for roadway construction shall be submitted to NHDES and appropriate local Conservation Commission(s) for each construction contract with a summary of wetland impacts for the associated contract work. Review and comments from NHDES and Conservation Commissions shall be considered by the NH Department of Transportation (hereinafter "NHDOT") and incorporated into the design where appropriate.
5. During final design, efforts to avoid or minimize wetland and surface water impacts shall be maximized by constructing steepened side slopes, retaining walls, and accommodations for wildlife passage.
6. NHDOT will study the feasibility of reconstructing existing culverts at Policy Brook and Porcupine Brook in Salem, Beaver Brook in Derry, and Cohas Brook in Manchester, to address wildlife passage issues. These measures will be fully evaluated as part of the final design and incorporated into plans where practicable.
7. This permit shall not be effective until it has been recorded with the county Registry of Deeds offices by NHDOT. A copy of the registered permit shall be submitted to NHDES prior to construction.

DES Web site: www.des.nh.gov

P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095

Telephone: (603) 271-2147 • Fax: (603) 271-6588 • TDD Access: Relay NH 1-800-735-2964

034379

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REGISTRY OF DEEDS

Page 2 of 5 Time Extension 5/2/2011
Permit #2002-2033
Conditions Cont'd

8. This permit is contingent on approval by the NHDES Dam Safety Program.
9. NHDOT will comply with the provisions of the Section 401 Water Quality certification upon its issuance and noncompliance shall be considered a violation of the conditions of this permit.
10. A water quality monitoring program will be developed and implemented in accordance with requirements established by NHDES, Watershed Management Bureau.
11. This permit is contingent on NHDOT providing funding for establishment of an additional Environmentalist IV position within DES to provide for construction monitoring, minor modifications during final design and minor permitting changes due to unanticipated obstacles and conflicts during construction. This position shall be funded continuously through the completion of the project to ensure that all permit conditions are satisfied, including monitoring of all mitigation areas. The details for funding this position will be fully detailed in a memorandum of agreement to be negotiated and executed between NHDOT and NHDES no later than September 1, 2006.
12. Measures to mitigate impacts to the perennial wildflower wild lupine listed by the NH Natural Heritage Bureau (hereinafter "NHB") as a state threatened species will be addressed by completing a written mitigation plan specific to the population in the project area in consultation with NHB. The plan shall focus on efforts to relocate the individual plants by means of re-seeding or transplantation.
13. Potential habitat areas for the eastern hognose snake shall be determined using GIS-level analysis prior to construction to determine if the species will be impacted by the project in coordination with the NH Fish and Game Department (hereinafter "NHF&G").
14. Dredged material shall be placed out of NHDES jurisdiction unless otherwise specified.
15. This permit is contingent upon the submission of project specific stream diversion and erosion control plans to the NHDES for review and approval. Those plans shall detail the timing and method of stream flow diversion during construction, and the temporary siltation, erosion and turbidity control measures to be implemented.
16. At least 48 hours prior to the start of each construction contract, a pre-construction meeting shall be held with NHDES Land Resources Management Program staff at the project site or at the NHDES or NHDOT Offices in Concord, N.H. to review the conditions of this permit, the NHDES Water Quality Certificate, and any other environmental commitments stated in other approved documents such as the Interstate 93 Improvements Salem to Manchester Final Environmental Impact Statement (hereinafter "FEIS"). It shall be the responsibility of NHDOT to schedule the pre-construction meeting, and the meeting shall be attended by NHDOT, the contract administrator(s), wetlands scientist(s), wildlife professional(s), and the contractor(s) responsible for performing the work.
17. Appropriate siltation/erosion/turbidity controls shall be in place prior to construction, shall be maintained during construction, and shall remain until the area is stabilized.
18. The project engineer shall oversee installation of erosion controls and periodically verify that the controls are properly maintained during construction and until all areas are fully stabilized.
19. Appropriate storm water management and erosion control Best Management Practices (BMPs) shall be implemented to ensure turbidity is minimized and water quality standards are not violated. If the BMPs conflict with the terms or conditions of this permit, the terms and conditions of this permit shall control.
20. Construction equipment shall not be located within surface waters.
21. There shall be no further alteration of wetlands or surface waters without amendment of this permit.
22. Within three days of the last activity in an area adjacent to a wetland resource, all exposed soil areas, where construction activities are complete or have been temporarily suspended, shall be stabilized by seeding and mulching during the growing season, or if not within the growing season, by mulching with tack or netting and pinning on slopes steeper than 2:1.
23. Where construction activities have been temporarily suspended within the growing season, all exposed soil areas shall be stabilized within 14 days by seeding and mulching.
24. Where construction activities have been temporarily suspended outside the growing season, all exposed areas shall be stabilized within 14 days by mulching and tack. Slopes steeper than 3:1 shall be stabilized by matting and pinning.
25. Discharge from dewatering of work areas shall be to sediment basins that are: a) located in uplands; b) lined with hay bales or other acceptable sediment trapping liners; c) set back as far as possible from wetlands and surface waters and, wherever possible, with a minimum of 20 feet of undisturbed vegetated buffer.
26. The contractor responsible for completion of the work shall utilize techniques described in the New Hampshire Stormwater Manual, Volume 3, Erosion and Sediment Controls During Construction (December 2008).

Page 3 of 5 Time Extension 5/2/2011
Permit #2002-2033
Conditions Cont'd

27. NHDOT shall limit unnecessary removal of vegetation within riparian areas during road construction and areas cleared of vegetation shall be re-vegetated as quickly as soon after construction as possible so as to minimize erosion and restore wildlife habitat.
28. Land clearing in wetland areas during highway construction is to be kept to a minimum to reduce impacts on wildlife habitat.
29. Precautions shall be taken to prevent import or transport of soil or seed stock containing nuisance, invasive species such as purple loosestrife or Phragmites.
30. NHDOT shall provide a yearly progress report to NHDES relative to the efforts and progress achieved in studying transit issues in coordination with the Commonwealth of Massachusetts.
31. All activity shall be in accordance with the Comprehensive Shoreland Protection Act, RSA 483-B.
32. This permit is contingent on the execution of the mitigation components specified in the Wetland Mitigation Report dated July 2004 and received by NHDES on August 12, 2004.
33. Compensation for wetland and surface water impacts includes the advance mitigation project as approved by NHDES (permit #2000-00455) at the Pelham Road site in Salem for the creation of 4 acres of wetlands and the preservation of an additional 21 acres.
34. Remedial measures that remain uncompleted for the Pelham Road advance mitigation site shall be incorporated into a construction contract for this project. The NHDOT shall submit a copy of the contract to the NHDES Wetlands Bureau specifying such remedial measures.
35. The mitigation proposal as detailed in amended application materials dated July, 2004 and materials submitted on August 12, 2004 shall be followed for compensating impacts associated with the proposed project.
36. Modifications to the mitigation proposal may be required if changes to the project result in an increase in wetland impacts beyond that specified in this permit.
37. The proposed mitigation package includes providing \$3 million to the NHDES Drinking Water Supply Land Grant Program or to a comparable program to be approved by NHDES that can utilize the funds for aquatic resource protection in the area of Massabesic Lake.
38. NHDOT shall provide specific, detailed parcel information to NHDES, and all other resource agencies, for review and approval for disbursement of the \$3 million for funding aquatic resource protection within three years of the start of construction.
39. NHDOT shall provide annual progress reports relative to the status and disbursement of the \$3.5 million fund for the Community Technical Assistance Program to help area communities plan for growth as a result of the project. The following communities have been identified for potential assistance: Concord, Bow, Pembroke, Dunbarton, Allenstown, Deerfield, Goffstown, Hocksett, Candia, Raymond, Bedford, Manchester, Auburn, Chester, Fremont, Litchfield, Londonderry, Derry, Hampstead, Sandown, Danville, Hudson, Windham, Salem, Atkinson, and Pelham.
40. The schedule for the construction of the South Road (site 14 and 15) creation site shall coincide with the highway-widening contract so that salvaged wetland soils and other materials can be used at the South Road site.
41. The schedule for the construction of the three additional wetland creation areas shall coincide with the highway-widening contract for the particular area unless otherwise authorized by NHDES.
42. NHDOT and NHDES shall form an Interdisciplinary Oversight Team to provide technical assistance on the construction and completion of the wetland creation sites.
43. The wetland creation areas shall be properly constructed, monitored, and managed in accordance with final mitigation plans approved by NHDES.
44. Wetland creation and flood storage replacement areas shall be properly constructed, landscaped, and monitored. Remedial actions may be necessary to create functioning wetland and floodplain areas similar to those destroyed by the project. Remedial measures may include replanting, relocating plantings, removal of invasive species, changing soil composition and depth, changing the elevation of the wetland surface, and changing the hydrologic regime.
45. NHDOT shall designate a qualified professional who will be responsible for monitoring and ensuring that the mitigation areas are constructed in accordance with the mitigation plans. Monitoring shall be accomplished in a timely fashion and remedial measures taken if necessary. NHDES shall be notified in writing of the designated professional prior to the start of work and if there is a change of status during the project.

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Permit #2002-2033
Conditions Cont'd

46. The NHDOT shall notify, in writing, NHDES and the local conservation commission(s) in the municipality(ies) where the construction is to take place of their intention to commence construction no less than 5 business days prior to construction.
47. A post-construction report, including a narrative and photographs, documenting the status of the completed mitigation projects shall be submitted to NHDES within 60 days of the completion of construction.
48. NHDOT or the designated qualified professional shall conduct a follow-up inspection after the first growing season, to review the success of the mitigation area and schedule remedial actions if necessary. A report outlining these follow-up measures and a schedule for completing the remedial work shall be submitted by December 1 of that year. Similar inspections, reports and remedial actions shall be undertaken in at least the second, third and fifth years following the completion of each mitigation site.
49. Wetland creation areas shall have at least 75% successful establishment of wetlands vegetation after two (2) growing seasons, or shall be replanted and re-established until a functional wetland is replicated in a manner satisfactory to NHDES.
50. NHDOT shall delineate the wetlands and flood storage volume within the mitigation sites, document the delineation with US Army Corps of Engineers' data forms, and depict the delineation as an overlay of the final as-built plans after at least five full growing seasons.
51. Wetland soils from areas vegetated with purple loosestrife shall not be used in the wetland creation sites. The potential for the establishment of the invasive species should be considered in other areas where spoils may be spread to limit its further establishment.
52. NHDOT shall attempt to control invasive, weedy species such as purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) by measures approved by NHDES if the species is found in the mitigation areas during construction and during the early stages of vegetative establishment.
53. Baseline documentation reports for all lands to be protected shall be completed and submitted to NHDES within one year following NHDOT securing the parcels. The reports shall contain photographic documentation of the areas, and shall be submitted to NHDES to serve as a baseline for future monitoring of the areas.
54. NHDOT shall provide information for review and approval by NHDES relative to the mechanisms to be used for preservation of the parcels in perpetuity. The use of a conservation easement for long-term protection of the properties is preferred and should be pursued where possible.
55. NHDOT shall provide NHDES a status report on the properties to be protected as part of the second and third year monitoring reports to insure compliance with the preservation requirements. If the preservation of the properties has not been completed after three years, yearly reports shall be submitted following the third year as to the status of protection.
56. Conservation easements that are placed on the preservation areas shall be written to run with the land, and both existing and future property owners shall be subject to this easement. The conservation easements shall be executed and recorded within five years of the permit issuance.
57. Conservation easements that are placed on the preservation areas relative to the \$3 million contribution to the NHDES Drinking Water Supply Land Grant Program shall not preclude use of the property for public water supply purposes.
58. The plan depicting the conservation easement along with a copy of the final easement language shall be recorded with the Registry of Deeds Office for each property. A copy of the recording from the County Registry of Deeds Office shall be submitted to NHDES.
59. The boundaries of the protected properties shall be surveyed by a licensed surveyor, and marked by permanent markers/signs for purposes of identification and monitoring.
60. NHDES shall be notified of the placement of the permanent markers/signs to coordinate on-site review of their location.
61. There shall be no removal of the existing vegetative undergrowth within the preservation areas and the placement of fill, construction of structures, and storage of vehicles or hazardous materials is prohibited.
62. NHDES shall be notified in writing of the transfer of any preservation lands and mitigation sites to another organization that has been retained for management purposes and the notification shall state the name of the entity responsible for continuing long-term management and/or stewardship of the lands.
63. Activities in contravention of the conservation easement shall be construed as a violation of RSA 482-A, and those activities shall be subject to the enforcement powers of NHDES, including remediation and fines.

