SECTION N: HYDROLOGIC AND HYDRAULIC ANALYSIS

Hydrologic and Hydraulic Analysis

The Erie Converter Station site is not within the floodway of any stream. The cable route does cross through the floodway of several streams. At each of these crossings, the ground surface and stream channel cross sections will be either undisturbed or restored to existing conditions. Except for small marker signs, there will be no above ground structures within any floodplain area. As such, the floodway cross section will not be altered at any of the stream crossings. For these reasons, there will be no impacts to the floodway delineation or to water surface profiles. Therefore, no hydrologic and hydraulic analysis is included in this application.

SECTION O: STORMWATER MANAGEMENT ANALYSIS

O-1: Site Restoration Plan – Cable
O-2: Post-Construction Stormwater Management Plan – Erie Converter Station

Stormwater Management Analysis

The Post-Construction Stormwater Management Plan (PCSM Plan) for the Erie Converter Station is required both by the Conneaut Township Stormwater Management Ordinance (SWMO) and Pennsylvania Department of Environmental Protection (PaDEP) regulations at 25 Pa. Code Chapter 102, relating to requirement for an NPDES Permit for Stormwater Discharges Associated with Construction Activities (NPDES Permit). The PCSM Plan was submitted to the Conneaut Township Supervisors for review and approval on January 29, 2016. The PCSM Plan was submitted to the Erie County Conservation District (ECCD) with the NPDES Permit application on January 29, 2016. The Site Restoration Plan associated with the cable route was submitted to the Erie County Conservation District with the NPDES Permit application on January 29, 2016. A consistency letter from Conneaut Township will be provided when it becomes available.

SITE RESTORATION PLAN

FOR

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

CONNEAUT, GIRARD, AND SPRINGFIELD TOWNSHIPS
ERIE COUNTY, PENNSYLVANIA

PREPARED BY:

STEVEN R. HALMI, P.E.

DEISS & HALMI ENGINEERING, INC.
EDINBORO, PENNSYLVANIA

JANUARY 22, 2016

TABLE OF CONTENTS **Section**

Narrative **1**

- **1.1 Introduction**
  - **1.1.1 Purpose of Site Restoration Plan**
  - **1.1.2 Overall Project Description**
  - **1.1.3 Pennsylvania Cable Route Site Description**
  - **1.1.4 Plan Preparer, Training, and Experience**
- **1.2 Site Restoration Plan Requirements per 25 Pa Code Chapter 102**
  - **1.2.1 General Planning and Design**
  - **1.2.2 Consistency with E&SC Plan**
  - **1.2.3 Plan Preparer Requirements**
  - **1.2.4 Plan Contents**
  - **1.2.5 Plan Implementation for Special Protection Waters**
- **1.3 Conclusion**

Maps and Figures **2**

- **2.1 Location Map/USGS Quad Map**
- **2.2 Overall Project Map**

Soils Information **3**

- **3.1 Soils Descriptions and Soils Limitations**

Stormwater Calculations **4**

- **4.1 PaDEP NPDES Permit Worksheet No. 4**
- **4.2 Retentive Grading Calculations**

1.1 INTRODUCTION

1.1.1 Purpose of Site Restoration Plan

This Site Restoration Plan is required by Pennsylvania Department of Environmental Protection (PaDEP) regulations at 25 Pa. Code Chapter 102, and related to requirements for an NPDES Permit for Stormwater Discharges Associated with Construction Activities (NPDES Permit). Those regulations include the implementation of certain best management practices (BMPs) for stormwater management. Per §102.8(n) of the regulations, a site restoration plan that identifies post-construction stormwater management (PCSM) BMPs to manage stormwater from utility infrastructure may be used to satisfy the requirements for a PCSM Plan. A separate but related Erosion and Sedimentation Control Plan (E&SC Plan) has been prepared for this project. PaDEP, with the assistance of the Erie County Conservation District (ECCD), will review this Site Restoration Plan as part of the process for issuance of the NPDES Permit.

1.1.2 Overall Project Description

The proposed Project is an approximately 72.4 mile (116.5 km) 1,000 megawatt (MW) +/-320 kilovolt (kV) high-voltage direct current (HVDC) bi-directional electric transmission interconnection to transfer electricity between Canada and the United States (refer to Figure 2.2). The Project will consist of one 1,000-MW HVDC transmission line and two HVDC converter stations with ancillary aboveground facilities. One converter station will be located in Canada, the other in the United States (U.S.). The HVDC transmission line consists of two transmission cables, one positively charged and the other negatively charged, along with a fiber optic cable for communications between the converter stations. The HVDC transmission line consists of underground portions in Canada and the U.S. and an underwater portion through Lake Erie, having the following approximate lengths:

- Terrestrial 500 kV AC Cable Route – Haldimand County, Ontario - 0.8 mi (1.3 km)
- Canada, Underground HVDC Cable Route - 0.8 mi (1.3 km)
- Canada, Underwater HVDC Cable Route - 29.1 mi (46.8 km)
- U.S., Underwater HVDC Cable Route - 35.4 mi (58.0 km)
- U.S., Underground HVDC Cable Route - 7.1 mi (11.4 km)
- Terrestrial 500 kV AC Cable Route – Erie County, Pennsylvania - 0.4 mi (0.7 km)

For the purposes of this plan, only the U.S. portion of the Project is subject to Pa. DEP Chapter 102 regulations / NPDES Permit requirements. In the U.S. the cable will make landfall in Springfield Township in Erie County, Pennsylvania and will occur primarily along existing roadways to a new HVDC converter station (Erie Converter Station) to be constructed in Conneaut Township in Erie County, Pennsylvania. The Erie Converter Station will convert +/-320 kV direct current (DC) power to 345 kV alternating current (AC) power or vice-versa and connect to a nearby Point of Interconnection (POI) at the existing Penelec Erie West Substation that is part of the PJM Grid [1]. The route of the 345 kV AC interconnection between the Erie

[1] PJM Grid is the regional transmission organization that coordinates electricity movement in 13 U.S. states and the District of Columbia.

Converter Station property and the Erie West Substation is approximately 1,600 feet in length.

This Site Restoration Plan applies to the HVDC cable route between the Lake Erie shoreline and the Erie Converter Station, as well as the AC cable route between the Converter Station and the Erie West Substation. The cable route passes through Springfield Township, Girard Township, and Conneaut Township, all in Erie County, Pennsylvania. A separate Post-Construction Stormwater Management Plan has been prepared for the Erie Converter Station site in Conneaut Township.

1.1.3 Pennsylvania Cable Route Site Description

The Pennsylvania cable route includes that portion of the HVDC transmission line that is not under Lake Erie as well as the AC cables that connect the Erie Converter Station to the Erie West Substation. Both the HVDC cables and the AC cables will be installed underground, except where the ends of the cables come out of the ground at the Erie Converter Station and Erie West Substation.

The HVDC underground transmission line consists of two +/- 320 kV transmission cables, one positively charged and the other negatively charged, along with a fiber optic communications cable. Each HVDC cable is approximately 5 inches in diameter, consisting of a stranded copper conductor, extruded solid dielectric insulation, metallic screen, and polyethylene jacket. The AC underground transmission line consists of six +/- 345 kV transmission cables, each approximately 5 inches in diameter, consisting of a segmental copper conductor, cross-linked polyethylene insulation, metallic sheath, and polyethylene jacket.

Both the HVDC and AC transmission lines will typically be installed in a concrete encased PVC conduit with a minimum 3 feet (0.9 m) of cover. The trenches will be backfilled with low thermal resistivity material, such as well-graded sand, stone dust, or fluidized thermal backfill (controlled density low strength concrete). A protective cover of high-density polyethylene (HDPE), concrete, or polymer blocks may be placed above the cable or duct bank (a package of conduits). A marker tape will then be placed 1 foot to 2 feet (0.3 m to 0.6 m) above the cables in the trench. The top 1 foot to 2 feet (0.3 m to 0.6 m) of the trench will be backfilled to match the surrounding area. A representative cross section of a typical duct bank installations is shown on the Site Restoration Plan drawings.

Trenchless construction methods will be utilized in locations where open trenching is inappropriate due to either physical constraints (roadway or railroad crossings), environmental constraints (certain wetland and stream crossings), and at the transition from the on-land route to the underwater portion of the transmission line at the Lake Erie shoreline. There are two types of trenchless installation that could be used in construction of the Project: Jack & Bore (J&B) and Horizontal Direction Drill (HDD) methods. J&B installations begin by excavating a launching and receiving pit on either side of an obstacle. Once the excavations are open, a hydraulic ram is used to push a steel casing through soil under the obstacle while removing soil inside the casing with an auger. A cutting head on the casing opens the hole; the auger is not advanced ahead of the casing or used for boring. Depending on installation conditions, the steel casing will either

be left in place or pushed out by a replacement casing of reinforced concrete pipe or other material. Once the permanent casing is in place, PVC conduits are installed into the casing on rolling spacers. The annular space between the conduits and the casing is filled using a thermally acceptable free-flowing grout before tying the casing installation into the adjacent trench-installed sections. HDD is accomplished by using a guided drill rig to open a pilot bore, followed by multiple reaming passes of the pilot bore to open the hole to the diameter required to install the pipe bundle into the borehole, typically 50 percent larger than the pipe bundle. Drilling fluid, a combination of water, bentonite clay, and other additives, is used to stabilize the sides of the borehole and carry the cuttings out of the borehole. Bentonite clay is a naturally occurring mineral that is nontoxic. Once the borehole is open and stable, a heat fused length of HDPE is pulled into the borehole.

Along the route, the segments of the cables will be spliced together at intervals not more than 2,500 feet. Splices will typically occur within underground concrete splice vaults, which will have inside dimensions of approximately 28 feet long by 8 feet wide by 6 to 8 feet deep. A representative sketch of a typical splice vault is shown on the Site Restoration Plan drawings.

The location of the proposed Pennsylvania cable route is shown on the Site Restoration Plan drawings. The majority of the underground HVDC transmission system will be installed within existing roadway right-of-ways and adjacent to private roads. The anticipated locations of J&B and HDD installed portions of the cables, particularly at stream and wetland crossings, are also shown on the Site Restoration Plan drawings.

The limit of disturbance associated with the Pennsylvania cable route is shown on the Site Restoration Plan drawings. Along roads, the cable may be installed within the roadway itself, or outside the roadway but typically within the road right-of-way. The limit of disturbance along roads typically includes the roadway itself (to accommodate any roadway restoration that may be required) as well as applicable portions of the right-of-way outside the roadway itself. Along many roads, the limit of disturbance extends beyond the road right-of-way to accommodate vegetation management areas. Vegetation management areas are necessary for the removal of trees to prevent their root systems from drying out the soils surrounding the cables, which decreases the ability of the soils to conduct heat away from the cables. The width of vegetation management areas varies, depending on soil and groundwater conditions, from 10 feet to 25 feet on either side of the cables. There is not expected to be a great deal of earthwork in most vegetation management areas, since many of these areas already have no trees, and where trees are removed, the roots may remain. But it is conservatively assumed that all vegetation management areas are also disturbed areas in the event that grubbing of the tree stumps is desired.

The limit of disturbance associated with the Pennsylvania cable route also includes six construction laydown areas that will be used to store and assemble materials and equipment. These areas are identified on the Site Restoration Plan drawings.

The public right-of-ways and private properties in which the Pennsylvania cable route will be constructed (not including vegetation management easements or construction laydown areas) are as follows:

Public Right-of-Ways:
Lexington Road (PennDOT)
Springfield Road (Girard Township and Springfield Township)
Interstate 90 (PennDOT – crossing only)
U.S. Route 20 (PennDOT – crossing only)
Townline Road (Girard Township and Springfield Township)
Pa. Route 5 / West Lake Road (PennDOT)

Private Properties:
(Note: ITC Lake Erie Connector LLC has an executed option agreement to acquire right-of-way on the following properties.)

Tax ID No.:	Owner Name:
04-005-009.0-004.00	Sithe Pennsylvania Holdings LLC
04-005-010.0-011.00	Material Recovery Group Erie
04-005-010.0-006.00	Mary M. Gloskey
04-005-010.0-004.00	Andrew, Jr. and Alice Hazer
04-005-010.0-003.00	Terry A. Lavery
24-021-076.0-001.00	Sedler Trust
24-020-068.0-006.00	Bradley T. Carr
24-020-068.0-008.00	Bradley T. Carr
39-040-014.0-001.00	Thomas S. and Diane M. Newman
24-020-066.0-008.00	William S. Stewart
24-008-066.0-001.00	Patricia K. Puline
24-008-064.0-005.00	Fairview Evergreen Nurseries Inc.
39-005-006.0-005.01	Fairview Evergreen Nurseries Inc.
39-005-004.0-007.00	Carolyn M., Edward L., and Emily M. Beck
39-005-003.0-006.00	Carolyn M., Edward L., and Emily M. Beck

The applicant for the project is as follows:

ITC Lake Erie Connector LLC
27175 Energy Way
Novi, MI 48377

1.1.4 Plan Preparer, Training, and Experience

This plan has been prepared by Deiss & Halmi Engineering, Inc. Contact information for the plan preparer is as follows:

Steven R. Halmi, P.E.
Deiss & Halmi Engineering, Inc.
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Mr. Halmi is a licensed professional engineer in Pennsylvania. He has a B.S. degree in Civil and Environmental Engineering from Penn State University, and a M.S. degree in Civil and Environmental Engineering from Cornell University. Formal training includes college, graduate, and post-graduate courses in soils, hydrology and hydraulics, stormwater management, erosion and sedimentation control, environmental engineering, and other relevant subjects. Mr. Halmi has prepared numerous erosion and sedimentation control plans and post-construction stormwater management plans of similar scope throughout northwestern Pennsylvania. As such, he is trained and experienced in site restoration and stormwater management design methods and techniques applicable to the size and scope of the project.

Other firms participating in the preparation of this Site Restoration Plan include HDR Engineering, Inc. and David Laird Associates.

1.2 SITE RESTORATION PLAN REQUIREMENTS PER 25 PA CODE CHAPTER 102

25 Pa. Code §102.8(n) requires the following items to be described within the narrative and drawings of the Site Restoration Plan.

1.2.1 General planning and design.

1.2.1.1 Preserve the integrity of stream channels and maintain and protect the physical, biological and chemical qualities of the receiving stream. The integrity of stream channels and the physical qualities of the receiving streams will be preserved and protected because there will be no permanent alterations to the bed or banks of any stream to be crossed. This is possible because streams will be crossed using HDD and/or under existing culverts that will be maintained or restored to original condition. The only exception is Stream SPA-KAS-001 across which the cables will be installed by trenching, and for which the stream bed and banks will be restored to original condition. The biological and chemical qualities of the receiving streams will be preserved because the surface of the site will be restored to be similar to existing conditions. There are no new impervious surfaces proposed to be constructed as part of the Pennsylvania cable route.

1.2.1.2 Prevent an increase in the rate of stormwater runoff. There are no new impervious surfaces proposed to be constructed as part of the Pennsylvania cable route, and the surface of the site will be restored to be similar to existing conditions. Any impervious surfaces (i.e. gravel driveways) in construction laydown areas will be temporary only; construction laydown areas will be restored to existing conditions. Thus there will generally be no increase in the rate of stormwater runoff. The only exceptions will be where existing wooded areas will be replaced with meadow areas. In those areas, retentive grading will be used to mitigate any increase in the volume of stormwater runoff for the 2-year, 24-hour storm.

1.2.1.3 Minimize any increase in stormwater runoff volume. There are no new impervious surfaces proposed to be constructed as part of the Pennsylvania cable route, and the surface of the site will be restored to be similar to existing conditions. Any impervious surfaces (i.e. gravel driveways) in construction laydown areas will be temporary only; construction laydown areas will be restored to existing conditions. Thus there will generally be no increase in the volume of stormwater runoff. The only exceptions will be where existing wooded areas will be replaced with meadow areas. In those areas, retentive grading will be used to mitigate volume of stormwater runoff for the 2-year, 24-hour storm. Calculations for the storage/infiltration volume provided by the proposed retentive grading are included in Section 4.2. Typical details for the retentive grading areas are shown on the Site Restoration Plan drawings.

1.2.1.4 Minimize impervious areas. There are no new impervious surfaces proposed to be constructed as part of the Pennsylvania cable route. Any impervious surfaces (i.e. gravel driveways) in construction laydown areas will be temporary only; construction laydown areas will be restored to existing conditions.

1.2.1.5 Maximize the protection of existing drainage features and existing vegetation. Existing drainage features will be protected because there will be no alterations to the bed or banks of any stream to be crossed, and drainage ditches will be restored to existing conditions. The route was chosen to make use of existing road right-of-ways for most of the route such that clearing existing vegetation will be minimized. Where vegetation must be disturbed, it will be replaced with a vegetated surface of meadow or brush.

1.2.1.6 Minimize land clearing and grading. The route was chosen to make use of existing road right-of-ways for most of the route such that land clearing will be minimized. Where vegetation must be disturbed, it will be replaced with a vegetated surface of meadow or brush. Final surface grades will be similar to existing.

1.2.1.7 Minimize soil compaction. Most of the proposed route will be accessible for construction and maintenance from existing roadways. Thus the need for new access routes and the associated soil compaction will be minimized. The ground surface will be restored to conditions similar to existing.

1.2.1.8 Utilize other structural or nonstructural BMPs that prevent or minimize changes in stormwater runoff. Refer to Section 1.2.1.3 above.

1.2.2 Consistency with E&SC Plan.

This Site Restoration Plan has been planned and designed, and will be implemented, to be consistent with the separate E&SC Plan prepared for the Pennsylvania cable route.

1.2.3 Plan preparer requirements.

This Site Restoration Plan has been prepared by a person trained and experienced in PCSM design methods and techniques applicable to the size and scope of the Project. Refer to Section 1.1.4.

1.2.4 Plan contents.

1.2.4.1 The existing topographic features of the project site and the immediate surrounding area. The topographic features of the project site and the immediate surrounding area are shown on the Site Restoration Plan drawings. A USGS location map is included in Figure 2.1. The entire project is within the Lake Erie watershed, which slopes very generally from south to north toward Lake Erie. Surface waters which may receive runoff within or from the project site, and their classification under 25 Pa. Code Chapter 93, are as follows:

Waterbody	Chapter 93 Classification
Lake Erie	CWF
Unnamed Tributaries to Lake Erie	CWF; MF
Crooked Creek (Main Stem)	HQ-CWF; MF
Unnamed Tributaries to Crooked Creek	HQ-CWF; MF

In the above listing, CWF refers to Cold Water Fishes, MF refers to Migratory Fishes, and HQ refers to High Quality.

1.2.4.2 The types, depth, slope, locations and limitations of the soils and geologic formations. Soil types have been plotted on the Site Restoration Plan drawings using shapefiles available on the Pennsylvania Spatial Data Access (PASDA). Soil descriptions are excerpted from the 1960 "Soil Survey for Erie County Pennsylvania" prepared by the United States Department of Agriculture (USDA) Soil Conservation Service. The 1960 soil survey was used for the soil descriptions this report as the data is consistent with the soil mapping available on the PASDA database. Newer soil maps, descriptions, and limitations available from other sources such as the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey are not consistent with the data available on PASDA, limitations identified in the March 2012 Pa. DEP "Erosion and Sediment Pollution Control Manual," nor are they consistent with the soil hydrologic soil group data contained in Exhibit A of NRCS TR-55 which is the most generally accepted modeling method for stormwater management calculations. For these reasons, the PASDA and 1960 "Soil Survey for Erie County Pennsylvania" were used to maintain consistency of data.

Section 3.1 includes soils descriptions and a discussion of soil use limitations for each of the soil types identified throughout the project. Soils limitations are excerpted from Appendix E of the March 2012 PaDEP "Erosion and Sediment Pollution Control Manual." There are no known geologic formations that would require special attention during site restoration, except for the Lake Erie bluff which is addressed in Section 1.2.4.11.

1.2.4.3 The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration to the project site. The historical (past 50 years) and current land use of the project area consist of agricultural and rural residential properties. For the most part, the cable route will follow existing public road right-of-ways. There are two wooded corridors where the cable route is not proposed to follow an existing public road: across Crooked Creek south of U.S. Route 20, and between Pa. Route 5 and the Lake Erie shoreline. The future land use, as identified in the 2003 Erie County Land Use and Community Facilities Plan, for the cable route consists of "Rural Resource Area," which indicates that the future land use is projected to be similar to existing.

The proposed transmission lines are underground, and the surface will be restored to existing conditions, except where vegetation management areas require clearing of trees. Because the majority of the route follows existing public right-of-ways, trees along the

route for the most part have already been cleared, and further clearing would not bisect wooded areas. For the wooded area that crosses Crooked Creek south of U.S. Route 20, the clearing of trees will be limited to be no closer than 150 feet from the top of the stream bank, which will preserve the existing riparian forest buffer, and will prevent bisection of the wooded corridor along Crooked Creek. For the wooded area between the CSX Railroad and the Lake Erie shoreline, the cable route follows a private driveway, along which trees have already been cleared, although the width of cleared trees will be widened to 50 feet.

1.2.4.4 An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area. Along most of the cable route, the ground surface will be restored to existing condition, which will not alter the volume or rate of runoff from the project site. However, some parts of the cable route through wooded areas will be restored to meadow rather than woods. For these parts of the route, runoff volume may change slightly. To analyze this change, the cable route is divided into the following segments:

Segment 1: AC Cable Route and HVDC Cable Route along Lexington Road and Springfield Road

Segment 2: Private right-of-way between Springfield Road and U.S. Route 20

Segment 3: Townline Road south of the Crooked Creek watershed boundary

Segment 4: Townline Road north of the Crooked Creek watershed boundary, and also Pa. Route 5

Segment 5: Private right-of-way between Pa. Route 5 and Lake Erie Shoreline

For each of the above segments, separate NPDES Permit Application Worksheets 1 through 4 are provided, plus Worksheet 5 where applicable. These worksheets are in Section 4 of this Site Restoration Plan.

In Segments 1, 3, and 4, the ground surface will not be significantly altered from preconstruction conditions. As shown in Worksheet 4 for these two segments, the runoff volume (and also the rate) will not change.

In Segments 2 and 5, portions of existing wooded areas will be replaced with meadow areas. Worksheet 4 for these two segments documents the small change in runoff volume that results. In those areas, retentive grading will be used to mitigate the small change in the volume of stormwater runoff for the 2-year, 24-hour storm. Calculations for the storage/infiltration volume provided by the proposed retentive grading are included in Section 5.1. Typical details for the retentive grading areas are shown on the Site Restoration Plan drawings.

1.2.4.5 A written description of the location and type of PCSM BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations. The following best management practices (BMPs) are proposed for stormwater management and site restoration.

a. Retentive grading. Retentive grading will be used to mitigate the small change in the volume of stormwater runoff for the 2-year, 24-hour storm where forested areas are converted to meadow areas. Retentive grading creates shallow depressions that collect and temporarily store stormwater runoff, allowing it to infiltrate into the ground and recharge groundwater. In sloped areas, retentive grading includes linear landscape features located along site contours, and may be constructed in series along the slope. In flatter areas, retentive grading may be used to create subtle saucer-shaped depressions which contain and infiltrate stormwater. Calculations for the storage/infiltration volume provided by the proposed retentive grading are included in Section 4.2. Typical details for the retentive grading areas are shown on the Site Restoration Plan drawings.

b. Erosion control mulch blanket. Erosion control mulch blankets will be installed on disturbed slopes 3H:1V and steeper, and in ditches or channels that are disturbed and in need of restoration. Specifications for erosion control mulch blankets are presented on the Site Restoration Plan drawings. Erosion control mulch blankets will be installed as soon as practical after final grade has been achieved, and will remain in place until a uniform 70 percent perennial vegetative cover has been achieved.

c. Vegetative stabilization. Vegetative stabilization consists of final grading, topsoil placement, seeding, and mulching. If weather conditions are favorable, permanent seeding will take place within 7 days of the completion of the earth disturbance activities. Otherwise, temporary seeding and mulching will be implemented until conditions become favorable for the establishment of permanent vegetative cover. Specifications for vegetative stabilization are included on the Site Restoration Plan drawings.