GENERAL CONDITIONS THAT APPLY TO ALL DES WETLANDS PERMITS:

1. A copy of this permit shall be posted on site during construction in a prominent location visible to inspecting personnel;
2. This permit does not convey a property right, nor authorize any injury to property of others; nor invasion of rights of others;
3. The Wetlands Bureau shall be notified upon completion of work;
4. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits, and/or consult with other agencies as may be required (including US EPA, US Army Corps of Engineers, NH Department of Transportation, NH Division of Historical Resources (NH Department of Cultural Resources), NHDES-Alteration of Terrain, etc.);
5. Transfer of this permit to a new owner shall require notification to and approval by DES;
6. This permit shall not be extended beyond the current expiration date.
7. This project has been screened for potential impacts to **known** occurrences of rare species and exemplary natural communities in the immediate area. Since many areas have never been surveyed, or have received only cursory inventories, unidentified sensitive species or communities may be present. This permit does not absolve the permittee from due diligence in regard to state, local or federal laws regarding such communities or species.
8. Review enclosed sheet for status of the US Army Corps of Engineers' federal wetlands permit.

APPROVED: _____

Collis G. Adams
 Collis G. Adams
 Bureau Administrator
 DES Wetlands Bureau

BY SIGNING BELOW I HEREBY CERTIFY THAT I HAVE FULLY READ THIS PERMIT AND AGREE TO ABIDE BY ALL PERMIT CONDITIONS.

William J. Cass
 William J. Cass, P.E.
 Director of Project Development
 NHDOT
 OWNER'S SIGNATURE (required)

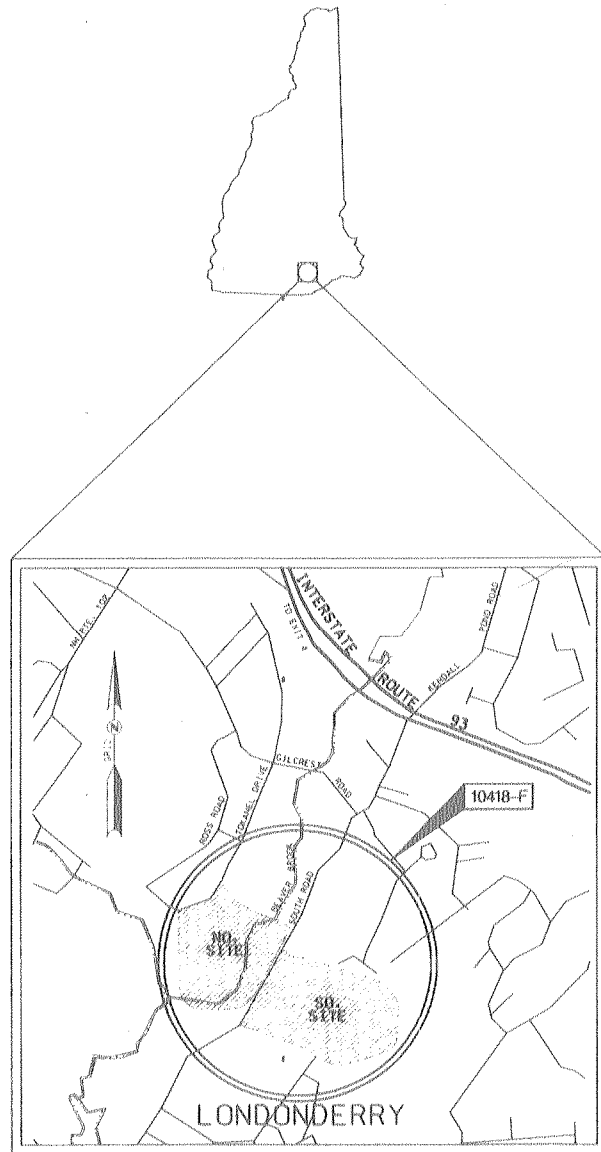
 CONTRACTOR'S SIGNATURE (required)

APPENDIX C
NHDOT PROJECT PLANS

STATE OF NEW HAMPSHIRE
 DEPARTMENT OF TRANSPORTATION
CONSTRUCTION PLANS
FEDERAL AID PRIMARY PROJECT

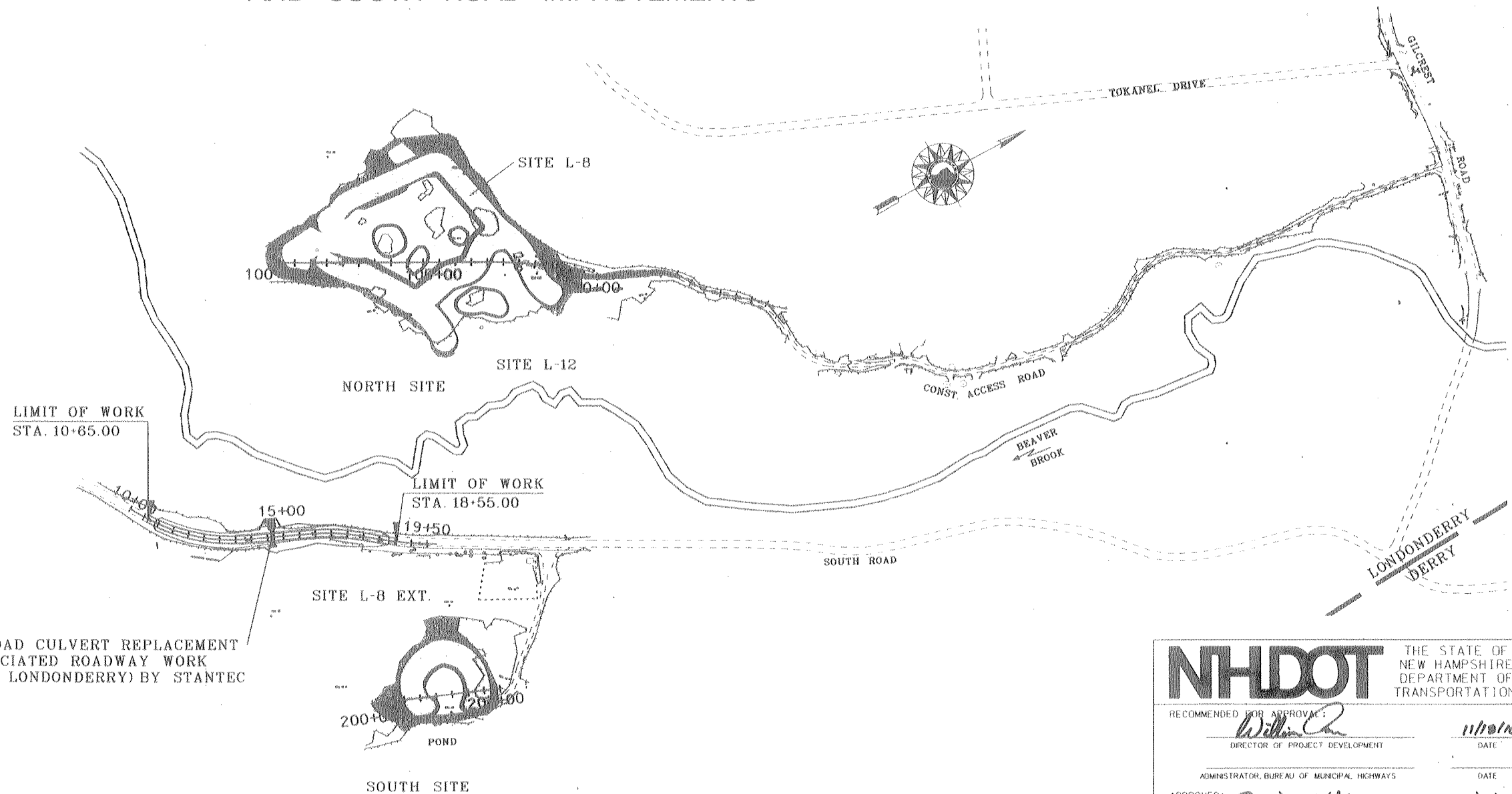
FEDERAL PROJECT NO. IM-0931(205)
 N.H. PROJECT NO. 10418-F
**WETLAND MITIGATION SITE L-8, L-8 EXT., & L-12
 AND SOUTH ROAD IMPROVEMENTS**

DESIGN DATA	
AVERAGE DAILY TRAFFIC 20 09	5000
AVERAGE DAILY TRAFFIC 20 --	---
PERCENT OF TRUCKS	N/A
DESIGN SPEED	35 MPH
LENGTH OF PROJECT	740 LF



LOCATION MAP
 SCALE: 1" = 400'

SOUTH ROAD CULVERT REPLACEMENT
 AND ASSOCIATED ROADWAY WORK
 (TOWN OF LONDONDERRY) BY STANTEC



TOWN OF LONDONDERRY
 COUNTY OF ROCKINGHAM
 SCALE: 1" = 200'

THESE PLANS HAVE BEEN REDUCED
 PHOTOGRAPHICALLY TO
 APPROXIMATELY 1/2 SCALE

DRAWN BY: CLK
 CHECKED BY: TMC
 DATE AUG. 04
 DATE OCT. 10

<p>HOYLE TANNER & ASSOCIATES, INC.</p>	<p>STANTEC</p>
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NH DOT THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION			
RECOMMENDED FOR APPROVAL:			
<i>William C. [Signature]</i>	11/10/10		
DIRECTOR OF PROJECT DEVELOPMENT	DATE		
ADMINISTRATOR, BUREAU OF MUNICIPAL HIGHWAYS	DATE		
APPROVED: <i>[Signature]</i>	11/10/10		
ASSISTANT COMMISSIONER AND CHIEF ENGINEER	DATE		
U. S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION			
APPROVED:			
DIVISION ADMINISTRATOR	DATE		
FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
IM-0931(205)	10418-F	1	44

SUMMARY OF QUANTITIES (ESTIMATED)
THIS INFORMATION IS FOR BIDDING PURPOSES ONLY

EARTHWORK				
	NORTH SITE	SOUTH SITE	SOUTH ROAD	TOTAL
Common Excavation in Sections, Including Boulders and Pavement			600	
Common Excavation for Wetland Creation, Including Boulders	60,000	18,000		
Common Excavation in Sections, Excl. Bldgs. & Conc. Pmnt.			570	
Common Excavation Not in Sections (For Placement of Loan within Slope Limits)	1,700	800		
Common Excavation Not in Sections (Areas Outside Slope Limits)	2,160	550		
Common Excavation for Wetland Creation	60,000	18,000		
Topsoil Removed Beneath Fill Sections			225	
Unsuitable Material Removed Beneath Fill Sections			50	
Total Common Excavation	63,860	19,350	845	
COMMON EXCAVATION FOR ESTIMATE ITEM 203.1				84,046
Muck Excavation			80	
MUCK EXCAVATION FOR ESTIMATE ITEM 203.4				80
Boulders in Sections (5% of Common Excavation in Sections)			30	
Rock Not Covered by Sections (Surface Bldgs, Headers, Foundations, etc.)			50	
Total Rock Excavation (Item 203.2)			80	
ROCK EXCAVATION FOR ESTIMATE ITEM 203.2				80
Rock Structure Excavation (See Item 206.2)			20	
ROCK STRUCTURE EXCAVATION FOR ESTIMATE ITEM 206.2				20
Sections Fill			915	
Fill in Bridge Areas (Not in Sections)	1,100	200		
Fill for Wetland Creation			225	
Topsoil Replacement			50	
Unsuitable Material Replacement			80	
Muck Replacement			80	
Embankment-in-Place (Item 203.6)	1,100	200	1,270	
EMBANKMENT-IN-PLACE (E) FOR ESTIMATE ITEM 203.6				2,570

PERMANENT CONSTRUCTION SIGNS AND WARNING DEVICES									
(INCLUDED IN ITEM NO. 619.1)									
SIGN NO.	DESCRIPTION	SIZE (ft)		S.F.	NO. REQ.	TOTAL AREA	POSTS	PORTABLE SIGN SUPPORTS	REMARKS
		W	H						
G20-2a	"END ROAD WORK"	4	2	8	2	16	4		AS REQUIRED
W20-1e	"ROAD WORK 1/2 MILE"	4	4	16	2	32	4		AS REQUIRED
W20-1c	"ROAD WORK 1000 FT"	4	4	16	2	32	4		AS REQUIRED
W20-1b	"ROAD WORK 500 FT"	4	4	16	2	32	4		AS REQUIRED
R60-1	"WORK ZONE SPEED"	6	4	24	2	48	4		AS REQUIRED
M4-8c	"SOUTH ROAD"	2	1.5	3	25	75			AS REQUIRED
M4-9	"DETOUR"	2	1	2	23	46			AS REQUIRED
M4-8a	DIRECTIONAL ARROW	2	1	2	14	28			AS REQUIRED
M4-8b	DIRECTIONAL ARROW	2	1	2	5	10			AS REQUIRED
M4-8d	DIRECTIONAL ARROW	2	1	2	4	8			AS REQUIRED
M4-8e	"END DETOUR"	2	1.5	3	2	6			AS REQUIRED
R11-3a	"ROAD CLOSED 1 MILE AHEAD LOCAL TRAFFIC ONLY"	5	2.5	12.5	3	37.5	6		AS REQUIRED
R11-2	"ROAD CLOSED"	4	2.5	10	4	40			AS REQUIRED

RELOCATION OF EXISTING TRAFFIC SIGNS IS SUBSIDIARY TO ITEM 619.1 FOR TRAFFIC CONTROL PHASING

NOTE: THE ESTIMATED QUANTITIES OF "PERMANENT CONTROLS" ARE HEREBY LISTED. THE CONTRACTOR IS RESPONSIBLE FOR ALL "OPERATIONAL CONTROLS" REQUIRED UNDER SECTION 619 OF THE NHDOT SPECIFICATIONS AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), PART VI.

FENCING					
ITEM NO.	607.250	607.4205	607.72524	607.9918	670.95
DESCRIPTION	CHAIN LINK FENCE WITH ALUMINUM COATED STEEL FABRIC, 5 FT. HIGH	POST ASSEMBLIES FOR CHAIN LINK FENCE, 5 FT. HIGH	DOUBLE GATE CHAIN LINK FENCE WITH ALUMINUM COATED STEEL FABRIC, 24" WIDE X 5' HIGH	BAR WAY (18-FOOT)	TEMPORARY SAFETY FENCE
UNIT	LF	U	U	U	LF
NORTH SITE	100	4	0	2	560
SOUTH SITE	600	6	1	0	710
SUBTOTAL	700	10	1	2	1270
ROUNDING	0	0	0	0	30
TOTAL	700	10	1	2	1300

CLEARING AND GRUBBING		
ITEM NO.	DESCRIPTION	201.1 CLEARING AND GRUBBING (F)
UNIT		
A		
THE AREAS LISTED BELOW ARE SHOWN ON THE PLANS BY LETTER ID'S		
	DESIGNATED AREAS	
LOCATION		
NORTH SITE	A	0.12
NORTH SITE	B	0.03
NORTH SITE	C	0.07
INTENTIONALLY BLANK	D	
NORTH SITE	E	0.01
NORTH SITE	F	0.01
NORTH SITE	G	0.01
NORTH SITE	H	0.01
NORTH SITE	I	0.15
NORTH SITE	J	0.01
NORTH SITE	K	0.02
NORTH SITE	L	0.01
NORTH SITE	M	0.05
SOUTH SITE	N	0.14
SOUTH SITE	O	0.03
SOUTH SITE	P	0.01
NORTH SITE	Q	0.01
NORTH SITE	R	0.01
SOUTH ROAD		
STA. 13+35.0, LT - STA. 14+15.0, LT	AA	0.01
STA. 14+30.0, RT - STA. 14+60.0, RT	BB	0.01
STA. 14+80.0, LT - STA. 18+20.0, LT	CC	0.09
STA. 14+25.0, LT - STA. 16+00.0, RT	DD	0.04
STA. 16+65.0, RT - STA. 17+30.0, RT	EE	0.01
STA. 13+29.0, RT - STA. 14+39.0, RT	FF	0.01
SUBTOTAL		0.87
ROUNDING		0.03
TOTAL		0.9

NOTE: THE ITEMS AND QUANTITIES SHOWN ON THIS SHEET ARE PROJECT TOTALS, BUT DO NOT REPRESENT ALL ITEMS WITHIN THE PROJECT. SEE SOUTH ROAD PLANS, SUMMARY OF QUANTITIES FOR ADDITIONAL ITEMS AND QUANTITIES.

INCIDENTAL ITEMS						
ITEM NO.	DESCRIPTION	UNIT	TOTAL	NORTH SITE	SOUTH SITE	SOUTH ROAD
201.881	INVASIVE SPECIES CONTROL TYPE I	SY	200	225	55	
201.882	INVASIVE SPECIES CONTROL TYPE II	SY	200	225	55	
206.19	COMMON STRUCTURE EXCAVATION EXPLORATORY	CY	10	8		
214	FINE GRADING	U	0.02	0.005	0.005	0.01
585.2	STONE FILL, CLASS B	CY	335	260		75
585.4	STONE FILL, CLASS D	CY	120	120		
615.03	TRAFFIC SIGN TYPE C (F)	SF	28	18	10	
619.7	FLAGGERS	HR	1210	720	240	250
619.1	MAINTENANCE OF TRAFFIC	U	0.08	0.01	0.01	0.06
634	BOULDERS FOR BARRICADE	EA	2	2		
641	LOAM	CY	5,200	3,900	1,300	
641.2	SPECIAL WETLAND SOIL	CY	19,000	14,500	4,500	
645.112	STRAW MULCH	A	7	5.25	1.75	
645.44	TEMPORARY SLOPE STABILIZATION TYPE D (WILDLIFE FRIENDLY)	SY	3,600	2,100	1,500	
645.7	STORM WATER POLLUTION PREVENTION PLAN	U	0.2	0.05	0.05	0.1
645.71	MONITORING SWPPP AND EROSION AND SEDIMENT CONTROLS	HR	220	150	50	20
646.3	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	A	7	5.3	1.7	
659.101	WATERING (INCLUDING LABOR MATERIALS, EQUIPMENT)	U	360	280	70	
659.401	LANDSCAPE ESTABLISHMENT CREW (4 MEN- 8 HR DAY)	DAY	10	8	2	
669.5	IRRIGATION SYSTEM	U	2	1	1	
670.0481	CONSTRUCTION ACCESS ROAD, LEFT IN PLACE	U	1	1		
670.0482	CONSTRUCTION ACCESS ROAD, LEFT IN PLACE	U	1			
692	MOBILIZATION	U	0.02	0.005	0.005	0.01
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	\$	15,000			
1008.53	ALTERATIONS AND ADDITIONS AS NEEDED - INVASIVE SPECIES MANAGEMENT	\$	5,000			
1010.15	FUEL ADJUSTMENT	\$	20,000			

WETLAND PLANTINGS						
ITEM NO.	BOTANICAL NAME	COMMON NAME	STOCK	SIZE	UNIT	QUANTITY
660.2	LANDSCAPING				U	1
	CRATAEGUS CRUS-GALLI	COCKSPUR HAWTHORN	PLANTS	3' - 4'	EA	525
	ALNUS RUGOSA	SPECKLED ALDER	PLANTS	3' - 4'	EA	125
	CORNUS AMOMUM	SILKY DOGWOOD	PLANTS	3' - 4'	EA	125
	ROSA PALUSTRIS	SWAMP ROSE	PLANTS	3' - 4'	EA	125
	RUBUS ALLEGHENIENSIS	BLACKBERRY	PLANTS	3' - 4'	EA	525
	SPIREA LATIFOLIA	MEADOWSWEET	PLANTS	3' - 4'	EA	125
	VIBURNUM DENTATUM	ARROWWOOD	PLANTS	3' - 4'	EA	125
	PINUS RIGIDA	PITCH PINE	PLANTS	3' - 4'	EA	200

WETLAND SEEDING					
CONFORMING TO ITEM NO.	DESCRIPTION	UNIT	ITEM TOTAL	NORTH SITE	SOUTH SITE
644.22*	SHRUB/FOREST WETLAND SEED MIX	LB	65	50	15
644.70*	UPLAND SEED MIX (DECIDUOUS TREES/GRASS SEED)	LB	60	42	18