1.2.4.6 A sequence of PCSM BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM BMP installation. BMP implementation and installation are projected to proceed in accordance with the following relative sequence.

1. Site preparation. (Refer to E&SC Plan).
2. Cable duct bank installation. (Refer to E&SC Plan).
3. Temporary surface restoration.
    a. For roadways, improved shoulders, and driveways, surface will be restored temporarily with a minimum of 18 inches of compacted PennDOT 2A coarse aggregate. Final restoration of roadways and shoulders may occur later in accordance with Township specifications.
    b. For non-roadway areas, surface will be rough graded to be slightly higher than adjacent grade.
4. Pull and splice cable. (Refer to E&SC Plan).
5. Demobilize the site and construction laydown areas.
6. Construct retentive grading "berms" and "saucers". Because this involves minimal earthwork, it will be done as part of the final grading process.
    a. Lightly scarify the soil in the area of the proposed retentive grading.
    b. Bring in or move fill material to make up the major portion of the retentive grading berm or saucer.
    c. Protect the surface ponding area at the base of the berm or saucer from compaction. If compaction does occur, scarify the soil to a depth of at least 8 inches.
    d. Finish grade the retentive grading berms or saucers at the time topsoil is added. Tamp soil lightly.
7. Inspection of retentive grading by a licensed professional. (25 Pa. Code §102.1 defines licensed professional as professional engineers, landscape architects, geologists, and land surveyors licensed to practice in this Commonwealth.)
8. Apply permanent vegetative stabilization to all disturbed areas; apply erosion control mulch blanket to all permanent slopes of 3:1 or greater, and to ditches or channels that have been disturbed and require restoration.
9. Inspection of restoration of all disturbed areas by a licensed professional.
10. After all upgradient disturbed areas have been stabilized with permanent vegetation, remove compost filter socks and rock filters. (Refer to E&SC Plan).

1.2.4.7 Supporting calculations. Calculations for preconstruction and post construction stormwater runoff volumes are in Worksheet 4 for the respective route segment. Refer to Section 4.1. Calculations for the storage/infiltration volume provided by the proposed retentive grading are included in Section 4.2.

1.2.4.8 Plan drawings. The Site Restoration Plan drawings show the location, details, and specifications for PCSM BMPs and site restoration.

1.2.4.9 A long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation. Operation and maintenance of the PCSM and site restoration BMPs will be as follows:

a. Retentive grading. Retentive grading generally has low maintenance requirements. Monitor infiltration time to ensure infiltration in approximately 1 to 3 days after storm events. Where planted in turf grass, maintain by mowing. Other vegetation (e.g. meadow) will require less maintenance. Avoid running heavy equipment over the infiltration area at the base retentive grading areas. Routinely move accumulated trash and debris. Remove invasive plants as needed. Inspect for signs of flow channelization; restore level gradient immediately after deficiencies are observed.

b. Erosion control mulch blanket. Areas covered by erosion control mulch blankets will be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 70 percent coverage throughout the blanketed area. Damaged or displaced blankets will be restored or replaced within 4 calendar days.

c. Vegetative stabilization. Seeded areas will be maintained in accordance with the specifications until perennial vegetation is established to a minimum uniform 70 percent coverage.

To document inspection and maintenance activities, the operator of the cable route must develop a written report after each inspection to include all BMP repair and maintenance activities.

The entire cable route will be along public right-of-ways or private easements through which access will be possible. Inspections will be possible by vehicle or by foot. Access for maintenance will be possible by the adjacent roadway, or by light trucks or small earthmoving equipment for which trails will be maintained.

1.2.4.10 Procedures which ensure that the proper measures for the recycling or disposal of materials associated with or from the PCSM BMPs are in accordance with PaDEP laws, regulations, and requirements. Excess excavated material and sediments removed from BMP construction and maintenance may be used as fill in a non-wetland upland area. Although such excavated materials and sediments are not anticipated to be impacted by releases of hazardous or regulated substances, the responsibility for performing environmental due diligence and the determination of clean fill in accordance

with the PaDEP Management of Fill policy will reside with the contractor. No building materials or wastes will be burned, buried, dumped, or discharged at the site. All applicable federal, state, and local laws and regulations must be followed in the use, handling, and disposal of potentially hazardous materials.

1.2.4.11 An identification of naturally occurring geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance activities are completed and PCSM BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts. There are no known naturally occurring geological formations or soil conditions at the site expected to have the potential to cause pollution during or earth disturbance activities or after site restoration. A possible exception is the bluff at the Lake Erie shoreline, which is subject to recession, but is being avoided by use of HDD methods to install the cables from a location that starts over 300 feet from the bluff. The cable alignment proceeds downward and then outward under the bluff and lake bed so as to avoid impacting bluff soils with potential stability issues.

1.2.4.12 Identification of potential thermal impacts from post construction stormwater to surface waters of this Commonwealth including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts. The entire Pennsylvania cable route will be restored to existing conditions, or otherwise revegetated. There are no impervious surfaces associated with the cable route to be constructed. As such, thermal impacts to surface waters of the Commonwealth are expected to be negligible.

1.2.4.13 Riparian buffer management plan. Portions of the Project involve the placement of underground transmission line facilities across (under) waterways within the Crooked Creek watershed that are classified as High Quality (HQ) waters and therefore potentially subject to the provisions of 25 Pa. Code §102.14 relating to riparian buffers. Within the Crooked Creek watershed, with limited exceptions, the Project has been designed to avoid disturbance within 150 feet of Crooked Creek and tributary streams within the Crooked Creek watershed.

The following is a listing of HQ perennial and intermittent streams, ponds, and lakes which are within 150 feet of the proposed transmission line route. The stream identifiers refer to the Lake Erie Connector Project Waterbody Identification and Wetland Delineation Report prepared by HDR Engineering, Inc. Also included is a description of the proposed means to protect the riparian buffers associated with those water bodies.

- Stream SPA-KAS-016 is the perennial stream Crooked Creek. The cables are proposed to be constructed by HDD under the existing pipe culvert which carries Lexington Road across this stream. Using HDD to cross this stream avoids impacts to both the existing roadway crossing and the adjacent riparian buffer areas on either side of the roadway. No earth disturbance is proposed within 150 feet of the stream.

- Pond PPA-KAS-002 is a pond located in the front of a residential house along Lexington Road. The pond appears to be manmade. The limit of disturbance for the

cable route is downgradient of this pond, and as such this pond should not be subject to the §102.14 requirements.

- Stream SPA-KAS-017 is an intermittent unnamed tributary (UNT) to Crooked Creek. The cables are proposed to be constructed by HDD under the existing pipe culvert which carries Lexington Road across this stream. Using HDD to cross under this stream and stream culvert avoids impacts to both the existing roadway crossing and the adjacent riparian buffer areas on either side of the roadway. No earth disturbance is proposed within 150 feet of the stream.

- Stream SPA-KAS-018 is an intermittent UNT to Crooked Creek. The cables are proposed to be constructed within the roadway under the existing pipe culvert which carries Springfield Road across this stream. Although temporary earth disturbance is proposed within 150 feet of the stream, the roadway, culvert, and adjacent roadside area will be restored to existing conditions. Since the land surface will not be permanently altered, no riparian buffer equivalency demonstration or offsetting is required.

- Stream SPA-KAS-026 is a perennial UNT to Crooked Creek. The cables are proposed to be constructed within the roadway under the existing pipe culvert which carries Springfield Road across this stream. Although temporary earth disturbance is proposed within 150 feet of the stream, the roadway, culvert, and adjacent roadside area will be restored to existing conditions. Since the land surface will not be permanently altered, no riparian buffer equivalency demonstration or offsetting is required.

- Stream SPA-KAS-031 is an ephemeral UNT to Crooked Creek. Riparian buffer requirements do not apply to ephemeral streams. The cables are not proposed to cross this stream, but do cross upstream of this stream. The existing land cover consists of meadow and a driveway. The restored land cover will also be a meadow and driveway.

- Stream SPA-KAS-025 is an intermittent UNT to Crooked Creek. The cables are proposed to be constructed by HDD under an existing pipe culvert which carries an existing private farm lane across this stream. Using HDD to cross under this stream at the existing culvert location avoids impacts to the stream's riparian buffer. The only earth disturbance proposed within 150 feet of the stream is within a corridor of approximately 15 feet wide consisting of an existing farm lane, which may be maintained for use as an access route for cable construction and maintenance; such road maintenance activities are exempt from the prohibition of earth disturbance within riparian buffers.

- Stream SPA-KAS-016 is the perennial stream Crooked Creek. The cables are proposed to be constructed by HDD to avoid impact to the stream bed and banks and the adjacent riparian buffer areas. No earth disturbance is proposed within 150 feet of the stream.

- Stream SPA-KAS-022 is a perennial UNT to Crooked Creek. This stream conveys water from roadside ditches and storm sewers near the intersection of Cross Station Road and U.S. Route 20. Although temporary earth disturbance is proposed within 150 feet of the stream, no earth disturbance is proposed within 100 feet of the stream. The proposed temporary earth disturbance between 100 and 150 feet of the stream is within an existing graveled parking area constructed on existing fill, which will be restored to existing conditions. Since the land surface will not be permanently altered, no riparian buffer equivalency demonstration is required, and because no disturbance is occurring within 100 feet of the stream or any other body of water, no offsetting is required.

- Stream SPA-KAS-030 is an ephemeral UNT to Crooked Creek. This stream conveys water from roadside ditches and culverts near the intersection of Cross Station Road and U.S. Route 20. The area around this stream has been previously disturbed and filled, and the vegetative cover is not thick. Riparian buffer requirements do not apply to ephemeral streams.

- Stream SPA-KAS-020 is a perennial UNT to Crooked Creek. The cables are proposed to be constructed within the roadway under the existing pipe culvert which carries Townline Road across this stream. Although temporary earth disturbance is proposed within 150 feet of the stream, the roadway, culvert, and adjacent roadside area will be restored to existing conditions. Since the land surface will not be permanently altered, no riparian buffer equivalency demonstration or offsetting is required.

- Stream SPA-KAS-021 is a perennial UNT to Crooked Creek. The cables are proposed to be constructed within the roadway under the existing pipe culvert which carries Townline Road across this stream. Although temporary earth disturbance is proposed within 150 feet of the stream, the roadway, culvert, and adjacent roadside area will be restored to existing conditions. Since the land surface will not be permanently altered, no riparian buffer equivalency demonstration or offsetting is required.

In addition to the above listed HQ perennial and intermittent streams, ponds, and lakes, the following perennial and intermittent streams, ponds, and lakes are not within special protection (HQ or EV) waters and therefore are not subject to 25 Pa. Code §102.14. These areas are listed here for completeness in describing how impacts to waterbodies and their riparian buffers are proposed to be minimized:

- Stream SPA-KAS-006 is a perennial UNT to Lake Erie that flows through wetland adjacent to Townline Road. The stream then crosses Townline Road through an existing pipe culvert. The cables are proposed to be constructed within the roadway itself in order to minimize impacts to the adjacent wetlands. The cables will also pass under the existing culvert which carries Townline Road across this stream. The roadway and culvert will be restored to existing conditions, and construction within

the roadway itself minimizes impacts to the adjacent wetlands and riparian buffer areas on either side of the roadway.

- Stream SPA-KAS-005 is a perennial UNT to Lake Erie. The cables are proposed to be constructed under the existing pipe culvert which carries Townline Road across this stream. The roadway and culvert will be restored to existing conditions, and construction within the roadway itself minimizes impacts to the adjacent riparian buffer areas on either side of the roadway.

- Stream SPA-KAS-004 is a perennial UNT to Lake Erie. The cables are proposed to be constructed under the existing pipe culvert which carries Townline Road across this stream. The roadway and culvert will be restored to existing conditions, and construction within the roadway itself minimizes impacts to the adjacent riparian buffer areas on either side of the roadway.

- Stream SPA-KAS-002 is a perennial UNT to Lake Erie. The cables are proposed to be constructed by HDD under the existing box culvert which carries Pa. Route 5 across this stream. Using HDD to cross this stream avoids impacts to both the existing roadway crossing and the adjacent riparian buffer areas on either side of the roadway.

- Stream SPA-KAS-001 is a perennial UNT to Lake Erie. The cables will be installed across the upper reach of this stream by trenching, followed by restoration of the stream bed and banks to existing conditions. The cables are also proposed to be constructed parallel to much of this stream within an existing private gravel road. The private gravel road will be temporarily widened to approximately 15 feet wide. Although trees within 25 feet of the cables will be removed, construction within the existing gravel road minimizes the impacts to the adjacent riparian buffer through which the existing private road passes.

- Lake Erie is a perennial surface water body. The cables are proposed to enter Lake Erie using HDD from the bluff. All HDD drilling operations will be set back over 450 feet from the shoreline and over 300 feet from the bluff crest. As such, the existing riparian buffer will be maintained.

1.2.5 Plan implementation for special protection waters.

Part of the Pennsylvania cable route is in the Crooked Creek watershed, which is designated High Quality (HQ) in 25 Pa. Code Chapter 93. Where receiving waters are designated as HQ, an antidegradation analysis is required to demonstrate how designated and existing water quality uses will be maintained and protected. The analysis is a multi-step process. First, environmentally sound nondischarge alternatives must be evaluated. If a nondischarge alternative does not exist (i.e. if the net change in stormwater discharge after construction is not fully eliminated by nondischarge BMPs), the applicant must utilize ABACT BMPs to manage the change. ABACT stands for Antidegradation Best Available Combination of Technologies.

The Pennsylvania cable route and restoration to existing conditions is a nondischarge alternative. There are no new impervious surfaces proposed to be constructed as part of the Pennsylvania cable route, and the surface of the site will be restored to be similar to existing conditions. Thus there will generally be no increase in the rate or volume of stormwater runoff. The only exceptions will be where existing wooded areas will be replaced with meadow areas. In those areas, retentive grading will be used to mitigate the increase in volume of stormwater runoff for the 2-year, 24-hour storm. Retentive grading is a nondischarge infiltration BMP.

Protection of riparian buffers and riparian forest buffers must be evaluated as a nondischarge BMP. Section 1.2.4.13 of this Site Restoration Plan presents a discussion of the riparian buffers and riparian forest buffers in the project area, and how impacts to those riparian buffers are minimized.

1.3 CONCLUSION

This Site Restoration Plan meets the requirements of PaDEP regulations at 25 Pa. Code Chapter 102. Per §102.8(n) of the regulations, a site restoration plan that identifies post-construction stormwater management (PCSM) BMPs to manage stormwater from utility infrastructure may be used to satisfy the requirements for a PCSM Plan. Furthermore, this Site Restoration Plan fulfills the antidegradation analysis required where receiving waters from the Project are designated as high quality (HQ).

Maps and Figures

2.1 Location Map/USGS Quad Map

ERIE WEST SUBSTATION

AC CABLE ROUTE

CONVERTER STATION SITE

DC CABLE ROUTE

LANDFALL LOCATION

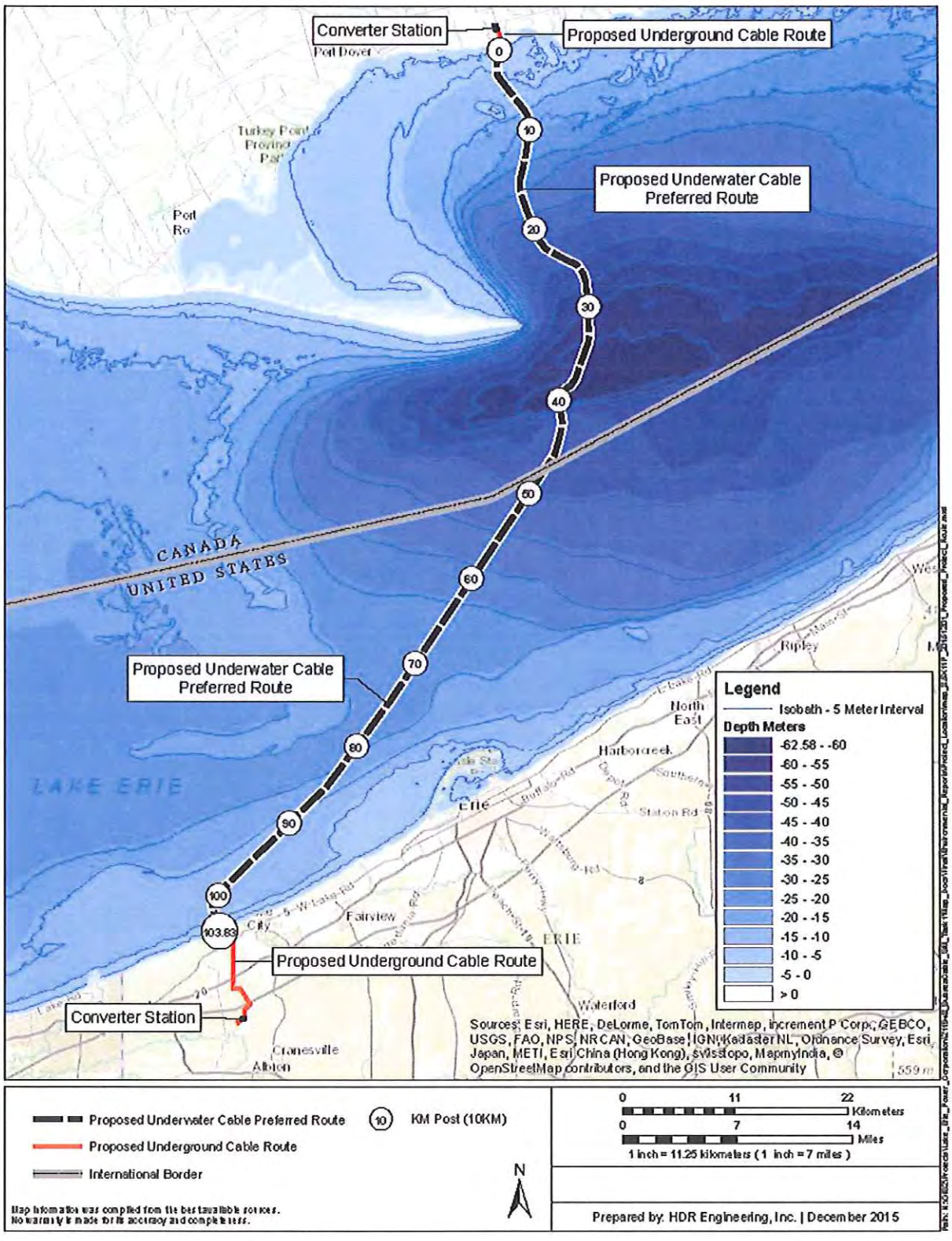
N

SCALE:
0 2,000 4,000 feet

DATE: 12/23/2015	SCALE: 1"=2,000'	ITC LAKE ERIE CONNECTOR LLC
DRAWN BY: JEFFREY T. BERNOSKY		GIRARD TWP., SPRINGFIELD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA
APPROVED BY:		
DRAWING No.:		

d&h Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 Ph. 814-734-3640 Fax 814-734-3643

2.2 Overall Project Map


Converter Station
Proposed Underground Cable Route
Port Dover
Turkey Point Provincial Park
Port Ro
Proposed Underwater Cable Preferred Route
0
10
20
30
40
50
60
70
80
90
100
103.83
CANADA
UNITED STATES
LAKE ERIE
Proposed Underwater Cable Preferred Route
Proposed Underground Cable Route
Converter Station
Ripley
North East
Harborcreek
Erie
Station Rd
Fairview
City
ERIE
Waterford
Cranesville
Albion
Legend
Isobath - 5 Meter Interval
Depth Meters
-62.58 - -60
-60 - -55
-55 - -50
-50 - -45
-45 - -40
-40 - -35
-35 - -30
-30 - -25
-25 - -20
-20 - -15
-15 - -10
-10 - -5
-5 - 0
> 0
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
559 m
Proposed Underwater Cable Preferred Route
Proposed Underground Cable Route
International Border
10 KM Post (10KM)
0 11 22 Kilometers
0 7 14 Miles
1 inch = 11.25 kilometers (1 inch = 7 miles)
N
Map information was compiled from the best available sources.
No warranty is made for its accuracy and completeness.
Prepared by: HDR Engineering, Inc. | December 2015

3.1 Soils Descriptions and Soils Limitations

Soil types have been plotted on the site plan using shape files available on the Pennsylvania Spatial Data Access (PASDA). PASDA is the official public access geospatial information clearinghouse for the Commonwealth of Pennsylvania and has served for fifteen years as Pennsylvania's node on the National Spatial Data Infrastructure, Geospatial One-Stop, and the National Biological Information Infrastructure. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

Soil descriptions are excerpted from the 1960 "Soil Survey for Erie County Pennsylvania" prepared by the United States Department of Agriculture (USDA) Soil Conservation Service. The 1960 soil survey was used for the soil descriptions this report as the data is consistent with the soil mapping available on the PASDA database. Newer soil maps, descriptions, and limitations available from other sources such as the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey are not consistent with the data available on PASDA, limitations identified in the March 2012 Pa. DEP "Erosion and Sediment Pollution Control Manual," nor are they consistent with the soil hydrologic soil group data contained in Exhibit A of NRCS TR-55 which is the most generally accepted modeling method for stormwater management calculations. For these reasons, the PASDA and 1960 "Soil Survey for Erie County Pennsylvania" were used to maintain consistency of data.

Soil use limitations for each of the soil types identified on the site are excerpted from Appendix E of the March 2012 Pa. DEP "Erosion and Sediment Pollution Control Manual."

Soil types identified on the site are as follows:

- BcA - Berrien Fine Sandy Loam, HSG C
- BcB - Berrien Fine Sandy Loam, HSG C
- BdA - Birdsall Silt Loam, HSG D
- BdB - Birdsall Silt Loam, HSG D
- CaB - Canadice Silt Loam, HSG D
- CbC - Canadice Silt Loam, HSG D
- CgB - Conotton Coarse Sandy Loam, HSG B
- CgC - Conotton Coarse Sandy Loam, HSG B
- CgD - Conotton Coarse Sandy Loam, HSG B
- ChA - Conotton Gravelly Loam, HSG B
- ChB - Conotton Gravelly Loam, HSG B
- ChC3 - Conotton Gravelly Loam, Severely Eroded, HSG B
- CkB - Conotton Gravelly Sandy Loam, HSG B
- CkD - Conotton Gravelly Sandy Loam, HSG B
- CmA - Conotton Gravelly Sandy Loam, Moderately Well Drained Variant, HSG B
- CmB - Conotton Gravelly Sandy Loam, Moderately Well Drained Variant ,HSG B
- FaA - Fredon Loam, HSG C
- FaB - Fredon Loam, HSG C
- HaA - Halsey Loam, HSG C/D
- OaA - Ottawa Fine Sandy Loam, HSG B
- OaB - Ottawa Fine Sandy Loam, HSG B
- OaB3 - Ottawa Fine Sandy Loam, Severely Eroded, HSG B
- ObA -Ottawa Loamy Fine Sand, HSG B
- PbA - Platea Silt Loam, HSG C
- PbB - Platea Silt Loam, HSG C
- PcB - Platea Silt Loam, HSG C
- PcC3 - Platea Silt Loam, Severely Eroded and Well Drained, HSG C
- PcD - Platea Silt Loam, Well Drained, HSG C
- RaA - Rimer Fine Sandy Loam, HSG C
- WaA - Wallington Fine Sandy Loam, HSG C
- WaB - Wallington Fine Sandy Loam, HSG C
- WbB3 - Wallington Silt Loam, Severely Eroded, HSG C
- WcA - Wauseon Fine Sandy Loam, HSG B/D
- WdA - Wayland Silt Loam, HSG C/D

The location and boundaries of the mapped soil types in the project area are shown on the drawings. Representative profiles of the soil types present at the site are as follows (adapted from the USDA SCS, Official Series Description):

Berrien Series (BcA and BcB): This is a deep, moderately well drained soil that is sandy and acidic. The following profile is representative of this soil:

0 to 7 inches	Dark-brown fine sandy loam; strong, medium, granular structure; friable when moist; pH 6.2; abrupt, smooth lower boundary.
7 to 9 inches	Yellowish-brown very fine sandy loam; moderate, coarse, subangular blocky structure; friable when moist; pH 6.0; clear, smooth lower boundary.
9 to 20 inches	Yellowish-brown very fine sandy loam; moderate, medium, subangular blocky structure; friable when moist; pH 6.0; clear smooth lower boundary.
20 to 28 inches	Dark yellowish-brown very fine sandy loam with common, coarse, prominent mottles of reddish brown and olive brown; moderate, medium, subangular blocky structure; friable to firm when moist; pH 5.8; clear, smooth lower boundary.
28 to 34 inches	Variegated dark reddish-brown and dark yellowish-brown fine sandy loam; strong coarse, block subangular structure; hard when dry, firm when moist, and nonsticky when wet; pH 5.8; clear, wavy lower boundary.
34 to 40 inches	Dark-brown loamy sand; single grain (structureless) ; pH 6.0; abrupt, wavy lower boundary.
40 to 60 inches+	Gray sandy clay; massive (structureless) ; very hard when dry, plastic when wet; calcareous.

Birdsall series (BdA and BdB): This is a deep, very poorly drained to poorly drained soil derived from lacustrine deposits of glacial origin. The following profile is representative of this soil:

0 to 10 inches	Very dark grayish-brown silt loam; moderate, fine, granular structure; friable when moist
10 to 18 inches	yellowish-brown silt loam with many, fine, distinct mottles of grayish brown; moderate, medium, granular structure; friable when moist
18 to 26 inches	yellowish-brown silty clay loam with common, coarse, distinct mottles of grayish brown; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and sticky when wet
26 to 36 inches	dark grayish-brown silty clay loam with common medium, distinct mottles of yellowish brown; weak, medium, subangular blocky structure; hard when dry, firm when moist, and nonsticky when wet

Canadice Series (CaB and CbC): This is a deep, poorly drained silty soil that's has a subsoil of silty clay loam or silty clay with strong well developed structure. The following profile is representative of this soil:

0 to 8 inches	Brown to dark-brown silt loam; moderate, medium, granular structure; friable when moist; pH 5.6; abrupt smooth lower boundary.
8 to 14 inches	Yellowish-brown silty clay loam with common, medium, distinct mottles of grayish brown and dark brown; strong, thick, platy structure; friable when moist; pH 5.4; clear, smooth lower boundary.
14 to 24 inches	Silty clay loam with a prominent coating od gray clay peds; interiors are light olive brown with many fine, distinct mottles of dark brown to strong brown with strong medium, block structure; firm when moist; pH 5.8, clear smooth lower boundary.
24 to 30 inches	Silty clay with a prominent coating of gray clay on peds; olive-brown interiors; strong coarse, blocky structure; firm when moist, hard when dry, and plastic when wet; pH 6.5; diffuse, wavy lower boundary.
30 to 38 inches	Silty clay with a gray clay coating on peds; olive-brown interiors; strong, very coarse blocky structure; hard when dry, firm when moist and plastic when wet; pH 7.2; diffuse, wavy boundary layer.
38 to 48 inches+	Olive-brown silty clay; strong, very coarse, blocky structure; hard when dry, firm when moist, and plastic when wet; soil material contains free lime and effervesces with dilute hydrochloric acid.

Connotton coarse sandy loam (CgB, CgC, CgD): This soil has a surface layer of coarse sandy loam that's is deep and well drained. The following profile is representative of this soil:

0 to 12 inches	Dark-brown coarse sandy loam; weak, medium, granular structure; friable when moist; pH 5.4; abrupt, smooth lower boundary.
12 to 30 inches	Dark-brown coarse sandy loam; single grain (structureless) friable when moist; pH 5.2; diffuse, wavy lower boundary.
30 to 60 inches	Dark-brown coarse sand and fine gravel; single grain (structureless); friable when moist; pH 5.0; diffuse, wavy lower boundary.
60 to 72 inches+	Dark-brown coarse sand and gravel of mixed size; single grain (structureless; friable when moist; pH 5.0.

Connotton gravely loam (ChA, ChB, ChC3, CkB, and CkD): This is a deep, well-drained, moderately coarse textured to medium textured soil derived from acid shale bedrock and from sandstone and granite of glacial origin sorted and deposited by wave action. Surface drainage is somewhat poorly drained to poorly drained. The following profile is representative of this soil:

0 to 8 inches	dark-brown gravelly loam; weak, fine, granular structure; friable when moist
8 to 11 inches	brown loam; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, and nonsticky when wet
11 to 18 inches	reddish-brown coarse sandy loam; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, and nonsticky when wet
18 to 24 inches	dark-brown loamy coarse sand; weak, medium, subangular blocky structure; friable when moist
24 to 26 inches	strong-brown loamy fine sand; moderate, medium, subangular blocky structure; slightly hard when dry, very friable when moist, and nonsticky when wet
26 to 56 inches+	brown loamy fine sand and gravel; stratified; structureless; friable when moist

Connotton moderately well drained variants (CmA and CmB): This is a deep, moderately well-drained, moderately coarse textured to medium textured soil derived from acid shale bedrock and from sandstone and granite of glacial origin sorted and deposited by wave action. The soils have a firm, compact layer that is moderately permeable to air and water. The following profile is representative of this soil:

0 to 7 inches	dark-brown gravelly sandy loam; weak, coarse, granular structure; friable when moist
7 to 12 inches	reddish-brown coarse sandy loam; moderate, coarse, granular structure; friable when moist
12 to 20 inches	yellowish-red coarse sandy loam; moderate, medium, subangular blocky structure; friable when moist
20 to 28 inches	dark-brown coarse sandy loam; moderate, thick, platy structure; friable when moist
28 to 33 inches	dark grayish-brown coarse sandy loam with common, fine, distinct mottles of light olive brown and strong brown; strong, coarse, subangular blocky structure; hard when dry, firm when moist
33 to 72 inches+	dark-brown loamy, sandy gravel; stratified; single grain (structureless); friable when moist

Fredon loam (FaA and FaB): The Fredon series consists of deep, somewhat poorly drained to poorly drained soils. The soils are on flats and in depressions of the gravelly beach ridges of the lake plain and are also on gravelly outwash terraces along stream valleys in the upland. The parent material consisted of alternate layers of sand, silt, and gravel mixed with some clay. It was derived from acid shale bedrock and sediments of sandstone and granite of glacial origin. This material was sorted and deposited by water.

0 to 10 inches very dark brown to dark yellowish-brown loam; moderate, medium, granular structure; friable when moist; pH 5.8; clear, smooth lower boundary.

10 to 20 inches dark-brown silt loam; weak, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.0; clear, smooth lower boundary.

20 to 28 inches yellowish-brown silt loam with many coarse distinct mottles of grayish brown; moderate, thin, platy structure; hard when dry, firm when moist; pH 5.8; gradual, wavy lower boundary.

28 to 35 inches grayish-brown silt loam with many, fine, distinct mottles of yellowish brown; moderate, medium, subangular blocky structure; loose when dry, friable when moist; pH 6.0; clear, smooth lower boundary.

35 to 48+ inches yellowish-brown stratified sand and gravel; single grain (structureless); pH 6.2.

Halsey Series (HaA: The Halsey soils are deep and are very poorly drained. They occur in depressions on the gravelly beach ridges along the lake plain and also on gravelly outwash terraces along stream valleys in the upland. The parent material consisted of alternate layers of sand, silt, and gravel mixed with some clay. It was derived from acid shale bedrock and sediments of sandstone and granite of glacial origin. This material was sorted and deposited by water.

0 to 7 inches very dark grayish-brown loam; moderate, fine, granular structure; friable when moist; pH 5.8; gradual, smooth lower boundary

7 to 12 inches dark-brown silt loam with many, medium, distinct mottles of strong brown; moderate, coarse, granular structure; friable when moist; pH 6.0; clear, smooth lower boundary

12 to 15 inches very dark grayish-brown silty clay loam with many, medium, distinct mottles of gray and dark reddish brown; strong, medium, granular structure; friable when moist, slightly sticky when wet; pH 5.8; abrupt, smooth lower boundary

15 to 25 inches grayish-brown silt loam with many, coarse, distinct mottles of dark brown; moderate, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.2; gradual, smooth lower boundary.

25 to 30 inches yellowish-brown loam with many, coarse, distinct mottles of gray; weak, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.6; gradual, smooth lower boundary.

30 to 42 inches + variegated brownish-yellow and dark yellowish-brown, stratified loamy sand to sandy loam; single grain (structureless) to weak, medium, subangular blocky structure; friable when moist; pH 7.0

Ottawa Series (OaA, OaB, OaB3, and ObA): This is a deep and well-drained soil. It is acidic and sandy. The following profile is representative of this soil:

0 to 7 inches	Very dark yellowish-brown loam fine sand; weak, fine, granular structure; friable when moist; pH 5.5; abrupt, smooth lower boundary.
7 to 14 inches	Yellowish-brown fine sandy loam; weak, medium, subangular blocky structure; friable when moist; pH 5.6; clear, smooth lower boundary.
14 to 24 inches	Dark yellowish-brown loamy sand with a reddish-brown coating on the soil particles; strong, coarse, blocky structure; friable when moist; pH 5.8; gradual, wavy lower boundary.
24 to 36 inches	Brownish-yellow and dark yellowish-brown loamy sand with a reddish-brown coating on coarse sand grains; weak, thick, platy structure; hard when dry, friable when moist; pH 6.0; gradual, wavy lower boundary.
36 to 52 inches	Variegated gray and dark grayish-brown loamy sand; weak, thick, platy structure to single grain (structureless) ; friable when moist; pH 6.2; abrupt smooth lower boundary.
52 to 144 inches+	Gray silt loam; strong medium, platy structure to massive (structureless) ; very firm when moist, plastic when wet; pH 7.0 as a depth of 54 inches; violent effervescence with dilute hydrochloric acid at a depth of 72 inches.

Platea series (PbA, PbB, PcC3, and PcD): The Platea series consists of deep, somewhat poorly drained soils on the upland. The parent material was silty glacial till containing a few rounded pebbles of granite and sandstone. Moderately well drained variants of the Platea series occupy sites having favorable internal drainage.

0 to 8 inches	dark-brown silt loam; weak, fine, granular structure; friable when moist; pH 4.8; clear, wavy lower boundary.
8 to 15 inches	brown silt loam with common, medium, distinct mottles of light brownish gray and strong brown; compound structure—weak, medium, platy and weak, medium, subangular blocky; friable when moist, nonplastic when wet; pH 4.8; clear, wavy lower boundary.
15 to 28 inches	yellowish-brown silt loam with common, medium, distinct mottles of gray and strong brown; moderate, medium, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 5.6; clear, irregular lower boundary.
28 to 38 inches	dark yellowish-brown silt loam with common, coarse, distinct mottles of gray and dark brown; very coarse prisms that break to moderate, medium, blocky or platy structure; thick coating of clay on the structural units; hard when dry, firm when moist, and slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.
38 to 48 inches	dark-brown silt loam with medium, distinct, mottles of gray; very coarse prisms that break to moderate, medium, platy structure; thick coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.
48 to 60 inches	dark yellowish-brown silt loam with a few, medium, distinct mottles of gray; very coarse prisms that break to moderate, medium, platy structure; distinct, thin coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 6.8; gradual, wavy lower boundary.
60 to 80 inches	olive-brown silt loam; moderate, thick, platy structure; firm when moist, slightly plastic when wet; pH 7.2.

Rimer series (RaA): This is made up of deep, somewhat poorly drained to poorly drained, sandy soils. The soils are acid, but are among the most important soils of the lake plain for vineyards. The following profile is representative of this soil:

0 to 9 inches	very dark brown to dark brown fine sandy loam with weak, medium, faint mottles of gray; very weak, medium fine, granular structure; very friable to friable when moist; pH 5.6; abrupt, smooth lower boundary.
9 to 15 inches	yellowish-brown fine sandy loam with common, medium, distinct mottles of grayish brown and strong brown and a few black concretions with dark reddish-brown centers; weak, medium, subangular blocky to platy structure; friable when moist; pH 6.0; abrupt, irregular lower boundary.
15 to 19 inches	strong-brown fine sandy loam with common, coarse, distinct mottles of yellowish brown and yellowish red and streaks and concretions of iron and manganese; weak, coarse, blocky structure; very hard when dry, very firm when moist, and nonplastic when wet; pH 6.2; clear, irregular lower boundary.
19 to 22 inches	dark yellowish-brown to yellowish-brown loamy fine sand with common, medium, distinct mottles of yellowish red; massive (structureless); hard when dry, firm when moist, and nonplastic when wet; pH 6.8; clear, irregular lower boundary.
22 to 32 inches	dark yellowish-brown loamy sand with reddish-brown streaks; single grain (structureless); friable when moist; pH 6.8; clear, irregular lower boundary.
32 to 38 inches	very dark grayish-brown to dark-brown gravelly sand; single grain (structureless); friable when moist; pH 7.2; abrupt, smooth lower boundary with oil material containing some cobblestones and boulders.
38 to 48 inches+	gray silt loam; weak, medium, platy structure; very firm when moist, plastic when wet; effervesces with dilute hydrochloric acid.

Wayland silt loam (WdA): The Wayland series consists of deep, somewhat poorly drained to poorly drained soils on the flood plains of streams. In spring the soils are covered by water for long periods. The parent material was made up of sediments of silt and clay washed down from the upland. This material was derived from acid shale bedrock and from sandstone and limestone of glacial origin.

0 to 10 inches	dark-gray silt loam with common, coarse, distinct mottles of yellowish brown; moderate, medium, granular structure; friable when moist; pH 5.8; clear, smooth lower boundary.
10 to 25 inches	light brownish-gray silty clay loam with common, coarse, distinct mottles of olive brown and strong brown; moderate, coarse, granular structure; firm when moist, nonsticky when wet; pH 6.4; gradual, smooth lower boundary.
25 to 35+ inches	light yellowish-brown silty clay loam with common, coarse, distinct mottles of olive brown and strong brown; moderate, medium, granular structure; firm when moist, slightly sticky when wet; pH 6.8.

Wallington fine sandy loam (WaA, WaB and WbB3): This is a deep, somewhat poorly drained to poorly drained soil consisting of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. A firm layer (fragipan) that is slowly permeable to air and water begins at depths of 10 to 18 inches. The following profile is representative of this soil:

0 to 8 inches	dark yellowish-brown silt loam; moderate, coarse, granular structure; friable when moist.
8 to 11 inches	dark yellowish-brown silt loam; moderate, medium, granular structure; friable when moist.
11 to 16 inches	very pale brown silt loam with common, coarse, distinct mottles of dark yellowish brown and brownish yellow; weak, fine, subangular blocky structure; slightly hard when dry, firm when moist, and nonplastic when wet.
16 to 25 inches	yellowish-brown loam; light brownish-gray clay forms a thin coat on the soil particles and fills the cracks; very coarse prisms that break to strong, coarse, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet.
25 to 35 inches	dark yellowish-brown silt loam with many, coarse, distinct mottles of olive brown and grayish brown; very coarse prisms that break to moderate, medium, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet.
35 to 41 inches	olive-brown, heavy silt loam with common coarse, distinct mottles of grayish brown; weak, coarse, subangular blocky structure; firm when moist, slightly plastic when wet.
41 to 60 inches+	olive-brown, heavy silt loam with a few, coarse, distinct mottles of grayish brown; weak, coarse, subangular blocky structure; firm when moist, slightly plastic when wet.

Wauseon Series (WcA): The Wauseon soils are deep, very poorly drained, acid, and sandy. The parent material consisted of acid lacustrine sands that were sorted and deposited by water. The following profile is representative of Wauseon soils:

0 to 9 inches	very dark brown to very dark grayish-brown very fine sandy loam to fine sandy loam; moderate, medium, granular structure; friable when moist; pH 5.6; clear, smooth lower boundary.
9 to 18 inches	light olive-brown sandy loam with many, coarse, distinct mottles of yellowish brown; weak, medium, subangular blocky structure; hard when dry, firm when moist, and slightly sticky when wet; pH 6.0; gradual, smooth lower boundary.
18 to 26 inches	yellowish-red loamy sand; soil particles coated with light olive brown; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and nonplastic when wet; pH 6.4; gradual, smooth lower boundary.
26 to 48 inches	light olive-brown loamy sand with many coarse, distinct mottles of yellowish brown; stratified; single grain (structureless); friable when moist; pH 6.6; clear, wavy lower boundary.
48 to 72 inches+	gray silt loam; massive (structureless); hard when dry, very firm when moist, and plastic to fluid when wet; pH 7.2 at a depth of 48 inches; effervesces with dilute hydrochloric acid at a depth of 60 inches.

Soil Name	Cutbanks Cave	Corrosive to Concrete/Steel	Droughty	Easily Erodible	Flooding	Depth to Saturated Zone/ Seasonal High Water Table	Hydric/Hydric Inclusions	Low Strength/ Landslide Prone	Slow Percolation	Piping	Poor Source of Topsoil	Frost Action	Shrink-Swell	Potential Sinkhole	Ponding	Wetness
Berrien	X	S		X		X	X		X	X		X			X	
Birdsall	X	c/s				X	X	X	X	X	X	X	X		X	X
Canadice	X	S		X		X	X	X	X		X	X	X		X	X
Conotton	X	c/s	X	X		X	X	X	X	X	X	X				
Fredon	X	c/s	X	X		X	X	X	X		X	X				X
Halsey	X	c/s		X	X	X	X	X	X	X	X	X				X
Ottawa	X	C	X						X			X				
Platea	X	c/s		X		X	X	X	X	X		X				X
Rimer	X	c/s	X	X		X	X		X	X	X	X	X			X
Wallington	X	c/s		X		X	X	X	X	X	X	X				X
Wauseon	X	c/s				X	X	X	X	X	X	X			X	X
Wayland	X	S		X	X	X	X	X	X	X	X	X			X	X

Summary of soil limitations

Proposed measures to address soil limitations:

1. Cutbanks Cave. There will be no exposed cutbanks upon completion of the project. The contractor shall adhere to all OSHA regulations regarding excavation and shoring/bracing or sloping trench walls.

2. Corrosive to Concrete/Steel. Concrete and steel structures shall be designed by the supplier for direct burial.

3. Droughty. Vegetation management areas have been established to protect the cables from dryout.

4. Easily Erodible. All disturbed surfaces will be stabilized either with vegetation to prevent erosion. Slopes of 3H:1V and steeper will be stabilized using an erosion control mulch blanket until a uniform 70% vegetative cover has been established.

5. Flooding. Flooding is not expected to have an adverse impact on this project.

6. Depth to Saturated Zone/Seasonal High Water Table. Soil borings have been investigated and the seasonal high water table is not expected to cause problems for this project. Appropriate dewatering BMPs are provided for during construction.

7. Hydric/Hydric Inclusions. Wetlands have been delineated within the project area. The area proposed for development on the site has been located to protect the delineated wetlands.

8. Low Strength/Landslide Prone. The proposed grades and construction activities located in these areas are not subject to landslides.

9. Slow Percolation. Slow percolation is not expected to have an adverse impact on this project.

10. Piping. Piping is not expected to have an adverse impact on this project.

11. Poor Source of Topsoil. The project is not dependent upon a significant depth of topsoil. What topsoil is available on site will be stockpiled and redistributed on areas that are to be seeded. Any additional topsoil that is required beyond what is available on site will be imported from a supplier.