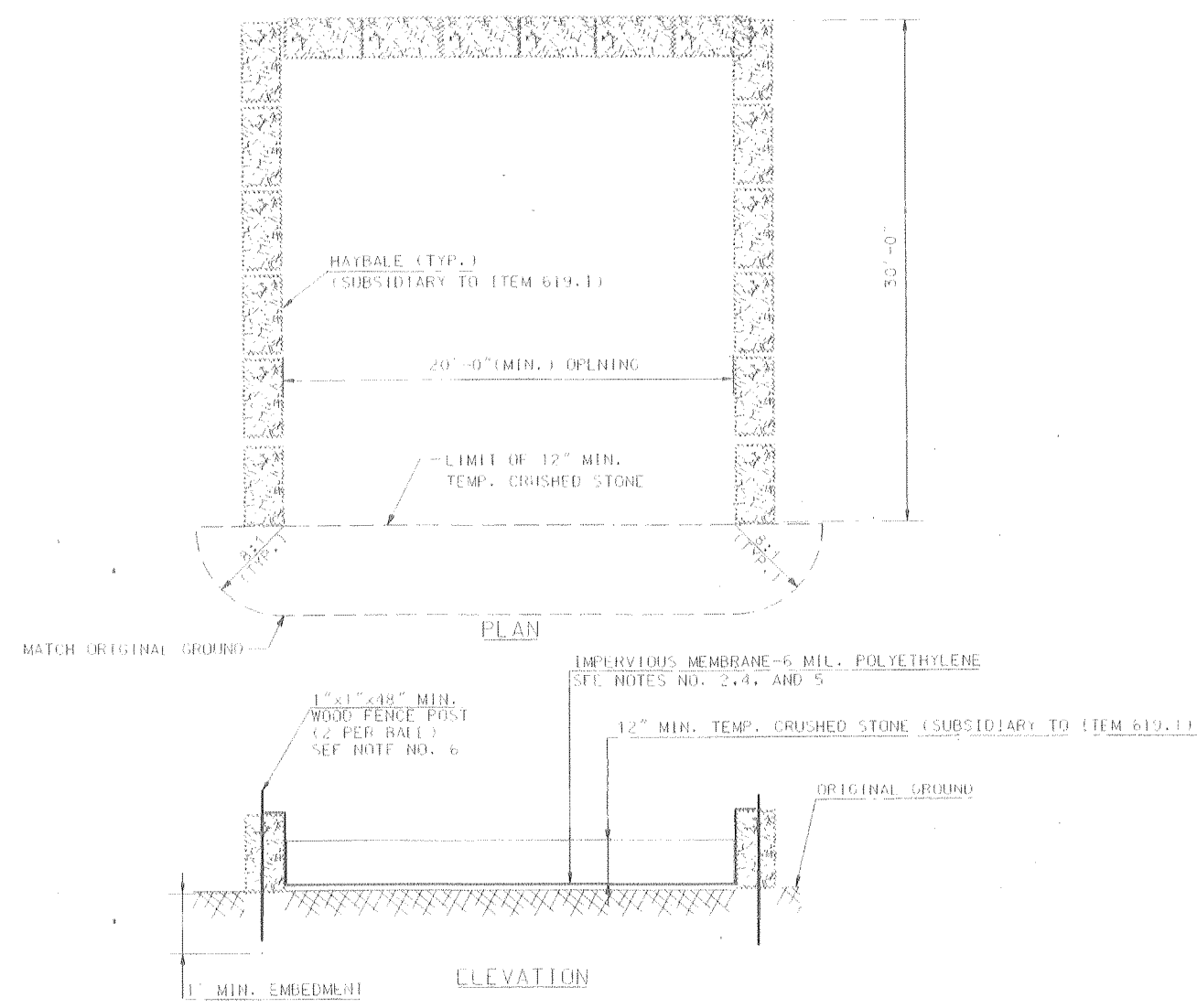
* WETLAND SEEDING IS PAID UNDER ITEM 646.3 - TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS

TEMPORARY EROSION CONTROL					
ITEM NO.	645.3	645.51	645.52	645.531	
ITEM	EROSION STONE	HAY BALES FOR TEMPORARY EROSION CONTROL	RYEGRASS FOR TEMPORARY EROSION CONTROL	SILT FENCE	REMARKS
UNIT	TON	EA	LB	LF	
NORTH SITE	25	600	50	1500	
SOUTH SITE	25	134	50	400	
SOUTH ROAD				1400	
SUBTOTAL	50	634	100	3300	
ROUNDING	0	16	0	200	
TOTAL	50	650	100	3500	

REVISIONS AFTER PROPOSAL
 STATION
 DATE
 NUMBER
 DATE 10/10
 DATE 10/10
 DATE
 SDR PROCESSED
 NEW DESIGN JCC
 SHEET CHECKED TWC
 AS BUILT DETAILS



SR PROCESSED	DATE	DATE	DATE	DATE
NEW DESIGN	10/10	10/10		
SHEET CHECKED	TMC			
AS BUILT DETAILS				



REFUELING SITE DETAILS
NOT TO SCALE

REFUELING SITE NOTES

- CONSTRUCTION AND REMOVAL OF THE REFUELING SITE(S) WILL BE SUBSIDIARY TO MAINTENANCE OF TRAFFIC (ITEM 619.1).
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE HAYBALES, IMPERVIOUS MEMBRANE AND TEMP. CRUSHED STONE. AT COMPLETION OF THE CONTRACT, THE HAYBALES, IMPERVIOUS MEMBRANE AND TEMP. CRUSHED STONE SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR. THE COST OF THE DISPOSAL OF THIS MATERIAL (POSSIBLY CONTAMINATED) SHALL BE SUBSIDIARY TO ITEM 619.1. ANY CONTAMINATION OF THE SOILS BELOW THE IMPERVIOUS MEMBRANE SHALL BE DISPOSED OF AT THE COST OF THE CONTRACTOR.
- THE REFUELING SITE(S) SHALL BE PLACED AT A LOCATION AS APPROVED BY THE CONTRACT ADMINISTRATOR.
- IMPERVIOUS MEMBRANE SHALL OVERLAP THE TOP OF THE HAYBALES AND BE SECURED BY WOODEN STAKES.
- A 12" MINIMUM LAYER OF TEMP. CRUSHED STONE SHALL BE PLACED ON THE TOP OF THE IMPERVIOUS MEMBRANE. WHEN PLACING THE TEMP. CRUSHED STONE CARE SHALL BE TAKEN AS NOT TO TEAR THE IMPERVIOUS MEMBRANE. THE TEMP. CRUSHED STONE SHALL BE MONITORED SO IT DOES NOT MEASURE LESS THAN 12" THICK AT ANY TIME.
- STAKES TO SECURE HAYBALES AND IMPERVIOUS MEMBRANE SHALL BE 1" x 1" OR EQUIVALENT SAPLINGS, AND SHALL BE LONG ENOUGH TO EXTEND ONE FOOT MINIMUM INTO THE GROUND. STAKES WILL BE SUBSIDIARY.
- HAYBALES SHALL BE SET 3" BELOW THE EXISTING GROUND OR AS DIRECTED BY THE CONTRACT ADMINISTRATOR. ANY REQUIRED EXCAVATION TO SET HAYBALES WILL BE SUBSIDIARY.
- AREA SHALL BE LOAMED, SEEDED, AND MULCHED UPON REMOVAL, WITH SEED CONFORMING TO ITEM 644.70 - UPLAND SEED MIX (DECIDUOUS TREES/GRASS SEED), SUBSIDIARY TO ITEM 619.1.

- PRE-CONSTRUCTION SPECIFICATIONS
 - PRE-CONSTRUCTION MEETING WITH ALL PRINCIPLES INVOLVED IN THE WETLAND CONSTRUCTION PROJECT.
 - SUBMIT THE STORMWATER POLLUTION PREVENTION PLAN IN ACCORDANCE WITH NHDOT SPECIFICATION 105.02.
 - FIELD VISIT FROM ALL RESOURCE AGENCIES WILL BE DONE AT COMMENCEMENT OF PROJECT. THE CONTRACTOR SHALL PROVIDE NHDOT WITH TWO (2) WEEKS PRIOR NOTIFICATION TO START OF PROJECT, TO ALLOW NHDOT TO COORDINATE MEETING.
 - DEVELOPMENT OF CONSTRUCTION SCHEDULE.
 - ASSIGN AREAS OF RESPONSIBILITY (I.E., EXCAVATION, PLANTINGS, EROSION CONTROL, ETC...).
 - MAKE SURE THAT ALL RELEVANT PERSONAL HAVE THE SAME CONSTRUCTION PLANS, REPORTS AND A COPY OF NHDOT'S WETLANDS PERMIT #2002-02033.
 - THE ISSUED WETLANDS PERMIT(S) MUST BE POSTED AT THE CONSTRUCTION SITE AT ALL TIMES.
- INSTALLATION OF EROSION CONTROL MEASURES.
 - INSTALL EROSION CONTROL MEASURES ACCORDING TO STORMWATER POLLUTION PREVENTION PLAN.
 - THE PROPOSED MITIGATION AREAS WILL BE IDENTIFIED IN THE FIELD ACCORDING TO FINAL PLANS.
 - PRE-CONSTRUCTION INSPECTION FOLLOWED BY REGULAR MONITORING INSPECTIONS BY A WETLAND SCIENTIST THROUGHOUT CONSTRUCTION.

- ANTICIPATED NORTH SITE CONSTRUCTION SEQUENCE.
 - CLEARING AND GRUBBING.
 - PERFORM EXCAVATION DOWN TO ELEVATION 218 OR SUBGRADE FOR THE PLACEMENT OF LOAM FOR PLANTINGS AND CONSTRUCT THE MOUNDED AREAS WITH THE EXCAVATED SAND.
 - PERFORM THE COMMON EXCAVATION (ITEM 203.1) FOR THE MUCK MOAT AND PLACEMENT OF THE SPECIAL WETLAND SOIL BEGINNING AT STA. 101+50, LT. 120 FEET AND CONTINUE IN A CLOCKWISE DIRECTION TO STA. 107+00, LT. 100 FEET. MOVE TO STA. 101+00, RT. 0 FEET AND WORK COUNTERCLOCKWISE TO STA. 104+25, RT. 130 FEET. MOVE TO STA. 105+25, RT. 250 FEET AND WORK CLOCKWISE TO STA. 104+25, RT. 130 FEET AND CONTINUE THROUGH THE MIDDLE OF THE SITE TO STA. 107+00, LT. 100 FEET AND FINISHING AT STA. 108+50, RT. 75 FEET. THE PLACEMENT OF THE LOAM FOR SLOPE WORK COULD ALSO CONTINUE IN THIS MANNER. DEWATERING MAY NOT BE AN ISSUE IF THE OPERATION IS UNDERTAKEN DURING DRY PERIODS. IF IT BECOMES A PROBLEM, THE MUCK MOAT EXCAVATION AND PLACEMENT COULD OCCUR SIMILAR TO A MUCK EXCAVATION OPERATION WITH THE EXCAVATION LIMITS BEING MEASURED WITH A SURVEY ROD BENEATH THE WATER LEVEL. AS THE OPERATION MOVES AWAY FROM STANDING WATER AREAS, THE ISSUE MAY BE LESS CRITICAL.
 - INSTALL PLANTINGS, SEEDING, AND FENCING.
 - CLEAN UP.

- ANTICIPATED SOUTH SITE CONSTRUCTION SEQUENCE.
 - CONSTRUCT TEMPORARY SAFETY FENCE TO DELINEATE ARCHAEOLOGICAL SENSITIVE AREA.
 - CLEARING AND GRUBBING.
 - PERFORM EXCAVATION DOWN TO ELEVATION 220 OR SUBGRADE FOR THE PLACEMENT OF LOAM FOR PLANTINGS AND CONSTRUCT THE MOUNDED AREAS WITH THE EXCAVATED SAND.
 - PERFORM THE COMMON EXCAVATION (ITEM 203.1) FOR THE MUCK MOAT AND PLACEMENT OF THE SPECIAL WETLAND SOIL BEGINNING AT STA. 201+50 AND CONTINUE IN A CLOCKWISE DIRECTION TO STA. 203+25. THE PLACEMENT OF THE LOAM FOR SLOPE WORK COULD ALSO CONTINUE IN THIS MANNER. DEWATERING MAY NOT BE AN ISSUE IF THE OPERATION IS UNDERTAKEN DURING DRY PERIODS. IF IT BECOMES A PROBLEM, THE MUCK MOAT EXCAVATION AND PLACEMENT COULD OCCUR SIMILAR TO A MUCK EXCAVATION OPERATION WITH THE EXCAVATION LIMITS BEING MEASURED WITH A SURVEY ROD BENEATH THE WATER LEVEL. AS THE OPERATION MOVES AWAY FROM THE STANDING WATER AREAS, THE ISSUE MAY BE LESS CRITICAL.
 - INSTALL PLANTINGS, SEEDING, AND FENCING.
 - CLEAN UP.