12. Frost Action. This limitation will not have an adverse effect on the proposed activity.

13. Shrink/Swell. This limitation will not have an adverse effect on the proposed activity.

14. Ponding. Ponding is not expected to have an adverse impact on this project.

15. Wetness. Wetness is not expected to have an adverse impact on this project.

4.1 PaDEP NPDES Permit Worksheets

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Pennsylvania Cable Route
Drainage Area: Segment 1: Lexington and Springfield roads (Crooked Creek Watershed)
2-Year Rainfall: 2.56 in

Total Site Area: 32.95 acres
Protected Site Area: 10.66 acres
Managed Site Area: 22.29 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	34412	0.79	55	8.18	1.64	0.09	269
Meadow (good condition)	B	215186	4.94	58	7.24	1.45	0.15	2653
Meadow (good condition)	C	436907	10.03	71	4.08	0.82	0.52	18983
Meadow (good condition)	D	23522	0.54	78	2.82	0.56	0.83	1621
Impervious	N/A	260924	5.99	98	0.20	0.04	2.33	50671
TOTAL:		970952	22.29					74197

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	34412	0.79	55	8.18	1.64	0.09	269
Meadow (good condition)	B	215186	4.94	58	7.24	1.45	0.15	2653
Meadow (good condition)	C	436907	10.03	71	4.08	0.82	0.52	18983
Meadow (good condition)	D	23522	0.54	78	2.82	0.56	0.83	1621
Impervious	N/A	260924	5.99	98	0.20	0.04	2.33	50671
TOTAL:		970952	22.29					74197

2-Year Volume Increase (ft^3): 0

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Pennsylvania Cable Route
Drainage Area: Segment 2 : Between Springfield Rd. and Rte. 20 (Crooked Creek Watershed)
2-Year Rainfall: 2.56 in

Total Site Area: 15.01 acres
Protected Site Area: 4.63 acres
Managed Site Area: 10.38 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	105851	2.43	55	8.18	1.64	0.09	826
Woods (good condition)	C	436	0.01	70	4.29	0.86	0.48	18
Meadow (good condition)	B	312325	7.17	58	7.24	1.45	0.15	3851
Meadow (good condition)	C	8712	0.20	71	4.08	0.82	0.52	379
Impervious (gravel drive and farm lane)	N/A	24829	0.57	98	0.20	0.04	2.33	4822
TOTAL:		452153	10.38					9895

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Meadow (good condition)	B	418176	9.60	58	7.24	1.45	0.15	5156
Meadow (good condition)	C	9148	0.21	71	4.08	0.82	0.52	397
Impervious (gravel drive and farm lane)	N/A	24829	0.57	98	0.20	0.04	2.33	4822
TOTAL:		452153	10.38					10375

2-Year Volume Increase (ft^3): 480

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Pennsylvania Cable Route
Drainage Area: Segment 3 : Townline Road (Crooked Creek Watershed)
2-Year Rainfall: 2.56 in

Total Site Area: 10.80 acres
Protected Site Area: 0.54 acres
Managed Site Area: 10.26 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Impervious	N/A	107158	2.46	98	0.20	0.04	2.33	20810
Meadow (good condition)	B	228254	5.24	58	7.24	1.45	0.15	2814
Meadow (good condition)	C	86249	1.98	71	4.08	0.82	0.52	3747
Meadow (good condition)	D	25265	0.58	78	2.82	0.56	0.83	1741
TOTAL:		446926	10.26					29113

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Impervious	N/A	107158	2.46	98	0.20	0.04	2.33	20810
Meadow (good condition)	B	228254	5.24	58	7.24	1.45	0.15	2814
Meadow (good condition)	C	86249	1.98	71	4.08	0.82	0.52	3747
Meadow (good condition)	D	25265	0.58	78	2.82	0.56	0.83	1741
TOTAL:		446926	10.26					29113

2-Year Volume Increase (ft^3): 0

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Pennsylvania Cable Route
Drainage Area: Segment 4 : Townline Rd. and Rte 5 (UNT to Lake Erie)
2-Year Rainfall: 2.56 in

Total Site Area: 12.49 acres
Protected Site Area: 1.26 acres
Managed Site Area: 11.23 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	9148	0.21	55	8.18	1.64	0.09	71
Woods (good condition)	C	19602	0.45	70	4.29	0.86	0.48	791
Woods (good condition)	D	6534	0.15	77	2.99	0.60	0.78	424
Meadow (good condition)	B	143748	3.30	58	7.24	1.45	0.15	1772
Meadow (good condition)	C	64904	1.49	71	4.08	0.82	0.52	2820
Meadow (good condition)	D	14810	0.34	78	2.82	0.56	0.83	1021
Impervious	N/A	230432	5.29	98	0.20	0.04	2.33	44750
TOTAL:		489179	11.23					51649

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	9148	0.21	55	8.18	1.64	0.09	71
Woods (good condition)	C	19602	0.45	70	4.29	0.86	0.48	791
Woods (good condition)	D	6534	0.15	77	2.99	0.60	0.78	424
Meadow (good condition)	B	143748	3.30	58	7.24	1.45	0.15	1772
Meadow (good condition)	C	64904	1.49	71	4.08	0.82	0.52	2820
Meadow (good condition)	D	14810	0.34	78	2.82	0.56	0.83	1021
Impervious	N/A	230432	5.29	98	0.20	0.04	2.33	44750
TOTAL:		489179	11.23					51649

2-Year Volume Increase (ft^3): 0

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Pennsylvania Cable Route
Drainage Area: Segment 5 : North of Rte. 5 (UNT to Lake Erie)
2-Year Rainfall: 2.56 in

Total Site Area: 14.95 acres
Protected Site Area: 8.82 acres
Managed Site Area: 6.13 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	B	110207	2.53	55	8.18	1.64	0.09	860
Woods (good condition)	C	59677	1.37	70	4.29	0.86	0.48	2408
Woods (good condition)	D	19602	0.45	77	2.99	0.60	0.78	1271
Meadow	B	47045	1.08	58	7.24	1.45	0.15	580
Impervious (gravel driveway)	N/A	30492	0.70	98	0.20	0.04	2.33	5922
TOTAL:		267023	6.13					11041

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Meadow	B	157252	3.61	58	7.24	1.45	0.15	1939
Meadow	C	59677	1.37	71	4.08	0.82	0.52	2593
Meadow	D	19602	0.45	78	2.82	0.56	0.83	1351
Impervious (gravel driveway)	N/A	30492	0.70	98	0.20	0.04	2.33	5922
TOTAL:		267023	6.13					11804

2-Year Volume Increase (ft^3): 763

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

4.2 Retentive Grading Calculations

Lake Erie Connector
Pennsylvania Cable Route
Retentive Grading Volume Calculations

Segment 2: Between Springfield Road and Route 20

2-Year Volume Increase per Worksheet 4 = **480 cubic feet** (storage volume required)

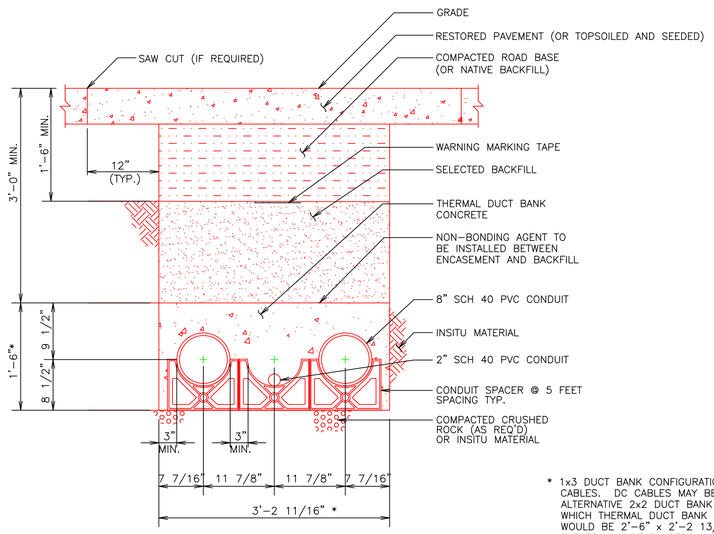
Retentive grading on slope areas: Six sections of 20 linear feet each = (6)(30)	= 180 cubic feet
Retentive grading on level areas: Three saucers of 100 square feet each = (3)(100)	= 300 cubic feet
Total storage volume provided by proposed retentive grading	= **480 cubic feet**

Segment 5: Between Route 5 and Lake Erie

2-Year Volume Increase per Worksheet 4 = **763 cubic feet** (storage volume required)

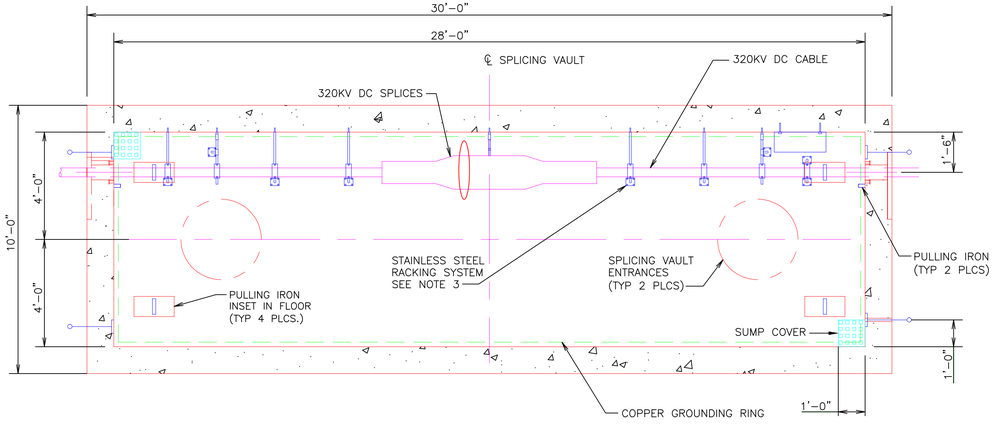
Retentive grading on slope areas: None	= 0 cubic feet
Retentive grading on level areas: Eight saucers of 400 square feet each = (8)(100)	= 800 cubic feet
Total storage volume provided by proposed retentive grading	= **800 cubic feet**

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE
SITE RESTORATION PLAN
SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP.,
ERIE COUNTY, PENNSYLVANIA



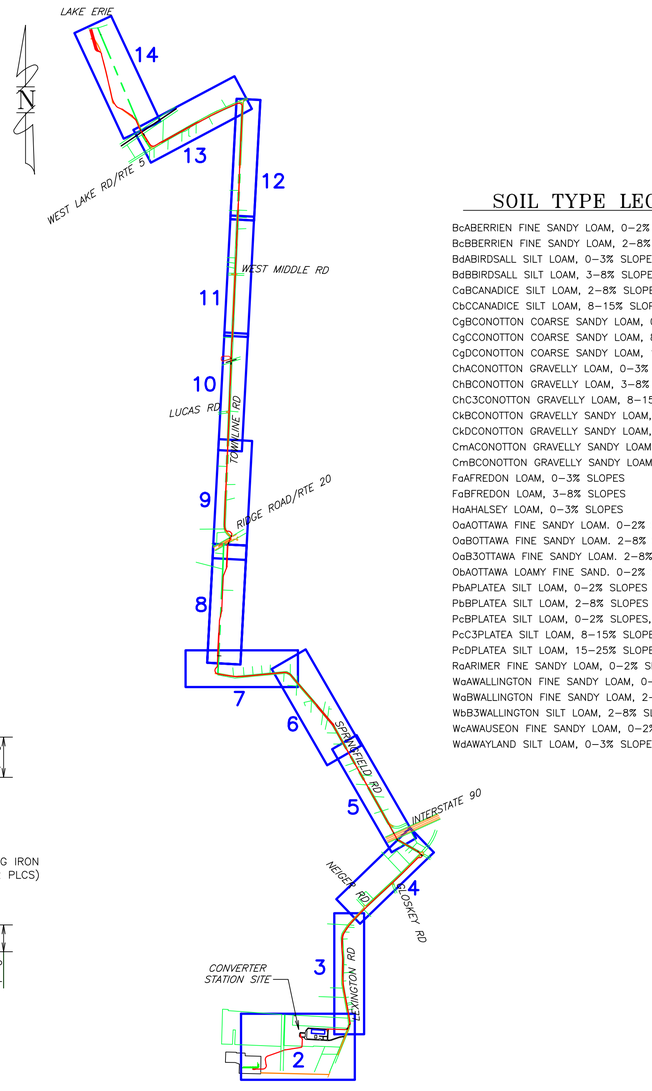
CABLE TYPICAL SECTION
SCALE: 1"=1'-0"

* 1x3 DUCT BANK CONFIGURATION SHOWN FOR DC CABLES. DC CABLES MAY BE PLACED IN ALTERNATIVE 2x2 DUCT BANK CONFIGURATION FOR WHICH THERMAL DUCT BANK CONCRETE DIMENSIONS WOULD BE 2'-6" x 2'-2 13/16" WIDE. AC CABLES MAY BE PLACED IN 4x2 DUCT BANK CONFIGURATION FOR WHICH THERMAL DUCT BANK CONCRETE DIMENSION WOULD BE 2'-6" HIGH x 4'-2 5/8" WIDE.



SPLICING VAULT TYPICAL PLAN
SCALE: 1"=1'-0"

NOTE: SPLICING VAULT LOCATIONS TO BE DETERMINED. SPLICING VAULTS TO BE PLACED WITHIN LIMIT OF DISTURBANCE. APPROXIMATELY 20 SPLICING VAULTS REQUIRED ALONG PA CABLE ROUTE AT SPACING NOT GREATER THAN 2,500 FEET.



LOCATION MAP
SCALE: 1"=2000'

SCALE: 0 2,000 4,000 feet

SHEET INDEX

1 TITLE SHEET
2-14 ROUTE PLAN SHEETS
15-16 DETAILS

SOIL TYPE LEGEND

BcABERRIEN FINE SANDY LOAM, 0-2% SLOPES
BcBBERRIEN FINE SANDY LOAM, 2-8% SLOPES
BdABIRDSALL SILT LOAM, 0-3% SLOPES
BdBBIRDSALL SILT LOAM, 3-8% SLOPES
CaBCANADICE SILT LOAM, 2-8% SLOPES
CbCCANADICE SILT LOAM, 8-15% SLOPES
CgBCONOTTON COARSE SANDY LOAM, 0-8% SLOPES
CgCCONOTTON COARSE SANDY LOAM, 8-15% SLOPES
CgDCONOTTON COARSE SANDY LOAM, 15-25% SLOPES
ChACONOTTON GRAVELLY LOAM, 0-3% SLOPES
ChBCONOTTON GRAVELLY LOAM, 3-8% SLOPES
ChC3CONOTTON GRAVELLY LOAM, 8-15% SLOPES
CkBCONOTTON GRAVELLY SANDY LOAM, 3-8% SLOPES
CkDCONOTTON GRAVELLY SANDY LOAM, 15-25% SLOPES
CmACONOTTON GRAVELLY SANDY LOAM, 0-3% SLOPES, MODERATELY WELL DRAINED
CmBCONOTTON GRAVELLY SANDY LOAM, 3-8% SLOPES, MODERATELY WELL DRAINED
FaAFREDON LOAM, 0-3% SLOPES
FaBFREDON LOAM, 3-8% SLOPES
HaAHALSEY LOAM, 0-3% SLOPES
OaAOTTAWA FINE SANDY LOAM. 0-2% SLOPES
OaBOTTAWA FINE SANDY LOAM. 2-8% SLOPES
OaB3OTTAWA FINE SANDY LOAM. 2-8% SLOPES, SEVERELY ERODED
ObAOTTAWA LOAMY FINE SAND. 0-2% SLOPES
PbAPLATEA SILT LOAM, 0-2% SLOPES
PbBPLATEA SILT LOAM, 2-8% SLOPES
PcBPLATEA SILT LOAM, 0-2% SLOPES, WELL DRAINED,
PcC3PLATEA SILT LOAM, 8-15% SLOPES, WELL DRAINED, SEVERERLY ERODED
PcDPLATEA SILT LOAM, 15-25% SLOPES
RaARIMER FINE SANDY LOAM, 0-2% SLOPES
WaAWALLINGTON FINE SANDY LOAM, 0-2% SLOPES
WaBWALLINGTON FINE SANDY LOAM, 2-8% SLOPES
WbB3WALLINGTON SILT LOAM, 2-8% SLOPES, SEVERELY ERODED
WcAWAUSEON FINE SANDY LOAM, 0-2% SLOPES
WdAWAYLAND SILT LOAM, 0-3% SLOPES

LEGEND

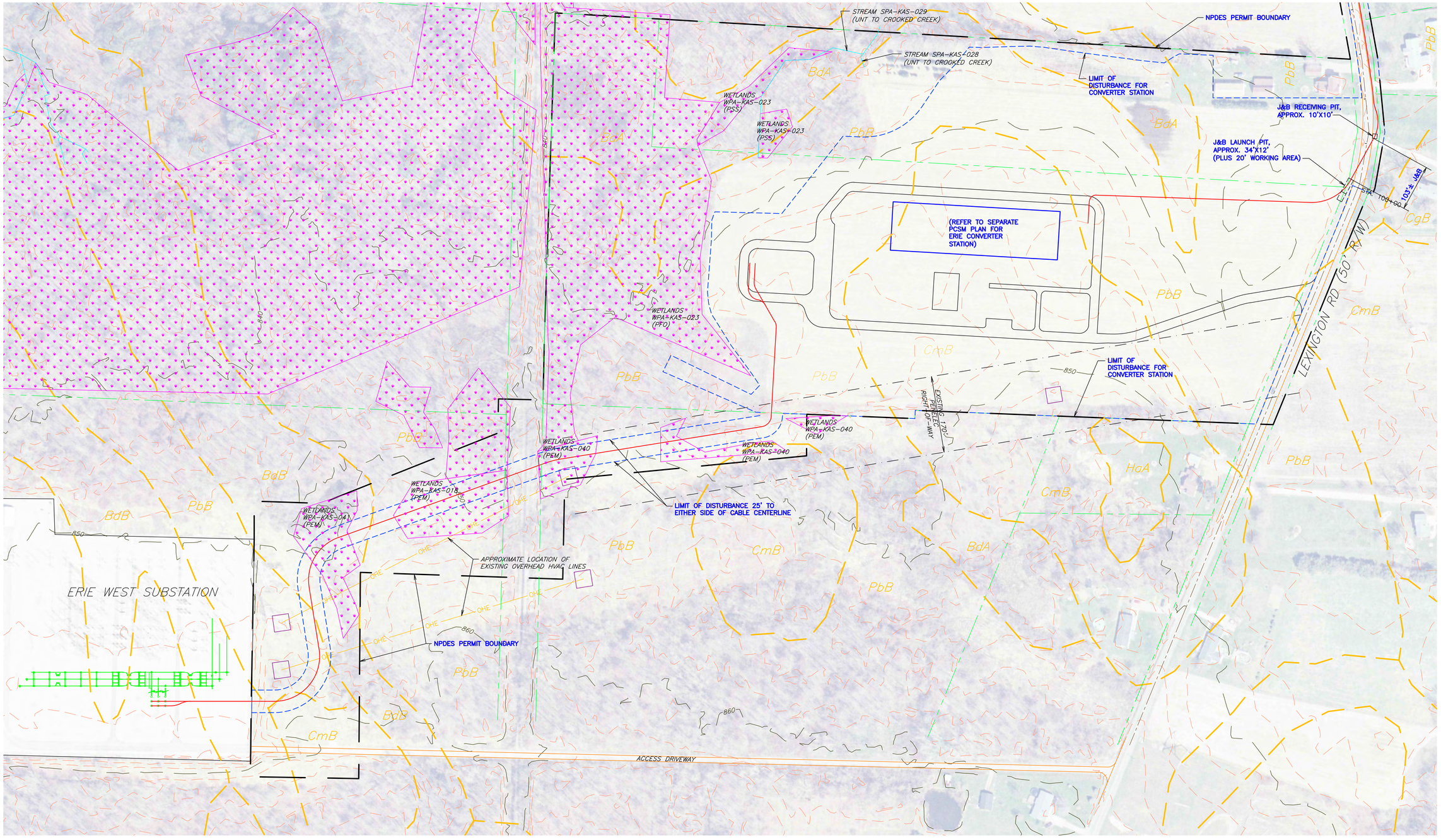
- PROPOSED CABLES
- PROPERTY BOUNDARY
- FLOODPLAIN BOUNDARY
- NPDES PERMIT BOUNDRY
- LIMIT OF DISTURBANCE
- OHE — OVERHEAD ELECTRIC LINES
- SOIL TYPE BOUNDARY
- 1005 — EXISTING CONTOURS
- 1005 — PROPOSED CONTOURS
- COMPOST FILTER SOCK
- STREAMS (FIELD DELINEATED BY HDR, PER SHAPEFILE DATED 1/7/2016)
- PONDS (FIELD DELINEATED BY HDR, PER SHAPEFILE DATED 10/5/2015)
- WETLANDS (FIELD DELINEATED BY HDR, PER SHAPEFILE DATED 1/7/2016)

NOTES

1. PROPERTY AND RIGHT-OF-WAY LINES PLOTTED FROM SURVEY BY DAVID A. LAIRD ASSOCIATES, DRAWING REVISED 10/7/2015.
2. AERIAL IMAGERY AND CONTOURS FROM PA SPATIAL DATA ACCESS, CONTOUR INTERVAL 2 FEET.
3. FLOODPLAINS PLOTTED FROM FEMA FLOOD INSURANCE RATE MAPS 42049C0330D, 42049C0309D, 42049C0307D, 42049C0144D.

PREPARED BY:
DEISS & HALMI ENGINEERING, INC.
EDINBORO, PENNSYLVANIA

JANUARY 22, 2016



SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

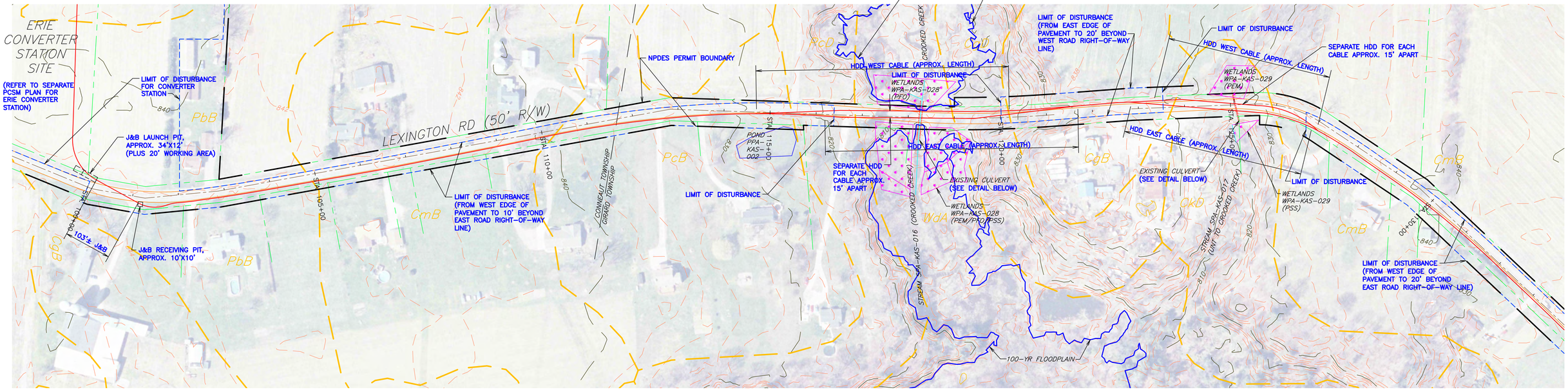
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

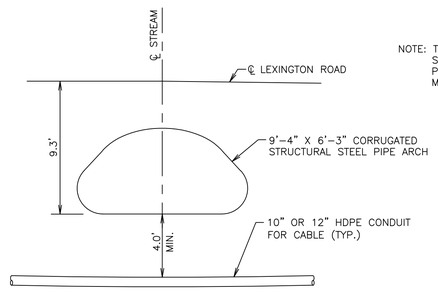
SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-2

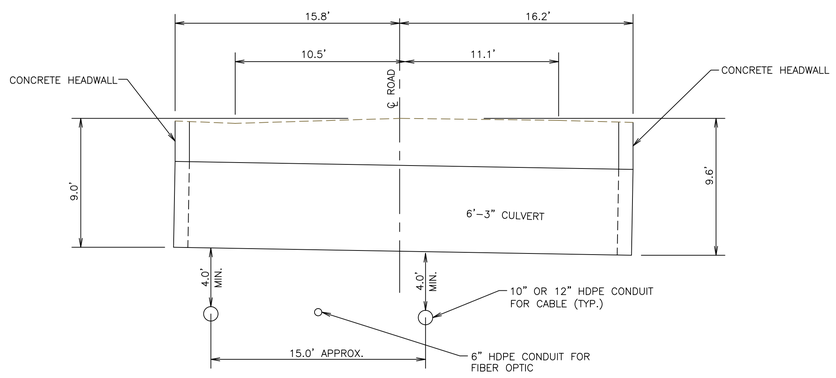
January 22, 2016 - 4:56pm C:\AutoCAD Files\AutoCAD Working\Lake Erie Power Corr\PA Cable Route 2015\Cable Route Drawings SR 1-22-2016.dwg



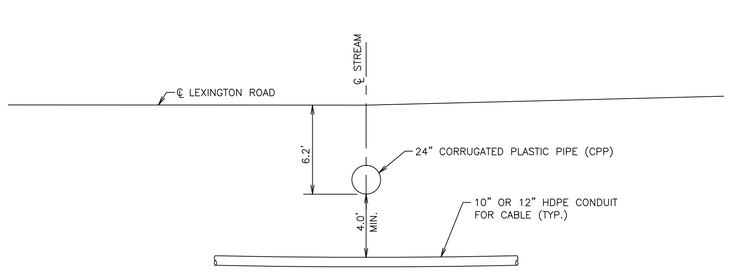


NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

CROSS SECTION OF STREAM SPA-KAS-016 (STA 118+26)
N.T.S.

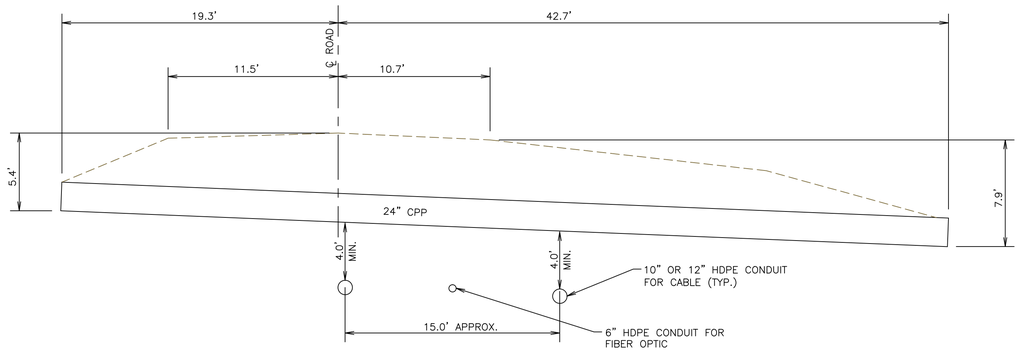


PROFILE OF STREAM SPA-KAS-016 (STA 118+26)
N.T.S.



NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

CROSS SECTION OF STREAM SPA-KAS-017 (STA 125+10)
N.T.S.



PROFILE OF STREAM SPA-KAS-017 (STA 125+10)
N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN	APPROVED BY:	DRAWN BY: JEFFREY T. BERNOSKY
DATE: 1/22/2016		

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
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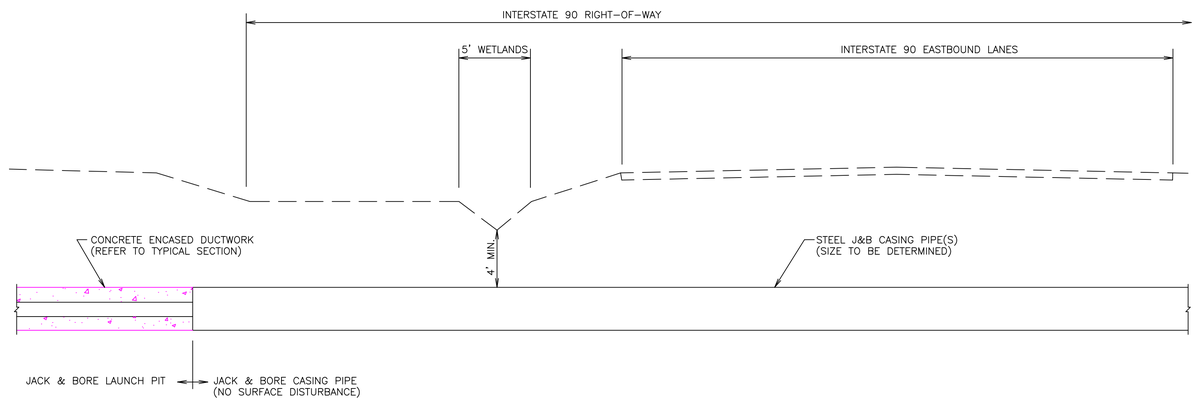
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-3



NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

PROFILE OF CABLE AT WETLANDS WPA-KAS-030 CROSSING (STA 166+40)

N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

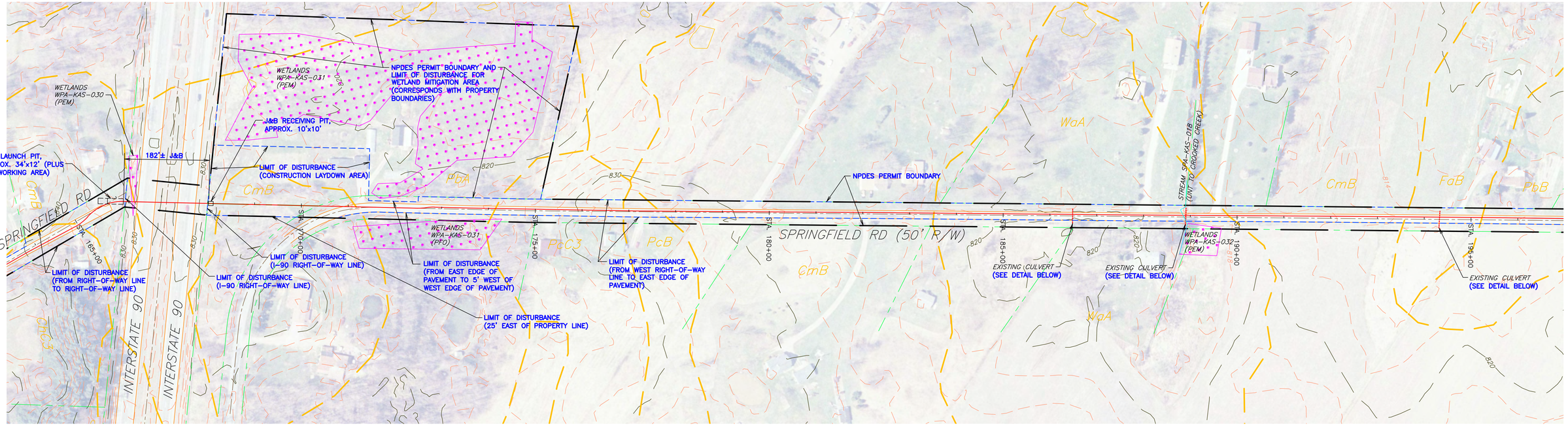
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

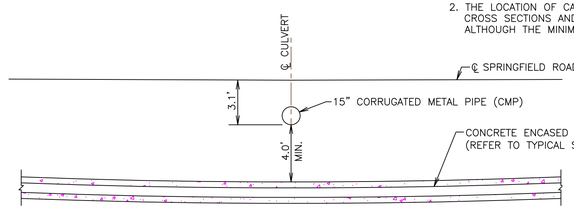
Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-4

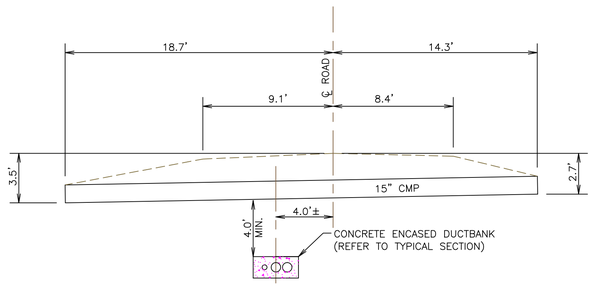
January 22, 2016 - 4:56pm C:\AutoCAD Files\AutoCAD Working\Lake Erie Power Corp\PA Cable Route 2015\Cable Route Template SR 1-22-2016.dwg



NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

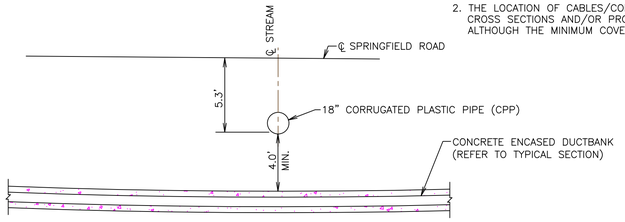


PROFILE OF SPRINGFIELD ROAD AT CULVERT CROSSING (STA 186+48)
N.T.S.

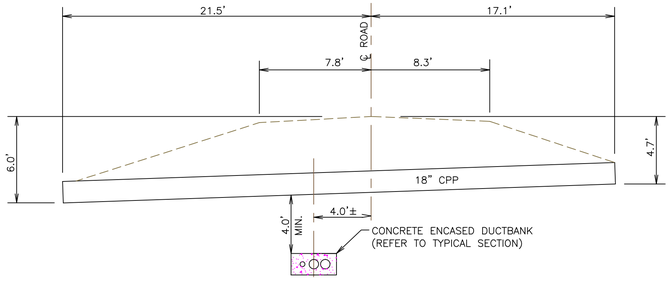


PROFILE OF CULVERT CROSSING (STA 186+48)
N.T.S.

NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.



CROSS SECTION OF STREAM SPA-KAS-018 (STA 188+90)
N.T.S.



PROFILE OF STREAM SPA-KAS-018 (STA 188+90)
N.T.S.

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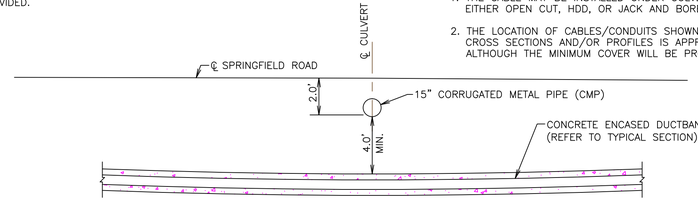
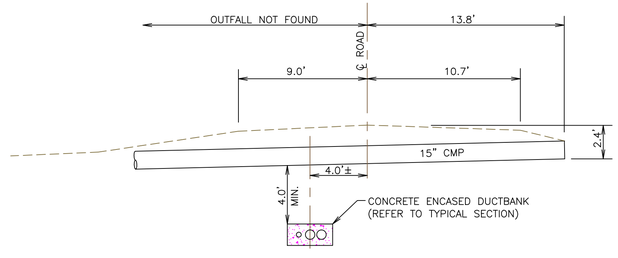


PROFILE OF SPRINGFIELD ROAD AT CULVERT CROSSING (STA 194+32)
N.T.S.



PROFILE OF CULVERT CROSSING (STA 194+32)
N.T.S.

SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

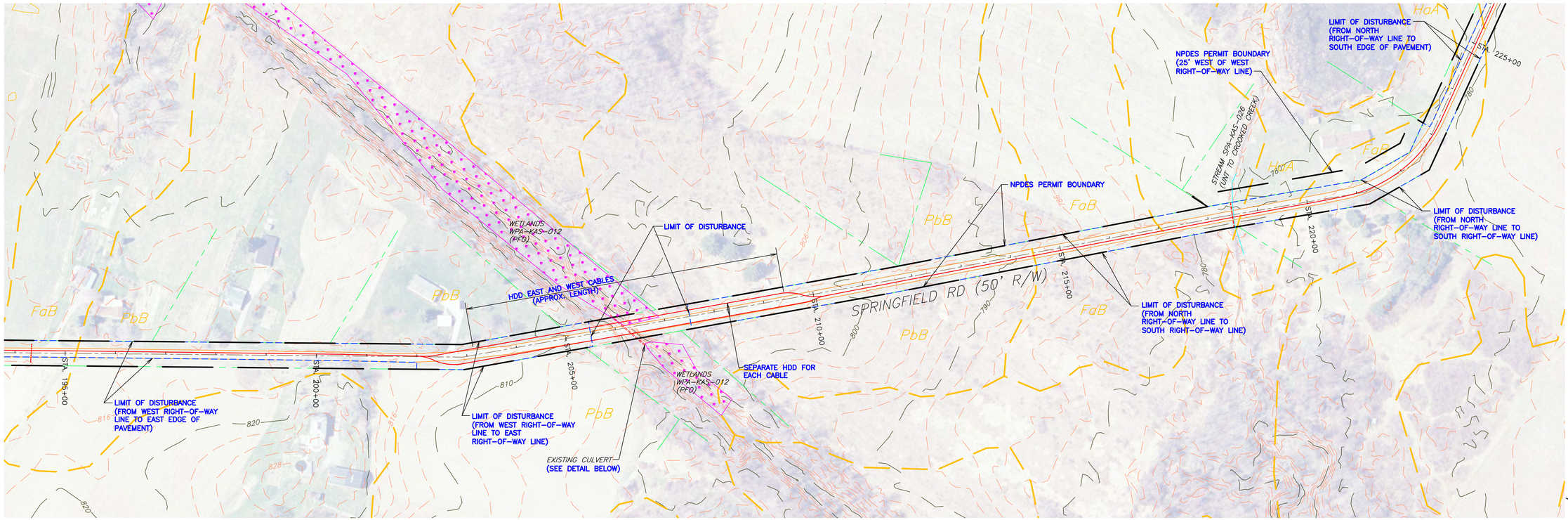
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

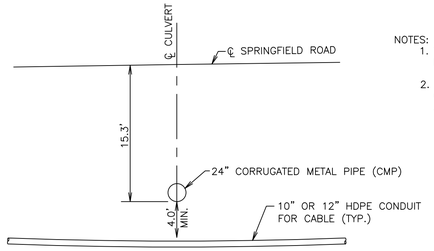
SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-5

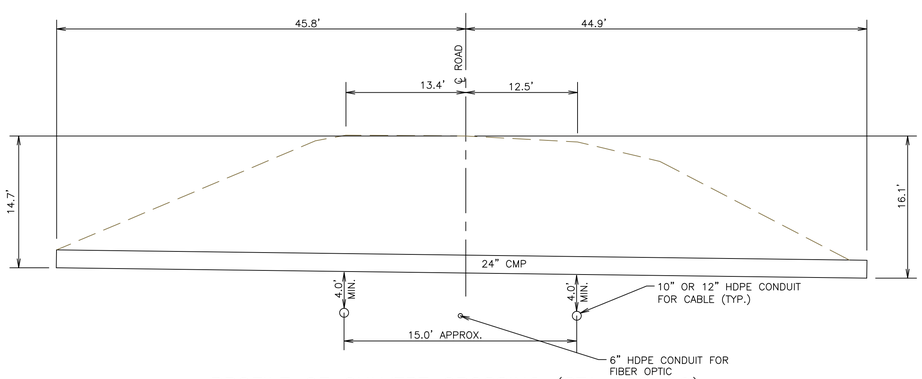
January 22, 2016 - 4:57pm C:\AutoCAD Files\AutoCAD Workspaces\Lake Erie Power Corp\PA Cable Route 2015\Cable Route Drawings SR 1-22-2016.dwg



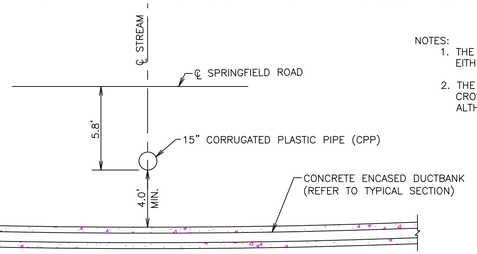


NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

PROFILE OF SPRINGFIELD ROAD AT CULVERT CROSSING (STA 206+19)
N.T.S.



PROFILE OF CULVERT CROSSING (STA 206+19)
N.T.S.



NOTES:
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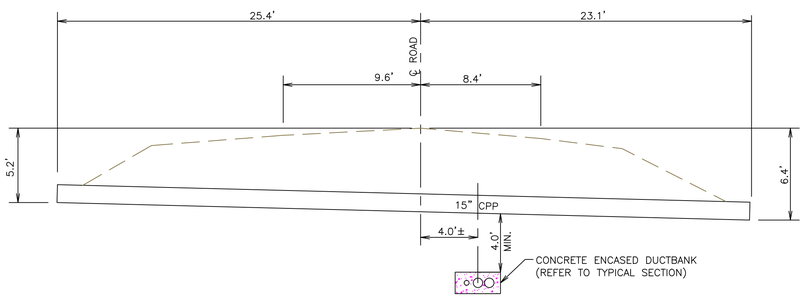
CROSS SECTION OF STREAM SPA-KAS-026 (STA 218+49)
N.T.S.



PROFILE OF STREAM SPA-KAS-026 (STA 218+49)
N.T.S.

SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

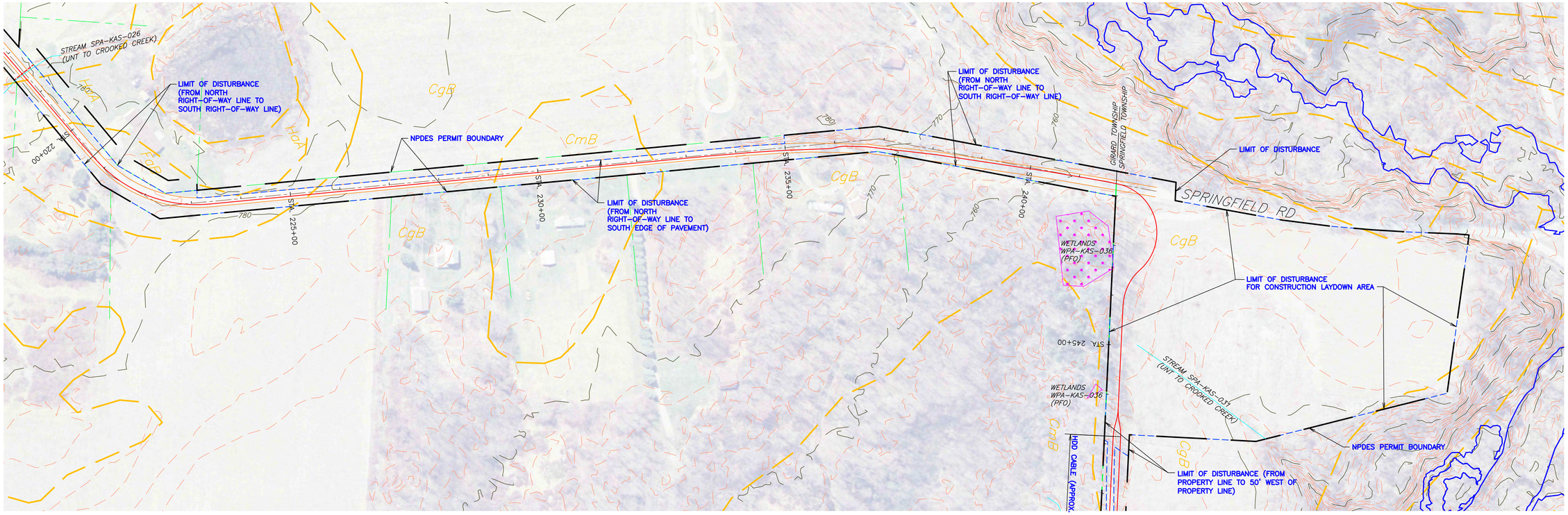
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-6

January 22, 2016 – 4:36pm C:\AutoCAD Files\AutoCAD Workfiles\Value Fire Power Corp\PA Cable Route 2015\Cable Route Timelines SR 1-22-2016.dwg



SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN

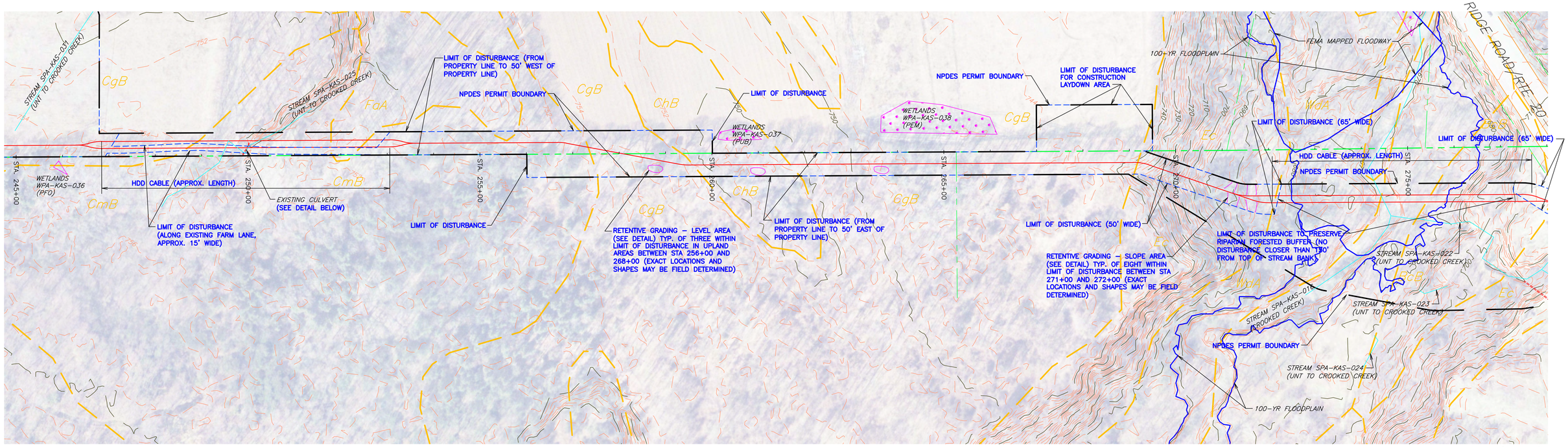
ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

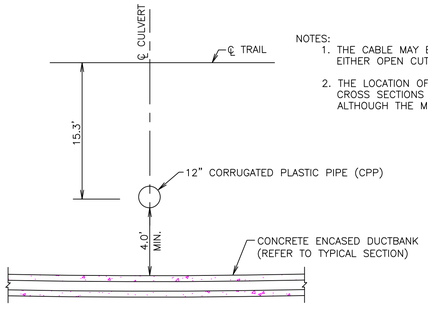
SCALE: AS SHOWN	APPROVED BY:	DRAWN BY: JEFFREY T. BERNOSKY
DATE: 1/22/2016		

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

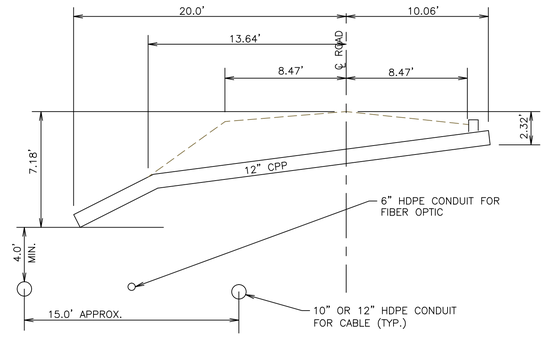
DRAWING NO.: 2080715-7



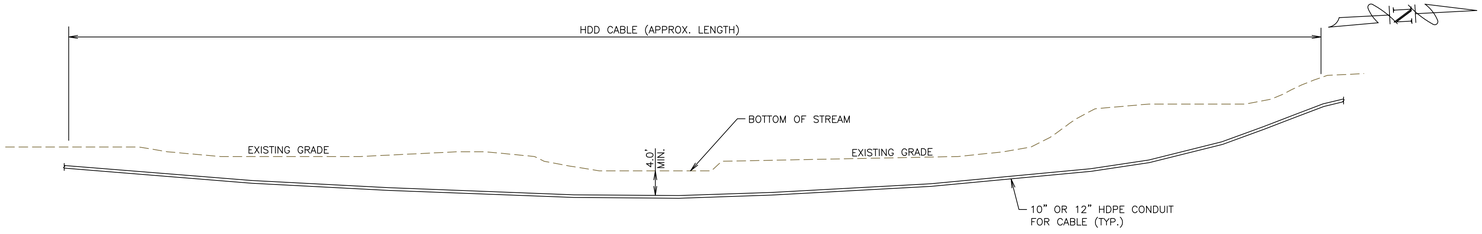


NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

CROSS SECTION OF STREAM SPA-KAS-025 (STA 250+01)
N.T.S.

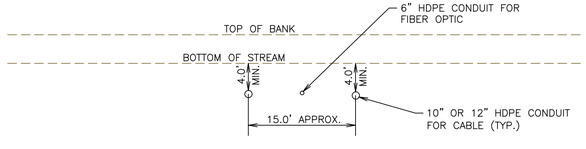


PROFILE OF STREAM SPA-KAS-025 (STA 250+01)
N.T.S.