- CONSTRUCTION MONITORING (BY OTHERS)
 - CONSTRUCTION OF THE MITIGATION AREAS WILL BE MONITORED CLOSELY, BY A WETLAND SCIENTIST, AS NEEDED DURING THE CONSTRUCTION PROCESS.
 - A CONSTRUCTION MONITORING REPORT WILL BE ISSUED BY A WETLAND SCIENTIST UPON EVERY INSPECTION, OUTLINING THE PRESENT CONSTRUCTION STATUS AND ANY PROBLEMS THAT MAY NEED IMMEDIATE ATTENTION.
 - AN OPEN LINE OF COMMUNICATION MUST BE MAINTAINED DURING CONSTRUCTION BETWEEN THE CONSTRUCTION CONTRACTOR, CONTRACT ADMINISTRATOR, AND THE WETLAND SCIENTIST IN ORDER TO FACILITATE A SUCCESSFUL WETLAND MITIGATION SITE.
 - EROSION AND SEDIMENT CONTROL ISSUES CONSTANTLY CHANGE DURING CONSTRUCTION AND MAY NEED IMMEDIATE ATTENTION THAT WAS NOT SPECIFIED IN THE FINAL PLANS. THE CONSTRUCTION CONTRACTOR MUST BE ABLE TO RESPOND IN A TIMELY MANNER TO THOSE CHANGING CONDITIONS THROUGHOUT THE CONSTRUCTION.

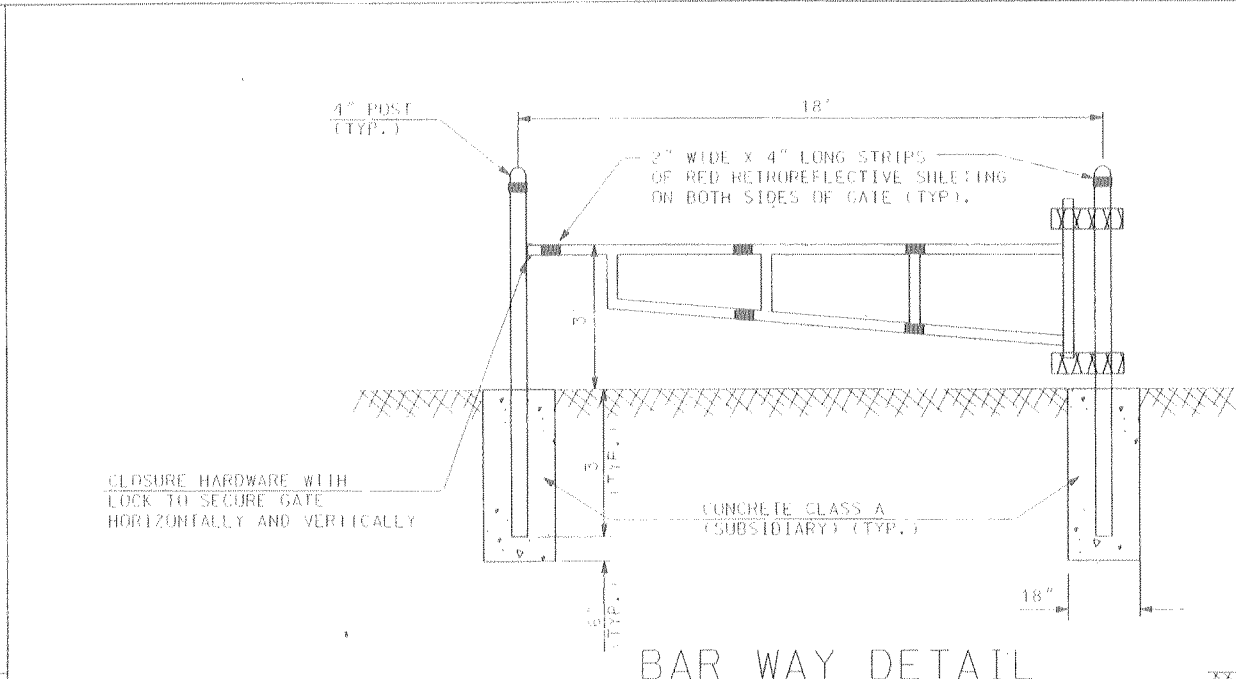
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

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**CONSTRUCTION SEQUENCING
AND REFUELING SITE DETAIL**

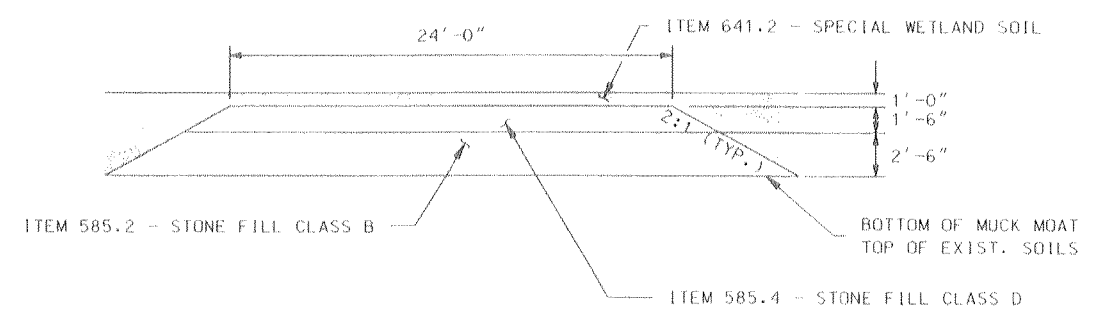
HTA PROJECT NO.	MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
023009	10418FTY2	10418FTY0	10418-F	6	44

SDR PROCESSED	DATE	DATE	DATE	DATE
NEW DESIGN	10/10	10/10		
SHEET CHECKED	TMC			
AS BUILT DETAILS				



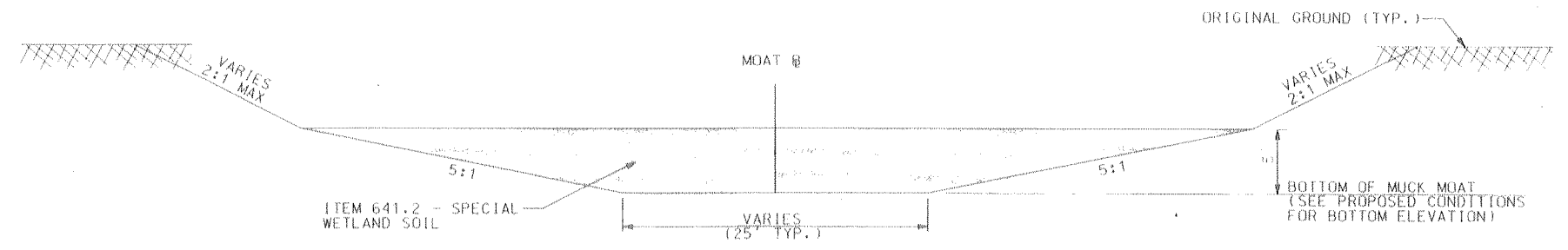
BAR WAY DETAIL
ITEM 607.9918

- NOTES
- SEE SPECIAL PROVISION FOR MATERIAL REQUIREMENTS.
 - TOP RAIL AND DIAGONAL BRACE SHALL BE 2" OUTSIDE DIAMETER (MINIMUM). OTHER BRACING SHALL BE 1 1/2" OUTSIDE DIAMETER (MINIMUM).
 - BRACING ARRANGEMENT MAY VARY FROM THAT SHOWN. DIAGONAL BRACE SHALL EXTEND FROM THE HINGE POST TO (AT MINIMUM) MIDPOINT OF TOP BAR. FREE END OF TOP BAR SHALL NOT DEFLECT MORE THAN 2" VERTICALLY UNDER WEIGHT OF GATE.



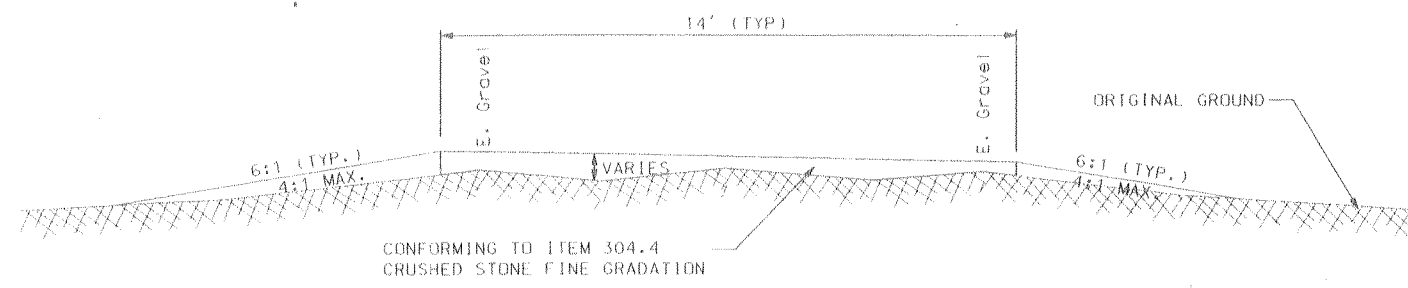
MAINTENANCE ACCESS POINT DETAIL
NOT TO SCALE

NOTE: CONSTRUCT ITEM 634 - BOULDERS FOR BARRICADE, ONE AT EACH END TO DELINEATE LOCATION FOR FUTURE MAINTENANCE. SEE NORTH SITE DETAIL FOR APPROXIMATE LOCATIONS.



MUCK MOAT EXCAVATION DETAIL
NOT TO SCALE

STATION 20+02 TO 24+72
STATION 30+13 TO 33+56
STATION 40+08 TO 49+69
STATION 50+04 TO 54+70



ITEM 670.048X - CONSTRUCTION ACCESS ROAD, LEFT IN PLACE
NOT TO SCALE

NOTE: IN GAINING ACCESS TO THE MITIGATION SITES IMPACTS DUE TO WIDENING, LEVELING, AND SHIMMING OF ACCESS ROADS ARE TO BE MINIMIZED. SEE PROSECUTION OF WORK AND SPECIAL PROVISION FOR ADDITIONAL INFORMATION.

NORTH SITE MOAT ALIGNMENT DATA									
TYPE	START STA.	END STA.	START NORTHING	START EASTING	END NORTHING	END EASTING	LENGTH (FT.)	BEARING	RADIUS (FT.)
TANGENT	20+00.00	20+34.83	127483.1763	1070966.1894	127499.9078	1070996.7405	34.8	N 61° 17' 33" E	
TANGENT	20+34.83	21+39.75	127499.9078	1070996.7405	127572.9505	1071072.0605	104.9	N 45° 52' 46" E	
TANGENT	21+39.75	22+70.43	127572.9505	1071072.0605	127646.0813	1071180.3573	130.7	N 55° 58' 10" E	
TANGENT	22+70.43	23+28.94	127646.0813	1071180.3573	127672.2328	1071232.6999	58.5	N 63° 27' 08" E	
CURVE	23+28.94	24+78.54	127672.2328	1071232.6999	127694.3795	1071378.7735	150.2		240.0
TANGENT	24+78.54	24+88.84	127694.3795	1071378.7735	127692.7936	1071388.4525	9.8	S 80° 41' 41" E	
TANGENT	30+00.00	31+12.30	127668.7722	1071225.7735	127777.8040	1071198.8983	112.3	N 13° 50' 48" W	
CURVE	31+12.30	31+47.67	127777.8040	1071198.8983	127812.8851	1071198.1765	35.4		80.0
TANGENT	31+47.67	31+85.75	127812.8851	1071198.1765	1278750.2045	1071205.7621	38.1	N 11° 29' 22" E	
CURVE	31+85.75	32+38.99	1278750.2045	1071205.7621	127900.1949	1071193.3651	53.2		60.0
TANGENT	32+38.99	32+73.85	127900.1949	1071193.3651	127927.1533	1071171.2646	34.9	N 39° 20' 41" W	
CURVE	32+73.85	33+08.16	127927.1533	1071171.2646	127958.0865	1071157.3494	34.3		65.0
TANGENT	33+08.16	33+67.21	127958.0865	1071157.3494	128016.3917	1071148.0146	59.1	N 9° 05' 46" W	
TANGENT	40+00.00	40+80.00	127532.8200	1070878.7934	127605.6508	1070845.6924	80.0	N 24° 26' 29" W	
CURVE	40+80.00	41+19.07	127605.6508	1070845.6924	127643.6887	1070838.6757	39.1		80.0
TANGENT	41+19.07	43+89.18	127643.6887	1070838.6757	127913.2874	1070855.3449	270.1	N 3° 32' 17" E	
CURVE	43+89.18	44+46.74	127913.2874	1070855.3449	127954.3259	1070890.0023	57.6		45.0
TANGENT	44+46.74	46+69.88	127954.3259	1070890.0023	128005.1854	1071107.2664	223.1	N 76° 49' 29" E	
CURVE	46+69.88	47+44.16	128005.1854	1071107.2664	128026.9435	1071178.2364	37.2		550.0
CURVE	47+44.16	47+92.38	128026.9435	1071178.2364	128037.7725	1071225.0640	48.2		175.0
CURVE	47+92.38	48+51.12	128037.7725	1071225.0640	128039.5779	1071283.7450	58.7		500.0
TANGENT	48+51.12	48+93.89	128039.5779	1071283.7450	128038.3811	1071326.4962	42.8	S 88° 23' 47" E	
CURVE	48+93.89	49+54.62	128038.3811	1071326.4962	128053.1019	1071384.6203	31.2		110.0
TANGENT	49+54.62	50+04.62	128053.1019	1071384.6203	128078.1228	1071427.9095	50.0	N 59° 58' 20" E	