CROSS SECTION OF STREAM SPA-KAS-016 (STA 274+50)
N.T.S.

NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.



PROFILE OF STREAM SPA-KAS-016 (STA 274+50)
N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

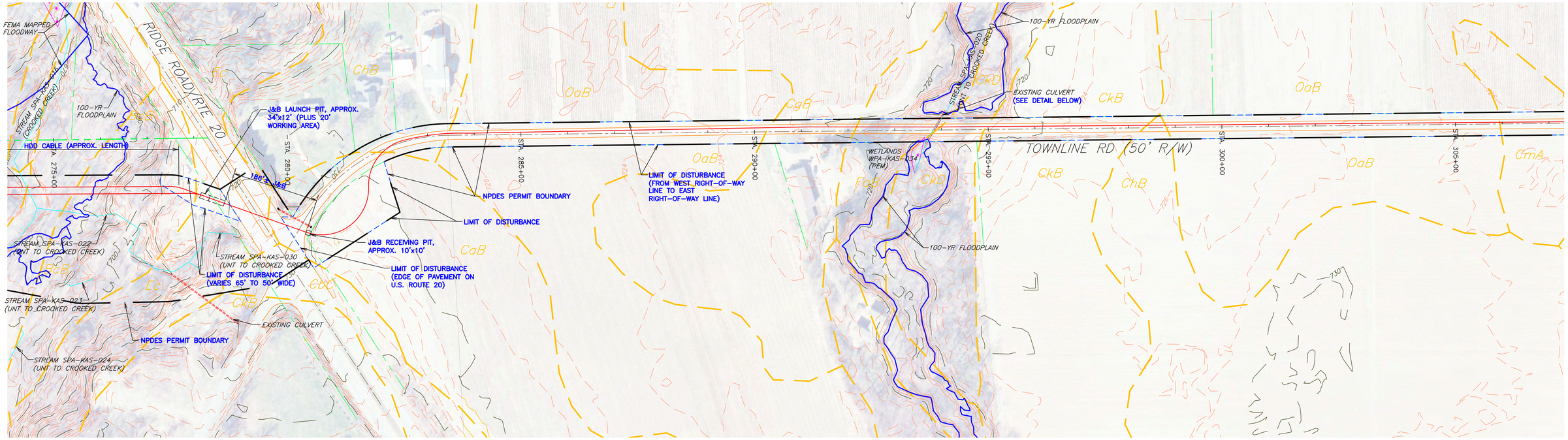
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

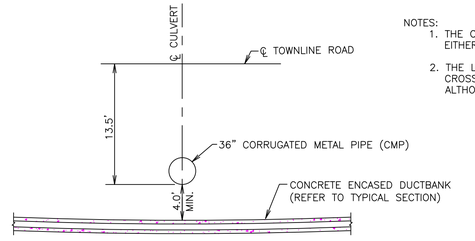
SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-8

January 22, 2016 – 4:58pm C:\AutoCAD Files\AutoCAD Working\Lake Erie Power Corp\PA Cable Route 2015\Cable Route Drawings SR 1-22-2016.dwg





NOTES:
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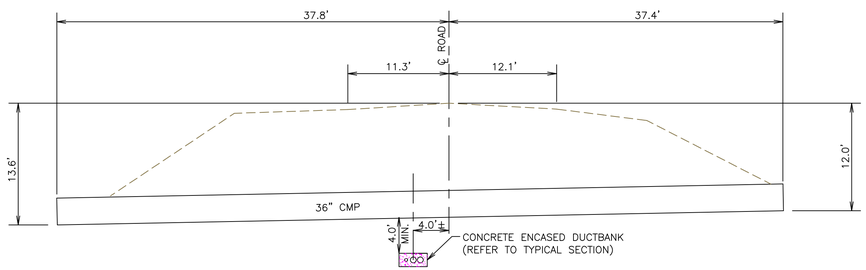
CROSS SECTION OF STREAM SPA-KAS-020 (STA 293+88)
N.T.S.



PROFILE OF STREAM SPA-KAS-020 (STA 293+88)
N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN

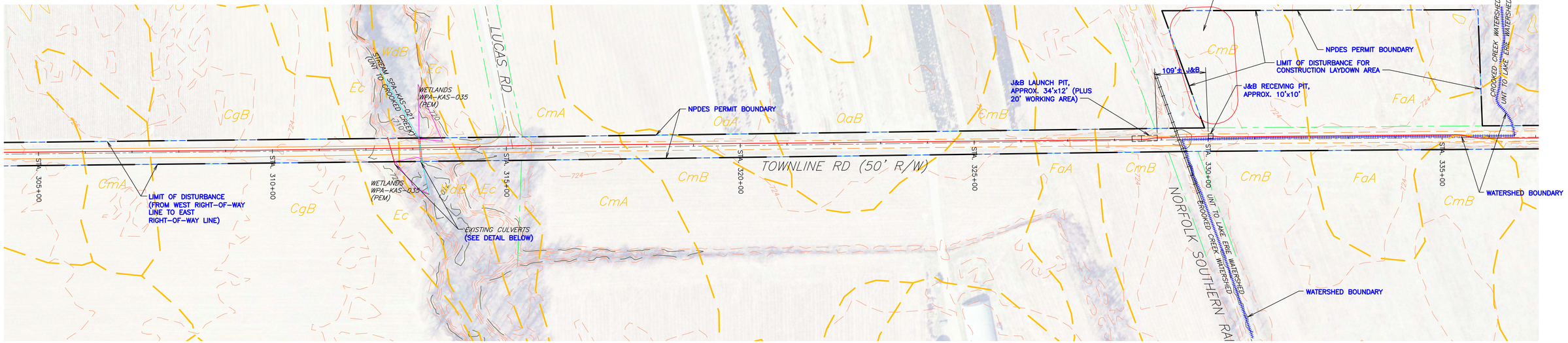
ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

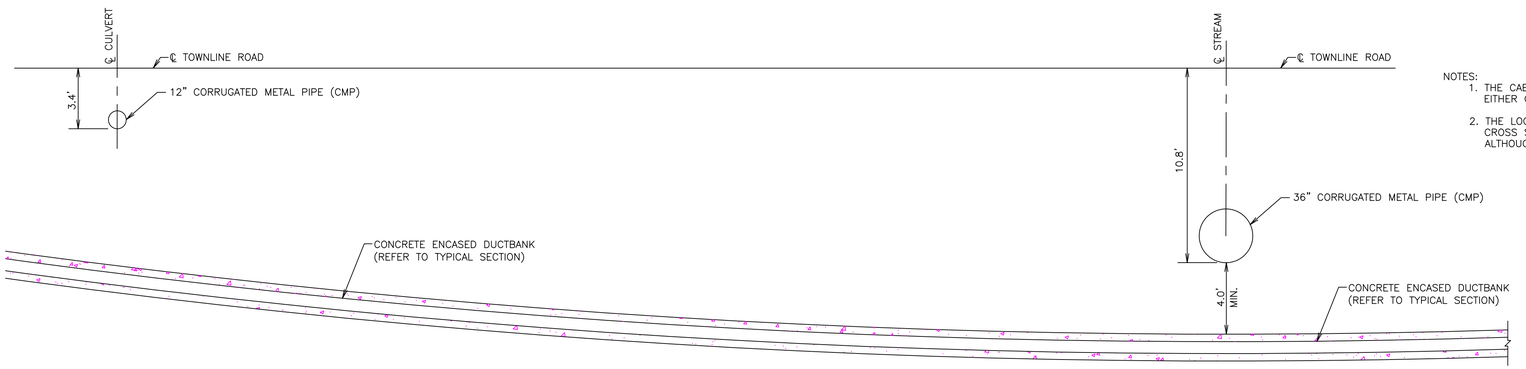
SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

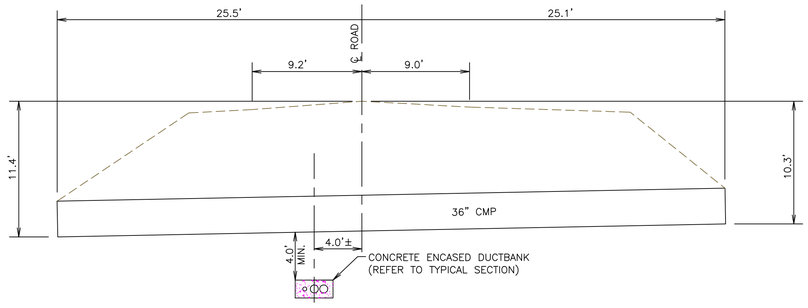
Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-9





CROSS SECTION OF STREAM SPA-KAS-021 (STA 313+16)
N.T.S.



PROFILE OF STREAM SPA-KAS-021 (STA 313+16)
N.T.S.

NOTES:
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SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

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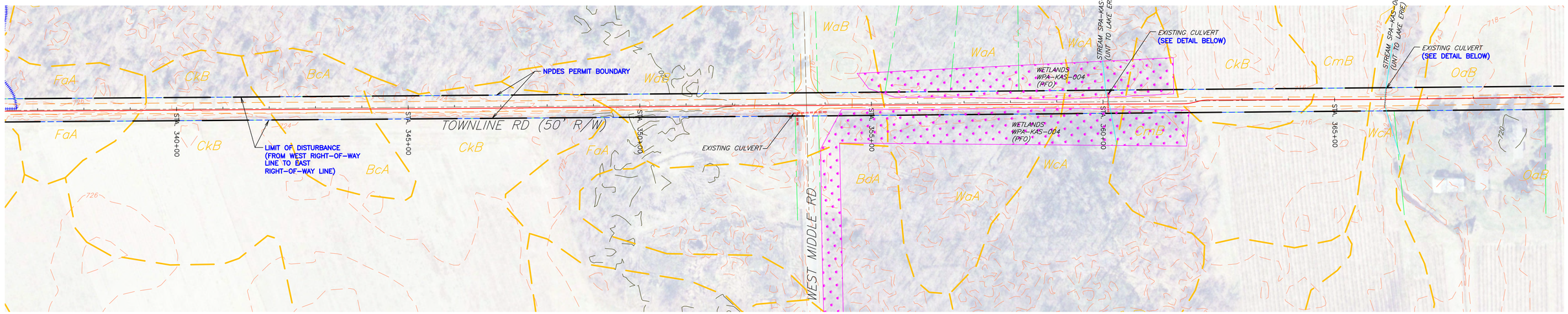
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH: 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-10



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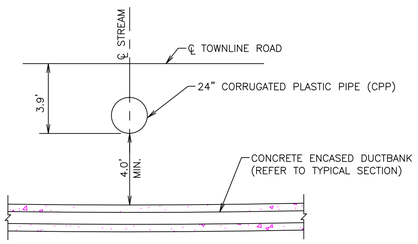
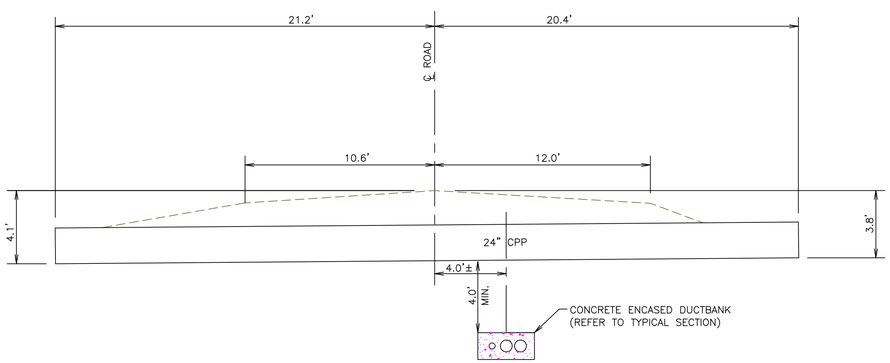
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

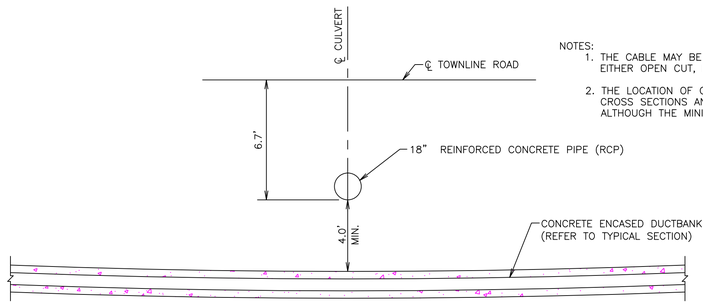


CROSS SECTION OF STREAM SPA-KAS-006 (STA 360+11)
N.T.S.

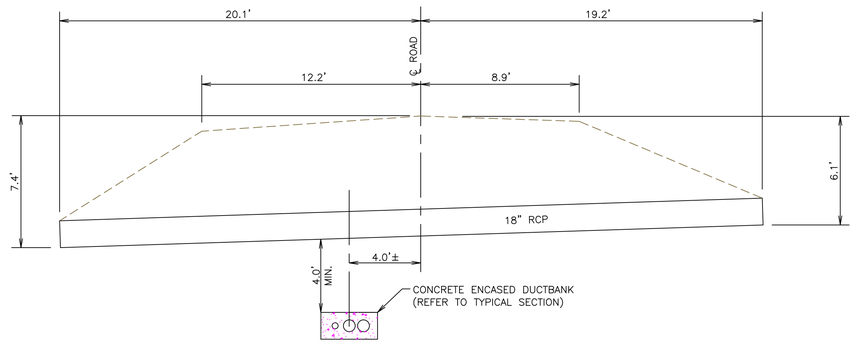


PROFILE OF STREAM SPA-KAS-006 (STA 360+11)
N.T.S.

NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.



CROSS SECTION OF STREAM SPA-KAS-005 (STA 366+09)
N.T.S.



PROFILE OF STREAM SPA-KAS-005 (STA 366+09)
N.T.S.

SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
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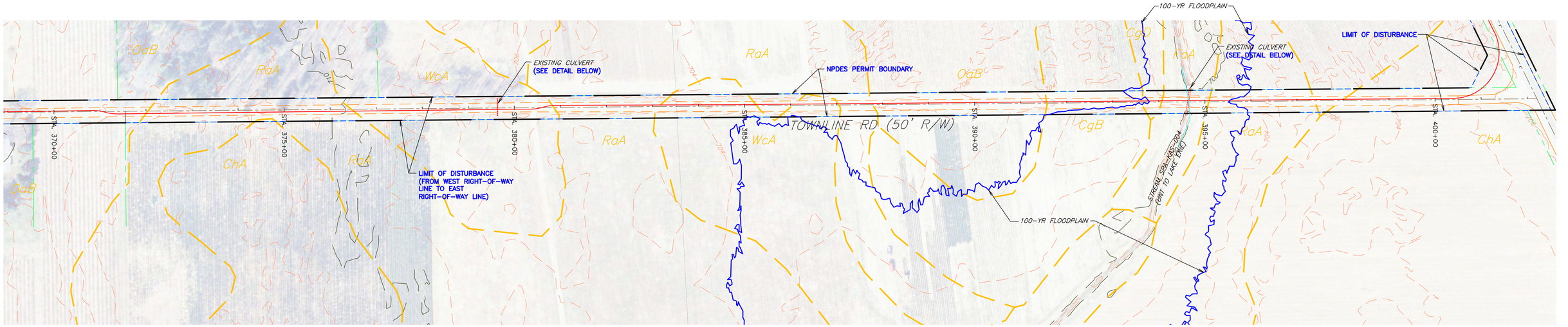
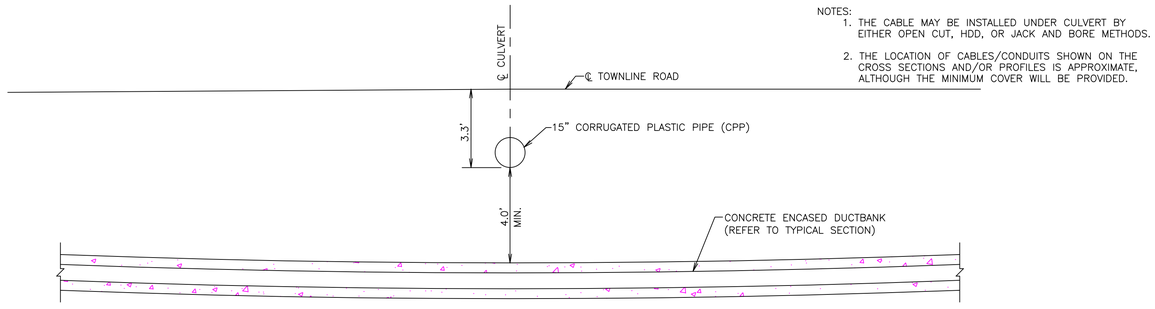
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-11

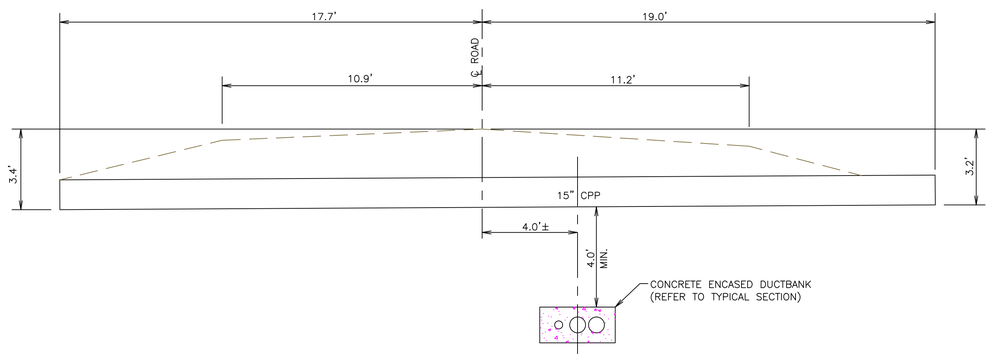
January 22, 2016 - 5:00pm C:\AutoCAD Files\AutoCAD Workbooks\Lake Erie Power Conn\PA Cable Route 2015\Cable Route Timelines '08 1-22-2016.dwg



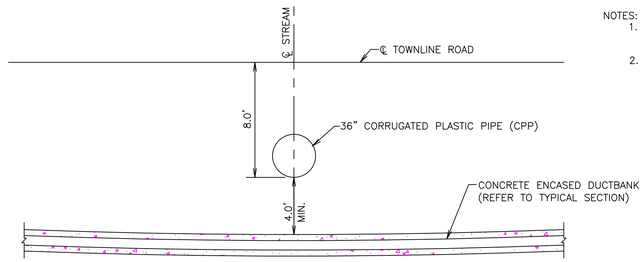


PROFILE OF TOWNLINE ROAD AT CULVERT CROSSING (STA 379+64)
N.T.S.

NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

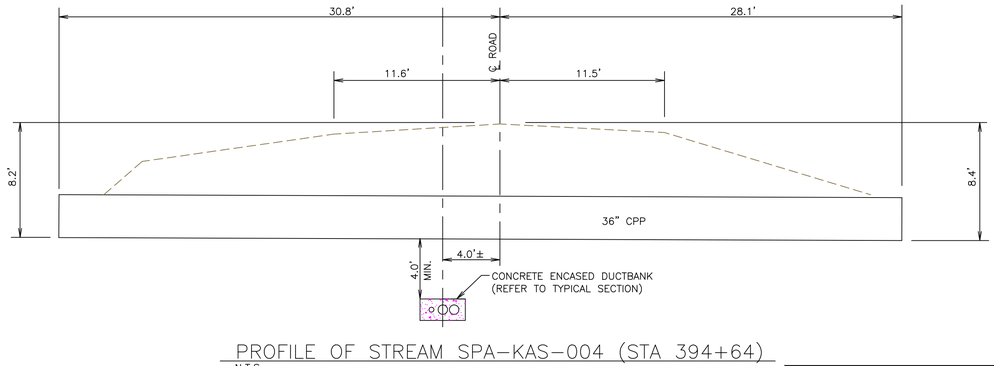


PROFILE OF CULVERT CROSSING (STA 379+64)
N.T.S.



CROSS SECTION OF STREAM SPA-KAS-004 (STA 394+64)
N.T.S.

NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.



PROFILE OF STREAM SPA-KAS-004 (STA 394+64)
N.T.S.

SCALE:
0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

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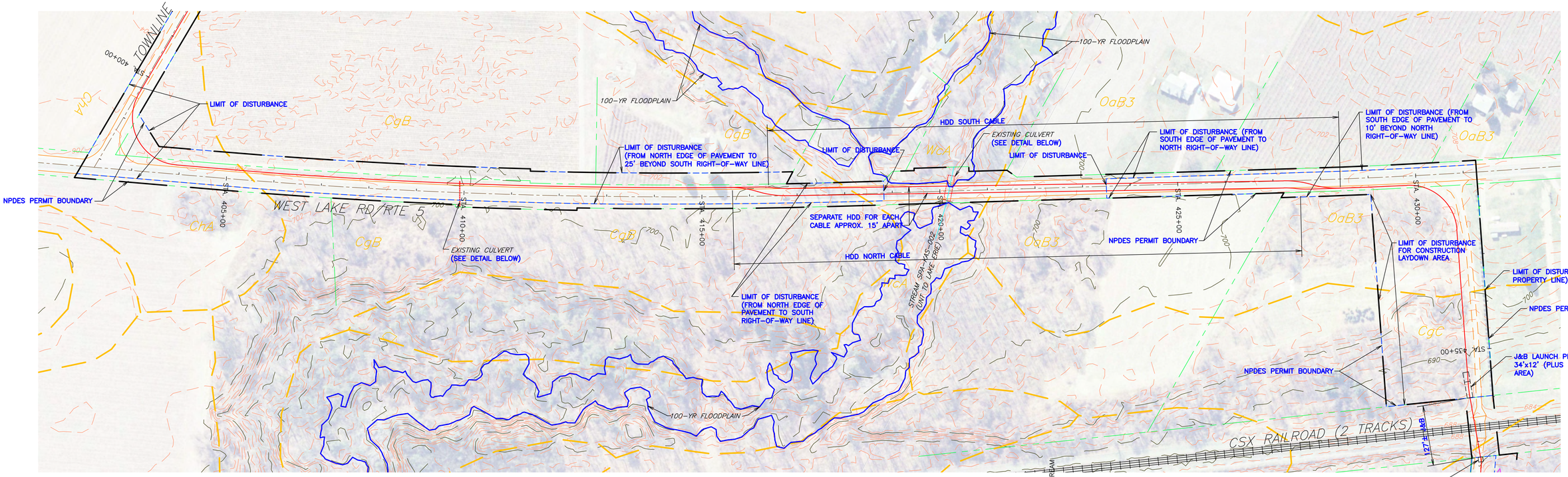
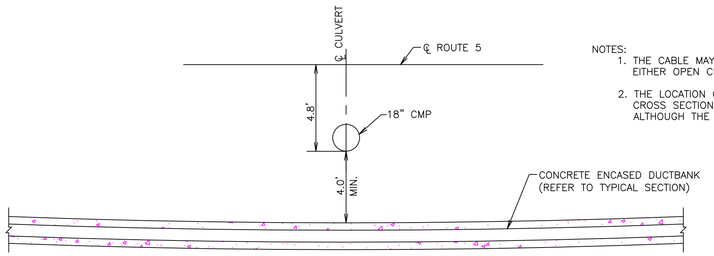
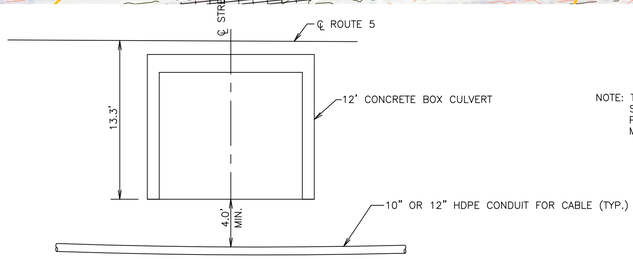
DRAWING NO.: 2080715-12





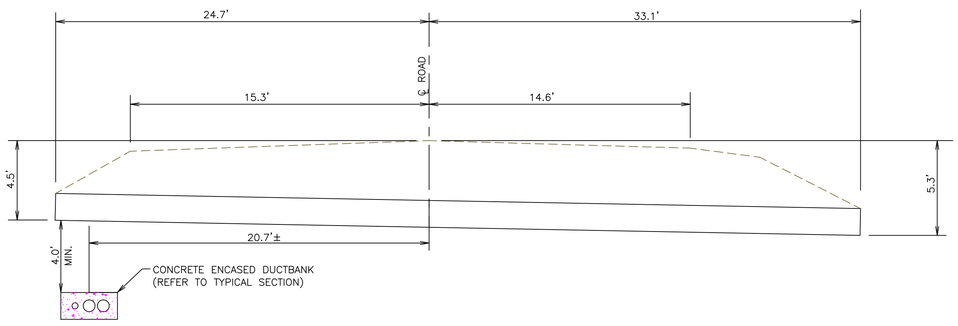
NOTES:
1. THE CABLE MAY BE INSTALLED UNDER CULVERT BY EITHER OPEN CUT, HDD, OR JACK AND BORE METHODS.
2. THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

PROFILE OF ROUTE 5 AT CULVERT CROSSING (STA 409+90)
N.T.S.