SOUTH SITE MOAT ALIGNMENT DATA									
TYPE	START STA.	END STA.	START NORTHING	START EASTING	END NORTHING	END EASTING	LENGTH (FT.)	BEARING	RADIUS (FT.)
TANGENT	50+00.00	50+20.19	127102.2530	1072354.3531	127093.6628	1072336.0810	20.2	S 64° 49' 14" W	
CURVE	50+20.19	51+02.82	127093.6628	1072336.0810	127095.2250	1072256.3385	82.6		90.0
CURVE	51+02.82	51+57.42	127095.2250	1072256.3385	127134.3683	1072219.8050	54.6		80.0
CURVE	51+57.42	52+32.13	127134.3683	1072219.8050	127207.1513	1072205.8116	74.7		170.0
CURVE	52+32.13	52+62.87	127207.1513	1072205.8116	127235.7069	1072215.8238	30.7		50.0
CURVE	52+62.87	53+07.47	127235.7069	1072215.8238	127266.7037	1072247.6384	44.6		145.0
CURVE	53+07.47	53+63.20	127266.7037	1072247.6384	127285.0474	1072299.5058	54.7		100.0
CURVE	53+63.20	54+88.20	127285.0474	1072299.5058	127239.6281	1072411.5382	125.0		140.0

Hoyle, Tanner & Associates, Inc.

STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN					
DETAILS AND ALIGNMENT DATA					
HTA PROJECT NO.	MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
023009	10418F TY3	10418F TY0	10418-F	7	44

NOTES:

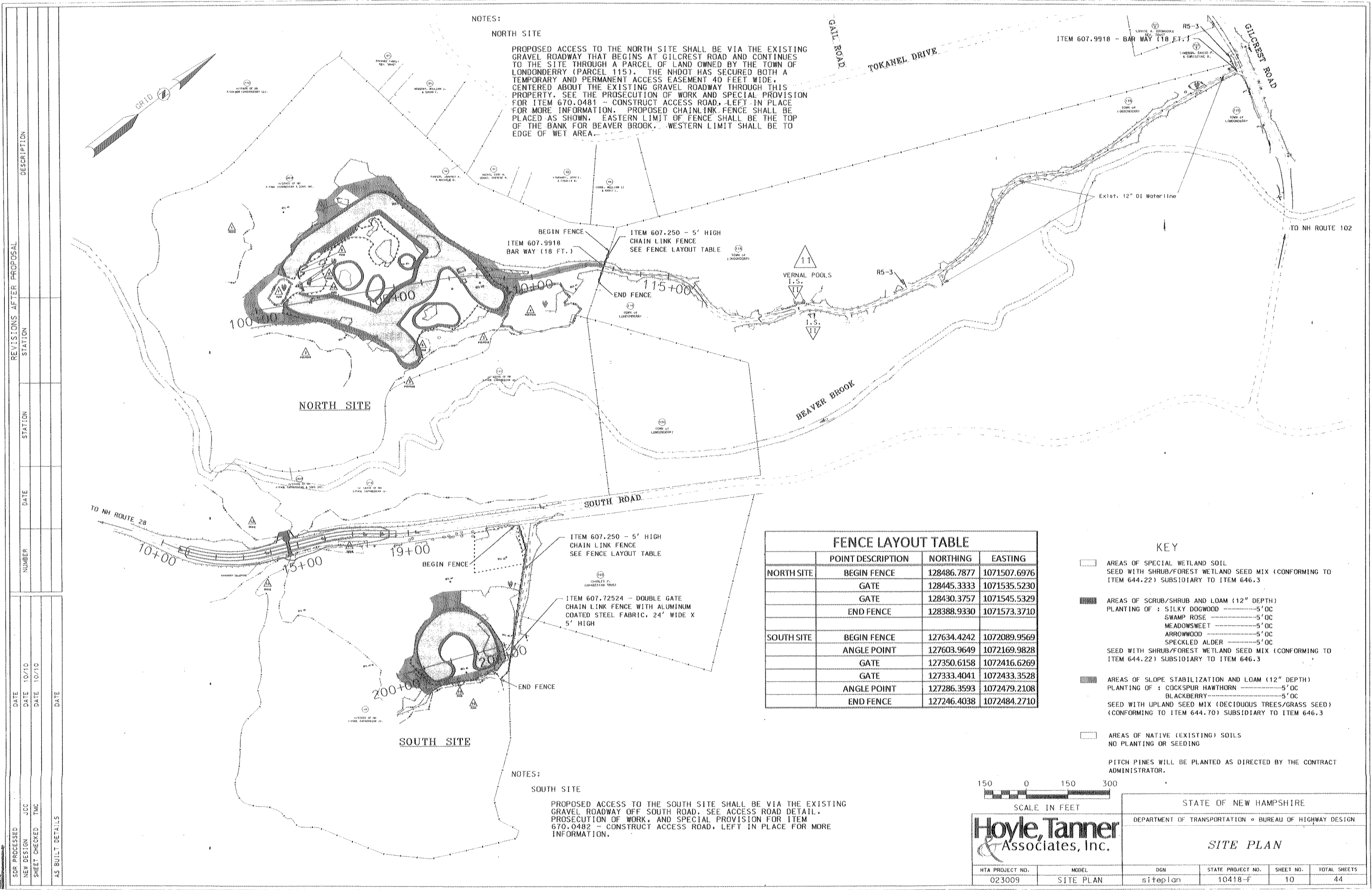
NORTH SITE

PROPOSED ACCESS TO THE NORTH SITE SHALL BE VIA THE EXISTING GRAVEL ROADWAY THAT BEGINS AT GILCREST ROAD AND CONTINUES TO THE SITE THROUGH A PARCEL OF LAND OWNED BY THE TOWN OF LONDONDERRY (PARCEL 115). THE NHDOT HAS SECURED BOTH A TEMPORARY AND PERMANENT ACCESS EASEMENT 40 FEET WIDE, CENTERED ABOUT THE EXISTING GRAVEL ROADWAY THROUGH THIS PROPERTY. SEE THE PROSECUTION OF WORK AND SPECIAL PROVISION FOR ITEM 670.0481 - CONSTRUCT ACCESS ROAD, LEFT IN PLACE FOR MORE INFORMATION. PROPOSED CHAINLINK FENCE SHALL BE PLACED AS SHOWN. EASTERN LIMIT OF FENCE SHALL BE THE TOP OF THE BANK FOR BEAVER BROOK. WESTERN LIMIT SHALL BE TO EDGE OF WET AREA.

NOTES:

SOUTH SITE

PROPOSED ACCESS TO THE SOUTH SITE SHALL BE VIA THE EXISTING GRAVEL ROADWAY OFF SOUTH ROAD. SEE ACCESS ROAD DETAIL. PROSECUTION OF WORK, AND SPECIAL PROVISION FOR ITEM 670.0482 - CONSTRUCT ACCESS ROAD, LEFT IN PLACE FOR MORE INFORMATION.



FENCE LAYOUT TABLE			
	POINT DESCRIPTION	NORTHING	EASTING
NORTH SITE	BEGIN FENCE	128486.7877	1071507.6976
	GATE	128445.3333	1071535.5230
	END FENCE	128388.9330	1071573.3710
SOUTH SITE	BEGIN FENCE	127634.4242	1072089.9569
	ANGLE POINT	127603.9649	1072169.9828
	GATE	127350.6158	1072416.6269
	GATE	127333.4041	1072433.3528
	END FENCE	127246.4038	1072484.2710

- KEY**
- AREAS OF SPECIAL WETLAND SOIL
SEED WITH SHRUB/FOREST WETLAND SEED MIX (CONFORMING TO ITEM 644.22) SUBSIDIARY TO ITEM 646.3
 - ▨ AREAS OF SCRUB/SHRUB AND LOAM (12" DEPTH)
PLANTING OF : SILKY DOGWOOD -----5' OC
SWAMP ROSE -----5' OC
MEADOWSWEET -----5' OC
ARROWWOOD -----5' OC
SPECKLED ALDER -----5' OC
SEED WITH SHRUB/FOREST WETLAND SEED MIX (CONFORMING TO ITEM 644.22) SUBSIDIARY TO ITEM 646.3
 - ▩ AREAS OF SLOPE STABILIZATION AND LOAM (12" DEPTH)
PLANTING OF : COCKSPUR HAWTHORN -----5' OC
BLACKBERRY -----5' OC
SEED WITH UPLAND SEED MIX (DECIDUOUS TREES/GRASS SEED) (CONFORMING TO ITEM 644.70) SUBSIDIARY TO ITEM 646.3
 - AREAS OF NATIVE (EXISTING) SOILS
NO PLANTING OR SEEDING
- PITCH PINES WILL BE PLANTED AS DIRECTED BY THE CONTRACT ADMINISTRATOR.



SCALE IN FEET
Hoyle, Tanner & Associates, Inc.

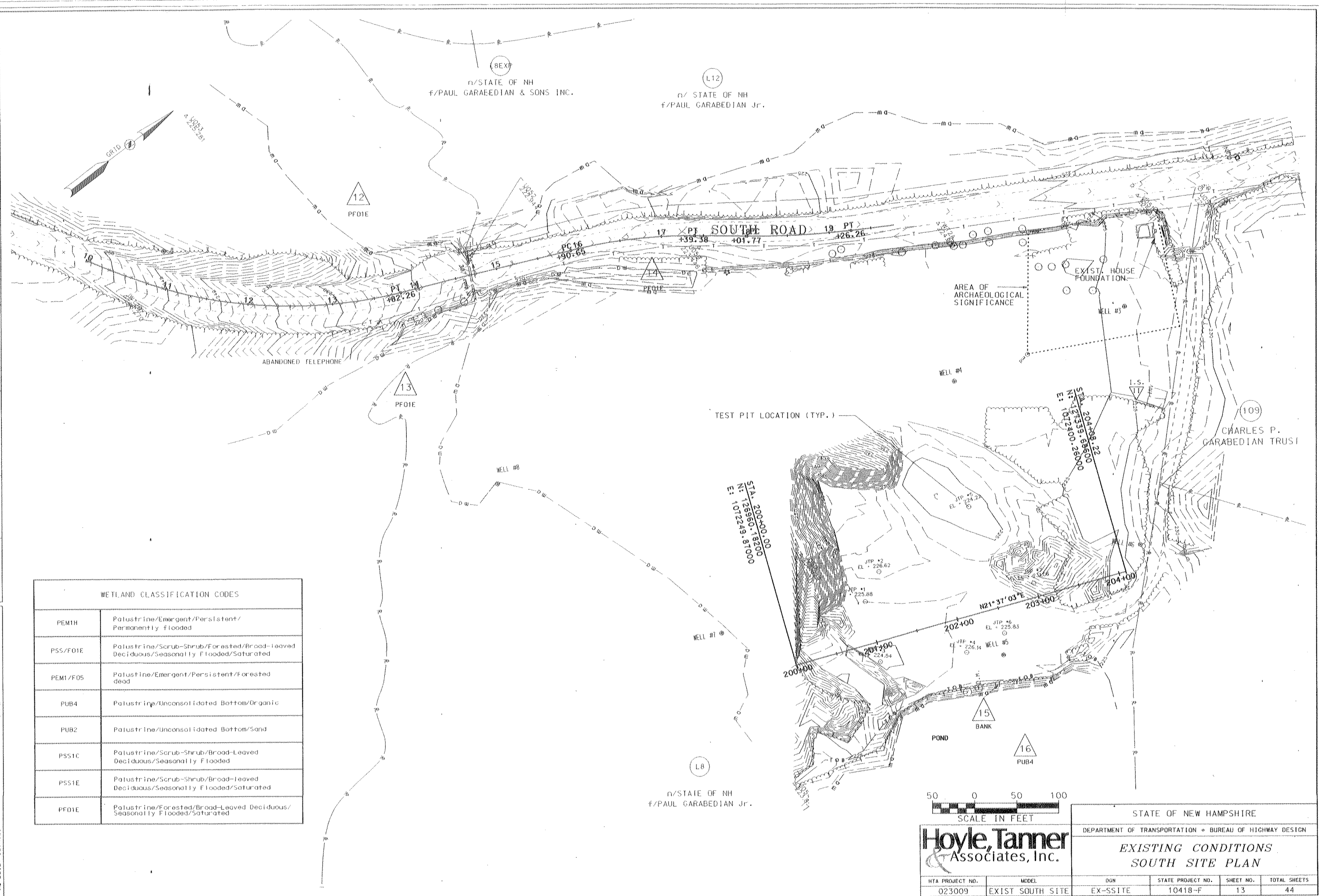
STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN					
SITE PLAN					
HTA PROJECT NO. 023009	MODEL SITE PLAN	DGN siteplan	STATE PROJECT NO. 10418-F	SHEET NO. 10	TOTAL SHEETS 44

SDR PROCESSED	DATE	10/10
NEW DESIGN	JCC	DATE
SHEET CHECKED	TMC	DATE
AS BUILT DETAILS		DATE

REVISIONS AFTER PROPOSAL	STATION	DESCRIPTION

SDR PROCESSED	DATE	DATE	DATE	DATE
NEW DESIGN	JCC	10/10	10/10	
SHEET CHECKED	TMC			
AS BUILT DETAILS				

REVISIONS AFTER PROPOSAL	STATION	DESCRIPTION



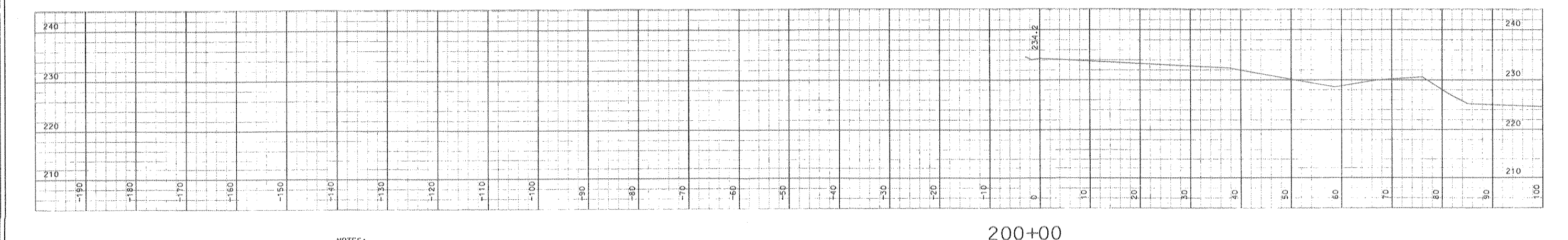
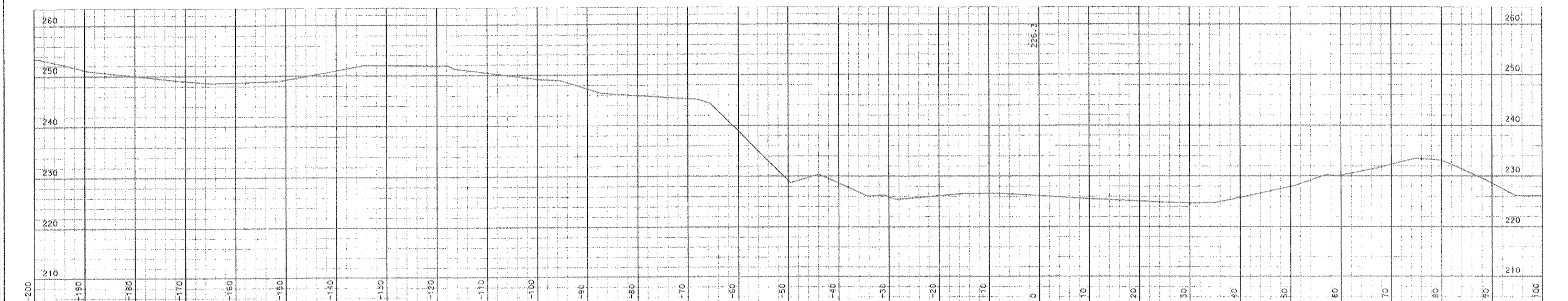
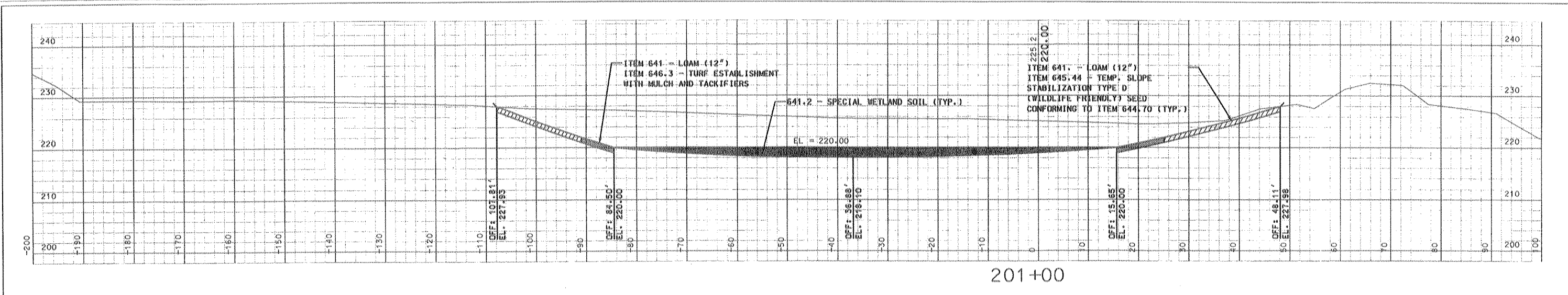
WETLAND CLASSIFICATION CODES	
PEM1H	Palustrine/Emergent/Persistent/ Permanently flooded
PSS/F01E	Palustrine/Scrub-Shrub/Forested/Broad-leaved Deciduous/Seasonally Flooded/Saturated
PEM1/F05	Palustrine/Emergent/Persistent/Forested dead
PUB4	Palustrine/Unconsolidated Bottom/Organic
PUB2	Palustrine/Unconsolidated Bottom/Sand
PSS1C	Palustrine/Scrub-Shrub/Broad-Leaved Deciduous/Seasonally Flooded
PSS1E	Palustrine/Scrub-Shrub/Broad-leaved Deciduous/Seasonally Flooded/Saturated
PF01E	Palustrine/Forested/Broad-Leaved Deciduous/ Seasonally Flooded/Saturated



Hoyle, Tanner & Associates, Inc.

STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN					
EXISTING CONDITIONS					
SOUTH SITE PLAN					
HTA PROJECT NO.	MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
023009	EXIST SOUTH SITE	EX-SSITE	10418-F	13	44

SDR PROCESSED		DATE		DATE		DATE		DATE	
NEW DESIGN		10/10		10/10		10/10		10/10	
SHEET CHECKED		TMC							
AS BUILT DETAILS									



- NOTES:
1. THE SHADED AREAS OUTSIDE THE SLOPE LIMITS PER NOTE 3 ON SHEET 14 ARE NOT DEPICTED ON THESE CROSS SECTIONS AS THE PROPOSED GRADING IS THE SAME AS THE EXISTING GRADING.
 2. CROSS SECTION EARTHWORK SHEET TOTALS FOR THIS PROJECT WITH AN "*" ARE FOR INFORMATIONAL PURPOSES ONLY. EARTHWORK QUANTITIES WERE DONE USING THE PROPOSED CONDITION PLAN. NOT THE AVERAGE END AREA METHOD. SEE THE EARTHWORK SUMMARY FOR QUANTITIES AND ADDITIONAL INFORMATION.



Hoyle, Tanner & Associates, Inc.

HTA PROJECT NO.	023009	SHEET TOTALS	
MODEL	10418FXSMCAM01	COMMON EXCAV. 3576.3*	C.Y. ROCK EXCAV. 0 C.Y.
		FILL 0	C.Y. MUCK EXCAV. 0 C.Y.
		DGN 10418FXSMCAM	STATE PROJECT NO. 10418-F
			SHEET NO. 28
			TOTAL SHEETS 44

SOUTH SITE

SCALE IN FEET

10 0 10 20

HOYLE, TANNER & ASSOCIATES, INC.