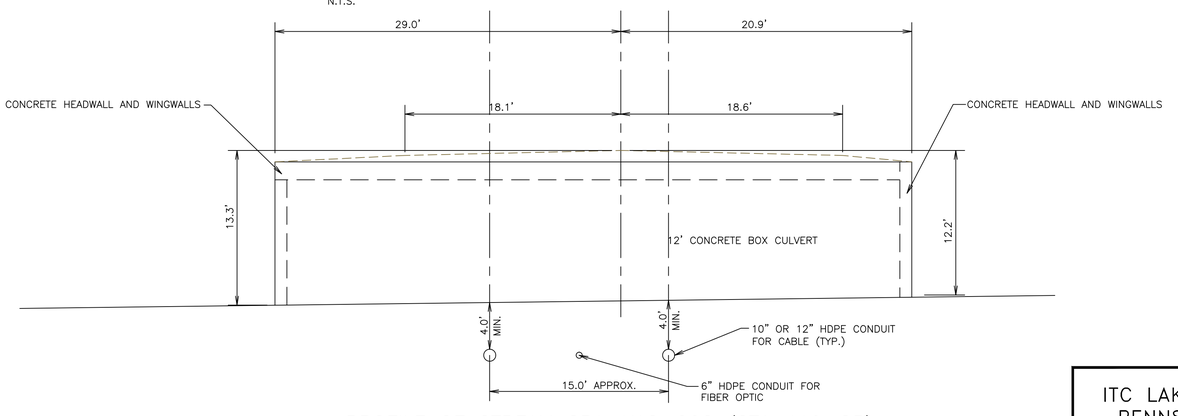


NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

CROSS SECTION OF STREAM SPA-KAS-002 (STA 419+85)
N.T.S.



PROFILE OF CULVERT CROSSING (STA 409+90)
N.T.S.



PROFILE OF STREAM SPA-KAS-002 (STA 419+85)
N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN

ITC LAKE ERIE CONNECTOR LLC PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

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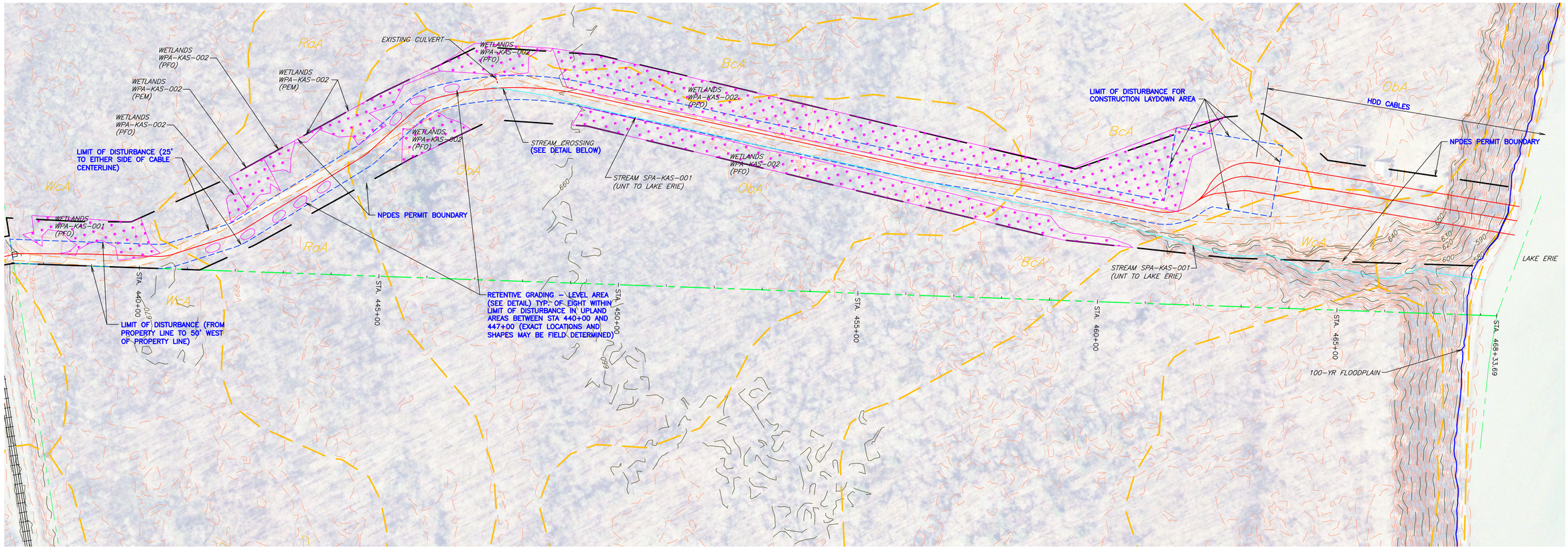
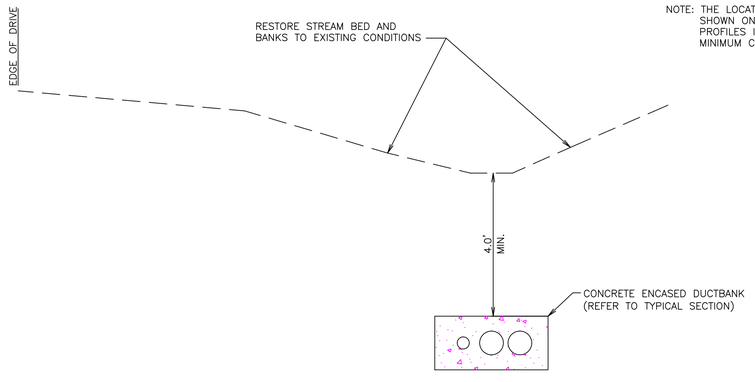
DRAWING NO.: 2080715-13

January 22, 2016 - 5:01pm C:\AutoCAD Files\AutoCAD Workbooks\Lake Erie Power Corr\PA Cable Route 2015\Cable Route Drawings SR 1-22-2016.dwg





NOTE: THE LOCATION OF CABLES/CONDUITS SHOWN ON THE CROSS SECTIONS AND/OR PROFILES IS APPROXIMATE, ALTHOUGH THE MINIMUM COVER WILL BE PROVIDED.

CROSS-SECTION OF STREAM SPA-KAS-001 (STA 447+35)
N.T.S.

SCALE: 0 100 200 feet

No.	Date	Revisions	By

SITE RESTORATION PLAN
ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
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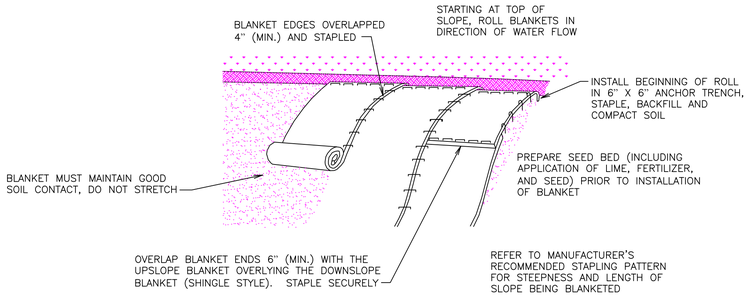
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-14

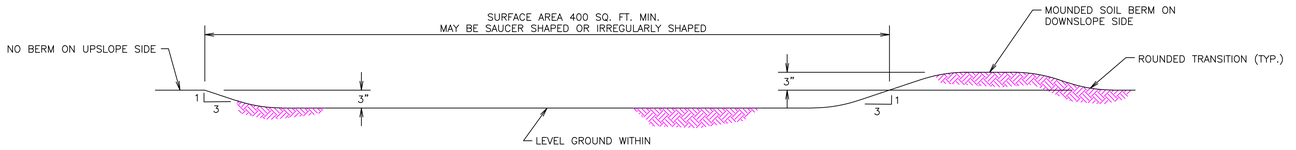


NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 5 CALENDAR DAYS.
7. PROVIDE EROSION CONTROL MULCH BLANKET IN ACCORDANCE WITH PENNDOT PUB. 408, SEC. 806.2(A)2.A.

EROSION CONTROL MULCH BLANKET INSTALLATION

N.T.S.

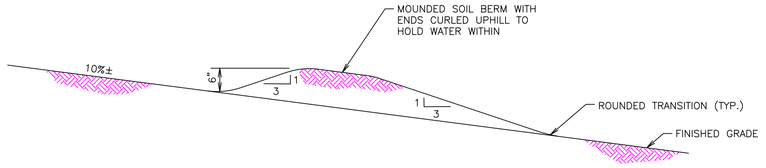


NOTES:

1. SEED PER SEEDING SPECIFICATIONS.
2. PROVIDES APPROX. 100 CUBIC FEET OF STORAGE FOR EACH SAUCER.

RETENTIVE GRADING TYPICAL SECTION (LEVEL AREAS)

N.T.S.

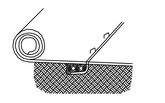


NOTES:

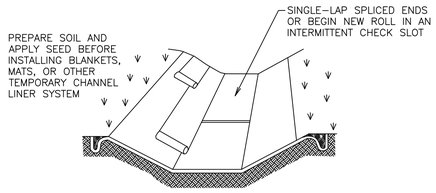
1. SEED PER SEEDING SPECIFICATIONS.
2. PROVIDES APPROX. 30 CUBIC FEET OF STORAGE PER EACH 20' OF BERM.

RETENTIVE GRADING TYPICAL SECTION (SLOPED AREAS)

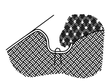
N.T.S.



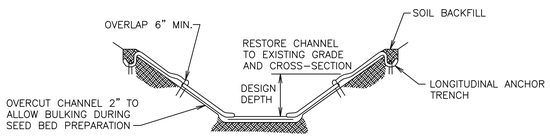
INTERMITTENT CHECK SLOT



ISOMETRIC VIEW



LONGITUDINAL ANCHOR TRENCH



DITCH CHANNEL CROSS-SECTION

* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATIVE STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION.

NOTES:

1. FOR ALL DISTURBED DITCHES (UNLESS OTHERWISE INDICATED ON DRAWINGS) PROVIDE EROSION CONTROL MULCH CONTROL BLANKET IN ACCORDANCE WITH PENNDOT PUB. 408, SEC. 806.2(A)2.A.
2. ANCHOR TRENCHES SHALL BE INSTALLED AT BEGINNING AND END OF CHANNEL IN THE SAME MANNER AS LONGITUDINAL ANCHOR TRENCHES.
3. CHANNEL DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY.
4. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.

DITCH RESTORATION

N.T.S.

DETAILS

No.	Date	Revisions	By

SITE RESTORATION PLAN

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN | APPROVED BY: | DRAWN BY: JEFFREY T. BERNOSKY

DATE: 1/22/2016

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
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DRAWING NO.: 2080215-15

January 22, 2016 - 5:07pm C:\AutoCAD Files\AutoCAD Workspaces\dwg File Power Core\PA Cable Route 2015\Cable Route Drawings SR 1-22-2016.dwg

BMPS TO BE USED:

THE FOLLOWING BEST MANAGEMENT PRACTICES (BMPS) ARE PROPOSED FOR SITE RESTORATION AND STORMWATER MANAGEMENT TO REMAIN IN PLACE AFTER CONSTRUCTION.

RETENTIVE GRADING. RETENTIVE GRADING WILL BE USED TO MITIGATE THE SMALL CHANGE IN THE VOLUME OF STORMWATER RUNOFF FOR THE 2-YEAR, 24-HOUR STORM WHERE FORESTED AREAS ARE CONVERTED TO MEADOW AREAS. RETENTIVE GRADING CREATES SHALLOW DEPRESSIONS THAT COLLECT AND TEMPORARILY STORE STORMWATER RUNOFF, ALLOWING IT TO INFILTRATE INTO THE GROUND AND RECHARGE GROUNDWATER. IN SLOPED AREAS, RETENTIVE GRADING INCLUDES LINEAR LANDSCAPE FEATURES LOCATED ALONG SITE CONTOURS, AND MAY BE CONSTRUCTED IN SERIES ALONG THE SLOPE. IN FLATTER AREAS, RETENTIVE GRADING MAY BE USED TO CREATE SUBTLE SAUCER-SHAPED DEPRESSIONS WHICH CONTAIN AND INFILTRATE STORMWATER. CALCULATIONS FOR THE STORAGE/INFILTRATION VOLUME PROVIDED BY THE PROPOSED RETENTIVE GRADING ARE INCLUDED IN SECTION 5.1. TYPICAL DETAILS FOR THE RETENTIVE GRADING AREAS ARE SHOWN ON THE SITE RESTORATION PLAN DRAWINGS.

EROSION CONTROL MULCH BLANKET. EROSION CONTROL MULCH BLANKETS WILL BE INSTALLED ON DISTURBED SLOPES 3H:1V AND STEEPER, AND IN DITCHES OR CHANNELS THAT ARE DISTURBED AND IN NEED OF RESTORATION. SPECIFICATIONS FOR EROSION CONTROL MULCH BLANKETS ARE PRESENTED ON THE SITE RESTORATION PLAN DRAWINGS. EROSION CONTROL MULCH BLANKETS WILL BE INSTALLED AS SOON AS PRACTICAL AFTER FINAL GRADE HAS BEEN ACHIEVED, AND WILL REMAIN IN PLACE UNTIL A UNIFORM 70 PERCENT PERENNIAL VEGETATIVE COVER HAS BEEN ACHIEVED.

VEGETATIVE STABILIZATION. VEGETATIVE STABILIZATION CONSISTS OF FINAL GRADING, TOPSOIL PLACEMENT, SEEDING, AND MULCHING. IF WEATHER CONDITIONS ARE FAVORABLE, PERMANENT SEEDING WILL TAKE PLACE WITHIN 7 DAYS OF THE COMPLETION OF THE EARTH DISTURBANCE ACTIVITIES. OTHERWISE, TEMPORARY SEEDING AND MULCHING WILL BE IMPLEMENTED UNTIL CONDITIONS BECOME FAVORABLE FOR THE ESTABLISHMENT OF PERMANENT VEGETATIVE COVER. SPECIFICATIONS FOR VEGETATIVE STABILIZATION ARE INCLUDED ON THE SITE RESTORATION PLAN DRAWINGS.

MAINTENANCE PROVISIONS

A MAINTENANCE PROGRAM FOR SITE RESTORATION AND STORMWATER MANAGEMENT BMPS WILL BE IMPLEMENTED, CONSISTING OF INSPECTIONS BY THE CONTRACTOR TO OCCUR WEEKLY, AS WELL AS AFTER ANY STORMWATER EVENT, OR MORE FREQUENTLY WHERE INDICATED BELOW. EACH INSPECTION MUST BE DOCUMENTED IN WRITING AS TO THE DATE OF THE INSPECTION, THE PERSON PERFORMING THE INSPECTION, AND ANY BMP REPAIRS, REPLACEMENT OR MAINTENANCE ACTIVITIES THAT OCCUR. RECORDS OF THESE INSPECTIONS WILL BE KEPT ON SITE BY THE CONTRACTOR, AND WILL BE MADE AVAILABLE UPON REQUEST TO INSPECTORS FROM PADEP OR THE ERIE COUNTY CONSERVATION DISTRICT. AFTER COMPLETION OF CONSTRUCTION, THE OWNER WILL TAKE OVER INSPECTION DUTIES AS NECESSARY TO ENSURE THE SITE RESTORATION AND STORMWATER MANAGEMENT BMPS CONTINUE TO PROVIDE THEIR INTENDED FUNCTION. TO DOCUMENT INSPECTION AND MAINTENANCE ACTIVITIES, THE OWNER SHOULD DEVELOP A WRITTEN REPORT AFTER EACH INSPECTION TO INCLUDE ALL BMP REPAIR AND MAINTENANCE ACTIVITIES.

RETENTIVE GRADING. RETENTIVE GRADING GENERALLY HAS LOW MAINTENANCE REQUIREMENTS. MONITOR INFILTRATION TIME TO ENSURE INFILTRATION IN APPROXIMATELY 1 TO 3 DAYS AFTER STORM EVENTS. WHERE PLANTED IN TURF GRASS, MAINTAIN BY MOWING. OTHER VEGETATION (E.G. MEADOW) WILL REQUIRE LESS MAINTENANCE. AVOID RUNNING HEAVY EQUIPMENT OVER THE INFILTRATION AREA AT THE BASE RETENTIVE GRADING AREAS. ROUTINELY MOVE ACCUMULATED TRASH AND DEBRIS. REMOVE INVASIVE PLANTS AS NEEDED. INSPECT FOR SIGNS OF FLOW CHANNELIZATION; RESTORE LEVEL GRADIENT IMMEDIATELY AFTER DEFICIENCIES ARE OBSERVED.

EROSION CONTROL MULCH BLANKET. AREAS COVERED BY EROSION CONTROL MULCH BLANKETS WILL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70 PERCENT COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS WILL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.

VEGETATIVE STABILIZATION. SEEDED AREAS WILL BE MAINTAINED IN ACCORDANCE WITH THE SPECIFICATIONS UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70 PERCENT COVERAGE.

STAGING OF CONSTRUCTION ACTIVITIES

SITE RESTORATION AND STORMWATER BMP INSTALLATION SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING RELATIVE SEQUENCE. THIS SEQUENCE MAY BE REPEATED FOR DIFFERENT WORK AREAS AS THE PROJECT PROGRESSES.

1. SITE PREPARATION. (REFER TO E&SC PLAN).
2. CABLE DUCT BANK INSTALLATION. (REFER TO E&SC PLAN).
3. TEMPORARY SURFACE RESTORATION.
   a. FOR ROADWAYS, IMPROVED SHOULDERS, AND DRIVEWAYS, SURFACE WILL BE RESTORED TEMPORARILY WITH A MINIMUM OF 18 INCHES OF COMPACTED PENNDOT 2A COARSE AGGREGATE. FINAL RESTORATION OF ROADWAYS AND SHOULDERS MAY OCCUR LATER IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS.
   b. FOR NON-ROADWAY AREAS, SURFACE WILL BE ROUGH GRADED TO BE SLIGHTLY HIGHER THAN ADJACENT GRADE.
4. PULL AND SPLICE CABLE. (REFER TO E&SC PLAN).
5. DEMOBILIZE THE SITE AND CONSTRUCTION LAYDOWN AREAS.
6. CONSTRUCT RETENTIVE GRADING "BERMS" AND "SAUCERS". BECAUSE THIS INVOLVES MINIMAL EARTHWORK, IT WILL BE DONE AS PART OF THE FINAL GRADING PROCESS.
   a. LIGHTLY SCARIFY THE SOIL IN THE AREA OF THE PROPOSED RETENTIVE GRADING.
   b. BRING IN OR MOVE FILL MATERIAL TO MAKE UP THE MAJOR PORTION OF THE RETENTIVE GRADING BERM OR SAUCER.
   c. PROTECT THE SURFACE PONDING AREA AT THE BASE OF THE BERM OR SAUCER FROM COMPACTION. IF COMPACTION DOES OCCUR, SCARIFY THE SOIL TO A DEPTH OF AT LEAST 8 INCHES.
   d. FINISH GRADE THE RETENTIVE GRADING BERMS OR SAUCERS AT THE TIME TOPSOIL IS ADDED. TAMP SOIL LIGHTLY.
7. INSPECTION OF RETENTIVE GRADING BY A LICENSED PROFESSIONAL. (25 PA. CODE §102.1 DEFINES LICENSED PROFESSIONAL AS PROFESSIONAL ENGINEERS, LANDSCAPE ARCHITECTS, GEOLOGISTS, AND LAND SURVEYORS LICENSED TO PRACTICE IN THIS COMMONWEALTH.)
8. APPLY PERMANENT VEGETATIVE STABILIZATION TO ALL DISTURBED AREAS; APPLY EROSION CONTROL MULCH BLANKET TO ALL PERMANENT SLOPES OF 3:1 OR GREATER, AND TO DITCHES OR CHANNELS THAT HAVE BEEN DISTURBED AND REQUIRE RESTORATION.
9. INSPECTION OF RESTORATION OF ALL DISTURBED AREAS BY A LICENSED PROFESSIONAL.
10. AFTER ALL UPGRADIENT DISTURBED AREAS HAVE BEEN STABILIZED WITH PERMANENT VEGETATION, REMOVE COMPOST FILTER SOCKS AND ROCK FILTERS. (REFER TO E&SC PLAN).

INVASIVE SPECIES CONTROL

PER THE RECOMMENDATIONS OF PA. DCNR, THE FOLLOWING STEPS SHOULD BE TAKEN TO HELP PREVENT THE SPREAD OF INVASIVE SPECIES:

1. THE AREA OF DISTURBANCE SHOULD BE MINIMIZED TO THE FULLEST EXTENT THAT WOULD ALLOW FOR CONSTRUCTION. THIS WILL HELP TO LESSEN THE AREA OF SOIL AND VEGETATION DISTURBANCE ASSOCIATED WITH THIS PROJECT.
2. IF POSSIBLE, CLEAN ALL CONSTRUCTION EQUIPMENT AND VEHICLES THOROUGHLY (ESPECIALLY THE UNDERCARRIAGE AND WHEELS) BEFORE THEY ARE BROUGHT ON SITE. THIS WILL REMOVE INVASIVE PLANT SEEDS FROM THE EQUIPMENT AND UNDERCARRIAGES OF THE VEHICLES THAT MAY HAVE BEEN PICKED UP AT OTHER SITES.
3. AVOID USING SEED MIXES THAT INCLUDE INVASIVE PLANT SPECIES (E.G. CROWN VETCH) TO RE-VEGETATE THE AREA. USE WEED-FREE STRAW OR HAY MIXES WHEN POSSIBLE.