10418F XSMCAM02

10418F XSMCAM

10418-F

29

44

DATE 10/10
DATE 10/10

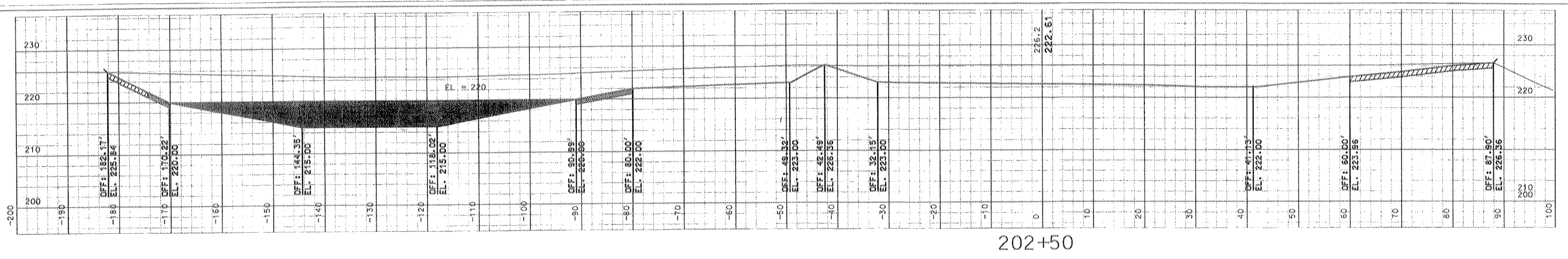
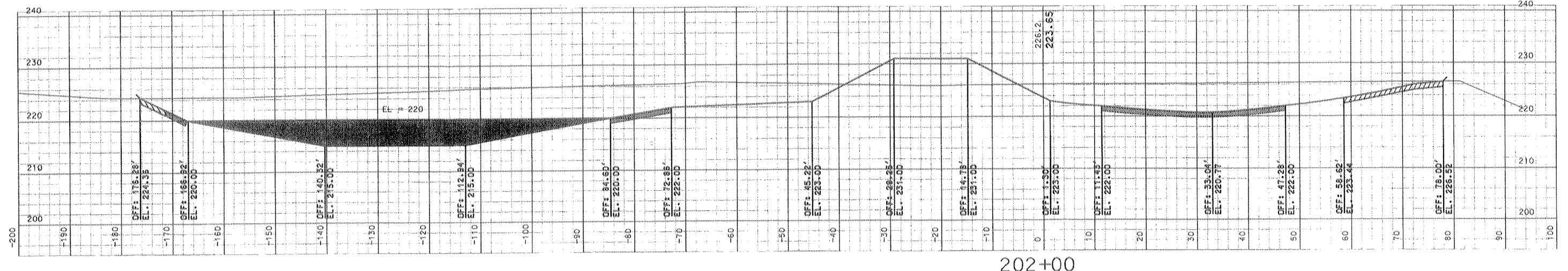
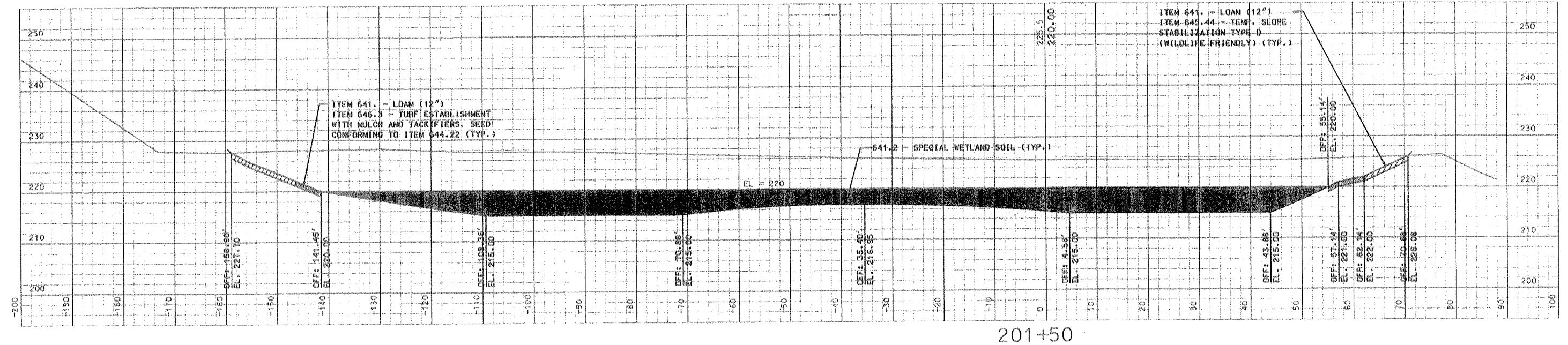
JCC
TMC

NUMBER
DATE

STATION
DATE

DESCRIPTION

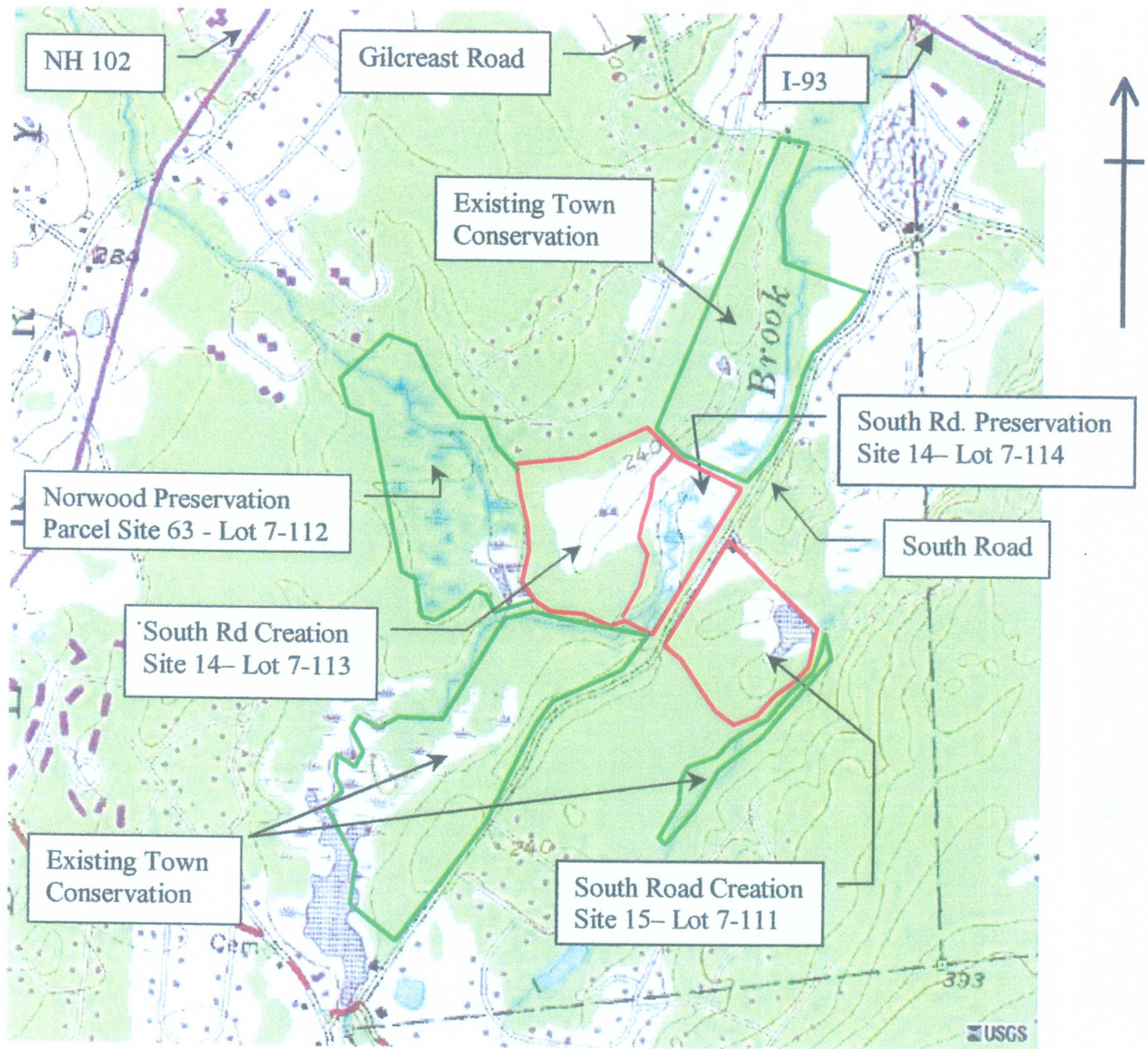
REVISIONS AFTER PROPOSAL



SOUTH SITE

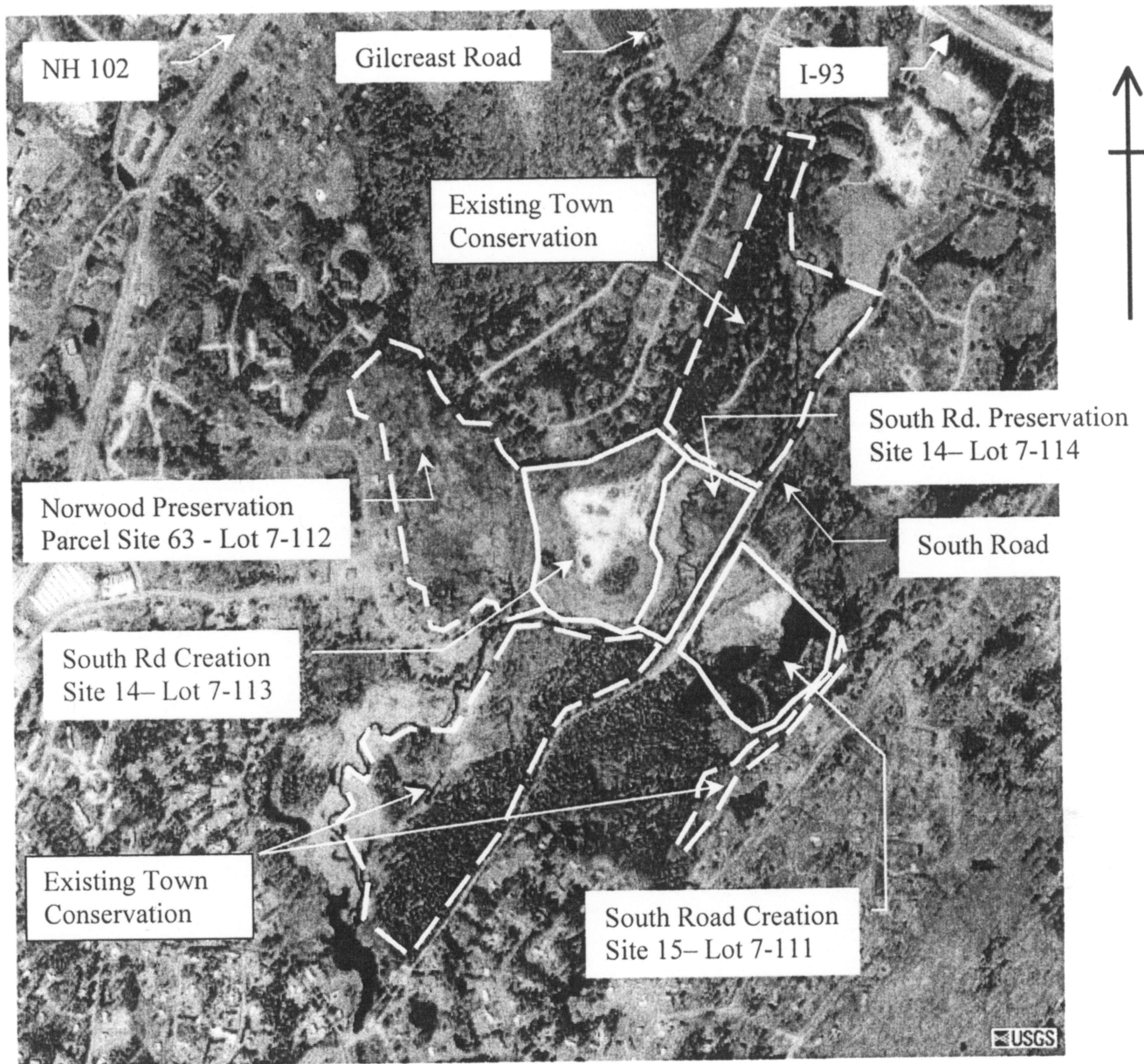
HIA PROJECT NO. 023009		SHEET TOTALS COMMON EXCAV. 8929.2* C.Y. ROCK EXCAV. 0 C.Y.	
MODEL 10418F XSMCAM02		MUCK EXCAV. 9 C.Y.	
DCN 10418F XSMCAM	STATE PROJECT NO. 10418-F	SHEET NO. 29	TOTAL SHEETS 44

APPENDIX D
OVERALL MITIGATION SITE LOCATION PLANS - TWO SHEETS



SITE LOCATION - SOUTH ROAD MITIGATION

Figure 2



AERIAL - SOUTH ROAD MITIGATION SITE

Figure 1