SOIL LIMITATIONS

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE/STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/HYDRIC INCLUSIONS	LOW STRENGTH/ LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK-SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
BARRIEN	X	s		X		X	X		X	X		X			X	
BIRDSALL	X	c/s				X	X	X	X	X	X	X	X		X	X
CANADICE	X	s		X		X	X	X	X		X	X	X		X	X
CONOTTON	X	c/s	X	X		X	X	X	X	X	X	X				
FREDON	X	c/s	X	X		X	X	X	X		X	X				X
HALSEY	X	c/s		X	X	X	X	X	X	X	X	X				X
OTTAWA	X	c	X						X			X				
PLATEA	X	c/s		X		X	X	X	X	X		X				X
RIMER	X	c/s	X	X		X	X		X	X	X	X	X			X
WALLINGTON	X	c/s		X		X	X	X	X	X	X	X				X
WAUSEON	X	c/s				X	X	X	X	X	X	X			X	X
WAYLAND	X	s		X	X	X	X	X	X	X	X	X			X	X

PROPOSED MEASURES TO ADDRESS SOIL LIMITATIONS

1. CUTBANKS CAVE. THERE WILL BE NO EXPOSED CUTBANKS UPON COMPLETION OF THE PROJECT. THE CONTRACTOR SHALL ADHERE TO ALL OSHA REGULATIONS REGARDING EXCAVATION AND SHORING/BRACING OR SLOPING TRENCH WALLS.
2. CORROSIVE TO CONCRETE/STEEL. CONCRETE AND STEEL STRUCTURES SHALL BE DESIGNED BY THE SUPPLIER FOR DIRECT BURIAL.
3. DROUGHTY. VEGETATION MANAGEMENT AREAS HAVE BEEN ESTABLISHED TO PROTECT THE CABLES FROM DRYOUT.
4. EASILY ERODIBLE. ALL DISTURBED SURFACES WILL BE STABILIZED EITHER WITH VEGETATION TO PREVENT EROSION. SLOPES OF 3H:1V AND STEEPER WILL BE STABILIZED USING AN EROSION CONTROL MULCH BLANKET UNTIL A UNIFORM 70% VEGETATIVE COVER HAS BEEN ESTABLISHED.
5. FLOODING. FLOODING IS NOT EXPECTED TO HAVE AN ADVERSE IMPACT ON THIS PROJECT.
6. DEPTH TO SATURATED ZONE/SEASONAL HIGH WATER TABLE. SOIL BORINGS HAVE BEEN INVESTIGATED AND THE SEASONAL HIGH WATER TABLE IS NOT EXPECTED TO CAUSE PROBLEMS FOR THIS PROJECT. APPROPRIATE DEWATERING BMPS ARE PROVIDED FOR DURING CONSTRUCTION.
7. HYDRIC/HYDRIC INCLUSIONS. WETLANDS HAVE BEEN DELINEATED WITHIN THE PROJECT AREA. THE THE AREA PROPOSED FOR DEVELOPMENT ON THE SITE HAS BEEN LOCATED TO PROTECT THE DELINEATED WETLANDS.
8. LOW STRENGTH/LANDSLIDE PRONE. THE PROPOSED GRADES AND CONSTRUCTION ACTIVITIES LOCATED IN THESE AREAS ARE NOT SUBJECT TO LANDSLIDES.
9. SLOW PERCOLATION. SLOW PERCOLATION IS NOT EXPECTED TO HAVE AN ADVERSE IMPACT ON THIS PROJECT.
10. PIPING. PIPING IS NOT EXPECTED TO HAVE AN ADVERSE IMPACT ON THIS PROJECT.
11. POOR SOURCE OF TOPSOIL. THE PROJECT IS NOT DEPENDENT UPON A SIGNIFICANT DEPTH OF TOPSOIL. WHAT TOPSOIL IS AVAILABLE ON SITE WILL BE STOCKPILED AND REDISTRIBUTED ON AREAS THAT ARE TO BE SEEDED. ANY ADDITIONAL TOPSOIL THAT IS REQUIRED BEYOND WHAT IS AVAILABLE ON SITE WILL BE IMPORTED FROM A SUPPLIER.
12. FROST ACTION. THIS LIMITATION WILL NOT HAVE AN ADVERSE EFFECT ON THE PROPOSED ACTIVITY.
13. SHRINK/SWELL. THIS LIMITATION WILL NOT HAVE AN ADVERSE EFFECT ON THE PROPOSED ACTIVITY.
14. PONDING. PONDING IS NOT EXPECTED TO HAVE AN ADVERSE IMPACT ON THIS PROJECT.
15. WETNESS. WETNESS IS NOT EXPECTED TO HAVE AN ADVERSE IMPACT ON THIS PROJECT.

SEEDING SPECIFICATIONS

SPECIES:	TEMPORARY PENNDOT FORMULA E MIX (ANNUAL RYEGRASS)	GENERAL SITE (INCLUDING INFILTRATION BASINS) PENNDOT FORMULA B MIX (PERENNIAL RYEGRASS/CREEPING RED OR CHEWINGS FESCUE/KENTUCKY BLUEGRASS)
% PURITY	95	97/97/97
% GERMINATION	90	90/85/80
APPL. RATE (LB/ACRE)	48	203 TOTAL (41/60/102)

SOW SEEDS UNIFORMLY ON THE PREPARED AREAS BY HYDRAULIC PLACEMENT, BROADCASTING, DRILLING, OR HAND SEEDING METHODS. INSPECT SEEDING EQUIPMENT AND ADJUST THE EQUIPMENT, IF REQUIRED, TO ENSURE THE SPECIFIED APPLICATION RATES. PERIODICALLY PERFORM A CHECK ON THE RATE AND UNIFORMITY OF APPLICATION, AS DIRECTED. SEEDING MAY BE APPLIED MARCH 15 TO OCTOBER 15 FOR TEMPORARY; MARCH 15 – JUNE 1, AUGUST 1 – OCTOBER 15 FOR PERMANENT.

1. COMMERCIAL FERTILIZER SHALL BE 10-20-20 APPLIED AT 678 LB/ACRE AND BLENDED INTO THE TOPSOIL
2. LIMING RATE SHALL BE 1.9 TON/ACRE
3. A SLOW RELEASE NITROGEN FERTILIZER SHALL BE APPLIED TO THE SURFACE AND SHALL BE 38-0-0 UREAFORM FERTILIZER APPLIED AT 242 LB/ACRE OR 32-0-0 TO 38-0-0 SULFER COATED UREA FERTILIZER APPLIED AT 286 LB/ACRE TO 242 LB/ACRE OR 31-0-0 IBDU FERTILIZER APPLIED AT 295 LB/ACRE

MULCH SHALL BE FREE FROM NOXIOUS WEEDS, MOLD, AND OTHER DELETERIOUS MATERIALS.

1. STRAW – EITHER WHEAT OR OAT STRAW, REASONABLY FREE OF VIABLE SEED, WELL CURED TO LESS THAN 20% MOISTURE CONTENT, BY WEIGHT AND OF PROPER CONSISTENCY FOR PLACING WITH COMMERCIAL MULCH BLOWING EQUIPMENT.

2. HAY – TIMOTHY HAY, MIXED CLOVER AND TIMOTHY HAY, OR OTHER ACCEPTABLE NATIVE OR FORAGE GRASSES, WELL-CURED TO LESS THAN 20% MOISTURE CONTENT, BY WEIGHT AND OF PROPER CONSISTENCY FOR PLACING WITH COMMERCIAL MULCH BLOWING EQUIPMENT.

APPLICATION: HAY OR STRAW MULCH SHALL BE SPREAD UNIFORMLY AT THE RATE OF 3.0 TONS PER ACRE TO PRODUCE A LAYER 1.0 TO 1.5 INCHES DEEP. MULCH SHALL BE SPREAD BY HAND, BLOWER-TYPE MULCH SPREADER, OR OTHER APPROVED METHOD. MULCHING SHALL BE STARTED ON THE WINDWARD SIDE OF RELATIVELY FLAT AREAS OR ON THE UPPER PART OF STEEP SLOPES, AND CONTINUED UNIFORMLY UNTIL THE AREA IS COVERED. THE MULCH SHALL NOT BE BUNCHED OR CLUMPED. SUNLIGHT SHALL NOT BE COMPLETELY EXCLUDED FROM PENETRATING TO THE GROUND SURFACE. ALL AREAS INSTALLED WITH SEED SHALL BE MULCHED ON THE SAME DAY AS THE SEEDING. MULCH SHALL BE ANCHORED IMMEDIATELY FOLLOWING SPREADING.

PROPERLY MAINTAIN MULCHED AREAS UNTIL THE ENTIRE PROJECT HAS BEEN COMPLETED. PROMPTLY REAPPLY MULCH MATERIALS WHICH BECOME DISLODGED OR LOST DUE TO WIND, RAIN, OR OTHER CAUSES, AT INITIAL OR MODIFIED RATES, AS DIRECTED. AFTER MULCHING WORK ON A SLOPE HAS BEEN SATISFACTORILY COMPLETED, IF A SLOPE FAILURE OCCURS THAT REQUIRES REDRESSING, EXCAVATION, OR THE ESTABLISHMENT OF A NEW SLOPE, REPLACE THE SEED AND MULCH, AS DIRECTED.

DETAILS

No.	Date	Revisions	By

SITE RESTORATION PLAN

ITC LAKE ERIE CONNECTOR LLC
PENNSYLVANIA CABLE ROUTE

SCALE: AS SHOWN
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

SPRINGFIELD TWP., GIRARD TWP., CONNEAUT TWP., ERIE COUNTY, PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080715-16

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN

FOR

ITC LAKE ERIE CONNECTOR LLC
ERIE CONVERTER STATION

CONNEAUT TOWNSHIP, ERIE COUNTY, PENNSYLVANIA

PREPARED BY:

STEVEN R. HALMI, P.E.

DEISS & HALMI ENGINEERING, INC.
EDINBORO, PENNSYLVANIA

JANUARY 22, 2016

TABLE OF CONTENTS **Section**

Narrative **1**

- **1.1 Introduction**
  - **1.1.1 Purpose of Post-Construction Stormwater Management Plan**
  - **1.1.2 Overall Project Description**
  - **1.1.3 Erie Converter Station Site Description**
  - **1.1.4 Plan Preparer, Training, and Experience**
  - **1.1.5 Existing Site Description**
  - **1.1.6 Watershed Classification**
- **1.2 Soils Description and Investigation**
  - **1.2.1 Soils Data from NRCS**
  - **1.2.2 Soils Data from Onsite Investigation**
  - **1.2.3 Soil Contamination**
- **1.3 Proposed Stormwater BMPs**
  - **1.3.1 Protect Sensitive/Special Value Features**
  - **1.3.2 Protect/Conserve/Enhance Riparian Areas**
  - **1.3.3 Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design**
  - **1.3.4 Surface Infiltration/Detention Basin**
  - **1.3.5 Vegetated Swales**
- **1.4 Volume Control**
- **1.5 Peak Rate Control**
- **1.6 Water Quality**
- **1.7 Thermal Impacts**
- **1.8 Antidegradation Analysis**
- **1.9 Conveyance Facilities**
- **1.10 Sequence of Construction Activities**
- **1.11 Inspection During Construction**
- **1.12 Maintenance**
- **1.13 Conclusion**

Maps and Figures **2**

- **2.1 Location Map/USGS Quad Map**
- **2.2 Aerial Photo**
- **2.3 Overall Project Map**
- **2.4 Erie Converter Station Concept Plan**

Soils Information **3**

- **3.1 County Soils Map and Soils Information**
- **3.2 Onsite Soils Test Pit Reports**
- **3.3 Onsite Soils Infiltration Test Reports**

PaDEP NPDES Permit Worksheets 4

Worksheet 1: General Site Information
Worksheet 2: Sensitive Natural Resources
Worksheet 3: Non-Structural BMP Credits
Worksheet 4: Change in Runoff Volume 2-Year Storm Event
Worksheet 5: Structural BMP Volume Credits
Worksheet 10: Water Quality Compliance for Nitrate

Calculations 5

5.1 Existing and Proposed Watershed Drainage Areas
5.2 Pre-Development HydroCAD Output
5.3 Post-Development HydroCAD Output
5.4 Conveyance Facilities
5.5 Riparian Buffer Equivalency Demonstration

1.1 INTRODUCTION

1.1.1 Purpose of Post-Construction Stormwater Management Plan

This Post-Construction Stormwater Management Plan (PCSM Plan) is required both by the Conneaut Township Stormwater Management Ordinance (SWMO) and Pennsylvania Department of Environmental Protection (PaDEP) regulations at 25 Pa. Code Chapter 102, relating to the requirement for an NPDES Permit for Stormwater Discharges Associated with Construction Activities (NPDES Permit). Those regulations include the implementation of certain best management practices (BMPs) related to stormwater management. The Conneaut Township Supervisors, with the assistance of their appointed engineer, will review this plan for consistency with the Conneaut Township SWMO. PaDEP, with the assistance of the Erie County Conservation District (ECCD), will review this plan as part of the process for issuance of the NPDES Permit.

It is noted that a separate Erosion and Sedimentation Control Plan (E&SC Plan) has been prepared which addresses stormwater runoff management during construction.

1.1.2 Overall Project Description

The proposed Project is an approximately 72.4 mile (117 km) 1,000 megawatt (MW) +/-320 kilovolt (kV) high-voltage direct current (HVDC) bi-directional electric transmission interconnection to transfer electricity between Canada and the United States (refer to Figure 2.3). The Project will consist of one 1,000-MW HVDC transmission line and two HVDC converter stations with ancillary aboveground facilities. One converter station will be located in Canada, the other in the United States (U.S.). The HVDC transmission line consists of two transmission cables, one positively charged and the other negatively charged, along with a fiber optic cable for communications between the converter stations. The HVDC transmission line consists of underground portions in Canada and the U.S. and an underwater portion through Lake Erie, having the following approximate lengths:

- Terrestrial 500 kV AC Cable Route – Haldimand County, Ontario - 0.8 mi (1.3 km)
- Canada, Underground HVDC Cable Route - 0.8 mi (1.3 km)
- Canada, Underwater HVDC Cable Route - 29.1 mi (46.8 km)
- U.S., Underwater HVDC Cable Route - 35.4 mi (58.0 km)
- U.S., Underground HVDC Cable Route - 7.1 mi (11.4 km)
- Terrestrial 500 kV AC Cable Route – Erie County, Pennsylvania - 0.4 mi (0.7 km)

In the U.S. the cable will make landfall in Springfield Township in Erie County, Pennsylvania and will occur primarily along existing roadways to a new HVDC converter station (Erie Converter Station) to be constructed in Conneaut Township in Erie County, Pennsylvania. A conceptual plan for the Erie Converter Station is included as Figure 2.4. The Erie Converter Station will convert +/- 320 kV DC power to 345 kV AC power or vice-versa and connect to a nearby Point of Interconnection (POI) at the existing Penelec Erie West Substation and electric

transmission line that is part of the PJM Interconnection Grid [1]. The route of the 345 kV AC interconnection between the Erie Converter Station property and the Erie West Substation is approximately 1,600 feet in length.

This Post-Construction Stormwater Management Plan applies to the Erie Converter Station site in Conneaut Township, Erie County, Pennsylvania, which is further described in the following sections. A separate Site Restoration Plan has been prepared for the underground portion of the cable route in the U.S., only a portion of which is in Conneaut Township (the remainder of the cable route is in Girard and Springfield Townships).

1.1.3 Erie Converter Station Site Description

The proposed Erie Converter Station site location and layout is shown in the PCSM Plan drawings. The selected location and layout of the Erie Converter Station is intended to be close to the existing Penelec Erie West Substation, avoid unnecessary wetland effects, and minimize other environmental and community effects.

An area of approximately 6 acres (2.4 hectares) is required for the Erie Converter Station with its surrounding equipment and access ways. Approximately 2 acres (0.9 hectares) is required for construction of stormwater management facilities. Additional areas will be temporarily disturbed during construction for the laydown and to support construction efforts. The Erie Converter Station will have a main building, which will be used to house HVDC converter modules and a service building to contain the control and protection equipment, cooling equipment and auxiliary distribution panels. The main building (converter hall) will be approximately 370 feet by 110 feet (110 m by 35 m) with a building footprint of about 1 acre (0.4 hectares) and a height of approximately 60 feet (18 m) (Figure 2.4). The indoor design of the HVDC converter modules will reduce audible sound and protect the equipment from exposure. The primary equipment installed outside of the buildings is anticipated to include circuit breakers, disconnects, surge arrestors, transformers, cooling equipment, and power line carrier filters. The facility will also have an emergency generator. Security fencing will surround the Erie Converter Station area to prevent unauthorized access and to ensure public safety.

A driveway will be constructed to the Erie Converter Station to provide access to the site from nearby roadways. The driveway will be approximately 20 feet (6.1 m) wide, with a 3-foot (0.9 m) shoulder. A culvert will be installed to ensure that stormwater flow across the driveway can be conveyed without adverse impact to upstream or downstream properties.

The Erie Converter Station will interconnect with the existing electrical power systems at the nearby Erie West Substation POI through short underground AC cables.

[1] PJM Interconnection is the regional transmission organization that coordinates electricity movement in 13 U.S. states and the District of Columbia.

Other pertinent information regarding the Erie Converter Station is as follows:

Property Information:
Erie County Tax Identification Numbers: 04-005-010.0-004.00 and 04-005-010.0-003.00
Municipality: Conneaut Township, Erie County, Pennsylvania
Latitude/Longitude: N 41° 56' 12" / W 80° 22' 36"
Size: 22.84 acres (9.24 hectares) and 10.11 acres (4.09 hectares), respectively

Property Owners:

Andrew Jr. and Alice Hazer	Terry A. Lavery
409 Vesta Drive	8680 Lexington Road
Dauphin, PA 17018	Girard, PA 16417

(Note: ITC Lake Erie Connector LLC has executed option agreements to purchase these properties.)

Applicant:
ITC Lake Erie Connector LLC
27175 Energy Way
Novi, MI 48377

1.1.4 Plan Preparer, Training, and Experience

This plan has been prepared by Deiss & Halmi Engineering, Inc. Contact information for the plan preparer is as follows:

Steven R. Halmi, P.E.
Deiss & Halmi Engineering, Inc.
105 Meadville Street
Edinboro, PA 16412
Phone: (814) 734-3640
Fax: (814) 734-3643
Email: shalmi@deisshalmi.com

Mr. Halmi is a licensed professional engineer in Pennsylvania. He has a B.S. degree in Civil and Environmental Engineering from Penn State University, and a M.S. degree in Civil and Environmental Engineering from Cornell University. Formal training includes college, graduate, and post-graduate courses in hydrology and hydraulics, stormwater management, erosion and sedimentation control, environmental engineering, and other relevant subjects. Mr. Halmi has prepared numerous stormwater management plans of similar scope throughout northwestern Pennsylvania. As such, he is trained and experienced in post-construction stormwater management design methods and techniques applicable to the size and scope of the project.

Other firms participating in the preparation of this Post-Construction Stormwater Management Plan include HDR Engineering, Inc. and David Laird Associates.

1.1.5 Existing Site Description

The topographic features of the project site and the surrounding area are shown on the Stormwater Management Plan drawings. A USGS location map is included in Figure 2.1, and an aerial photo is shown in Figure 2.2. The existing land use consists of an agricultural field, with a wooded area on the western third of the property. There are wetlands in the wooded area. None of the wetlands will be disturbed, and disturbance of the wooded areas will be minimal. The site is surrounded on the north by agricultural fields, woods, and residential properties; on the west by woods; on the east by Lexington Road and agricultural fields; and on the south by woods, brush, and residential properties. The ground generally slopes south to north, and slopes range from about 1 to 8 percent. There is an existing high voltage overhead power line which crosses the southeastern corner of the property. The historical land use (past 50 years) has been similar to the current land use.

Stormwater runoff from the project location generally flows south to north as sheet flow and shallow concentrated flow. On the eastern portion of the property, there is a low area that conveys shallow concentrated flow from south to north. That shallow concentrated flow becomes a defined watercourse further as it leaves the property, which initially flows west, then north as an unnamed tributary to Crooked Creek. On the western portion of the property, runoff flows north and west as overland flow, then forms a swale in the wooded area near the northwest corner of the property. The swale forms a watercourse which flows northeast onto the adjacent property, joining with the aforementioned watercourse which flows north as an unnamed tributary to Crooked Creek.

Offsite runoff enters the property as sheet flow and shallow concentrated flow from the south. Part of that offsite runoff is intercepted in an existing poorly defined ditch along the south property line, which flows west, then north towards the swale in the wooded area. There is also a catch basin near the southeast corner of the property which collects runoff flowing north along the west side of Lexington Road. The outlet of this catch basin appears to be part of an existing agricultural drainage tile system that runs north through the eastern portion of the project property. There are no ditches along Lexington Road along the property frontage.

1.1.6 Watershed Classification

The entire converter station site is in the Crooked Creek watershed. Crooked Creek has protected uses designated at 25 Pa. Code Chapter 93 as HQ-CWF, MF (High Quality – Cold Water Fishes; Migratory Fishes). Development in a High Quality watershed requires certain special protections per the provisions of 25 Pa. Code Chapter 102, including an antidegradation analysis and requirements (see Section 1.8).

1.2 SOILS DESCRIPTION AND INVESTIGATION

1.2.1 Soils Data from NRCS

Soils on the site as mapped by the United States Department of Agriculture Natural Resource Conservation Service (NRCS) soils maps are as follows (refer to the soil map in Section 3.1.):

Symbol	Name	HSG
BdA	Birdsall silt loam, 0% to 2% slopes	D
CmB	Conotton gravelly sandy loam, moderately well drained variant, 3% to 8% slopes	B
HaA	Halsey loam, 0% to 3% slopes	C
PbB	Platea silt loam, 2% to 8% slopes	C

Hydrologic soil group (HSG) refers to a group of soils having similar runoff potential under similar storm and cover conditions, ranging from Group A, soils having a high infiltration rate (low runoff potential), to Group D, soils having a very slow infiltration rate (high runoff potential).

NRCS soils descriptions and limitations are included in Section 3.1.

1.2.2 Soils Data from Onsite Investigation

A soils investigation was performed at the site by Deiss & Halmi Engineering, Inc., on January 22, 2015. Eleven soil test pits were excavated and five infiltration tests were performed. Data from the soils investigation is presented in Section 3.2.

A general summary of the soils conditions at the site is as follows. Soils in the lower elevations along the eastern portion of the site were found to be well drained to moderately well drained, with moderate to high rates of infiltration (5 to 9 inches per hour). These soils are characterized by topsoil underlain by sandy loam and course material, without larger rocks. Groundwater in these soils was encountered at depths of about 4 to 6 feet. As the elevation begins to rise towards the west, the soils have less coarse material, less sand, and more clay, with lower depths being primarily clay. Infiltration rates at the higher elevations near the middle of the property are slow to zero. From the highest elevations near the middle of the property towards the west, the soils are poorly drained, consisting of mostly clay material, with perched groundwater at or near the ground surface. Because the soils in the western half of the property were visibly poorly drained, no infiltration testing was attempted in that area.

Based on these observations, the stormwater management concept is to construct an infiltration BMP in the low lying areas of the eastern portion of the site. Runoff from most of the developed area will be conveyed to this location. Four double-ring infiltrometer tests were conducted in this area, for which the rates are calculated in Section 3.2. The infiltration tests were performed at elevations of 837.5 to 838.8 (the elevation of the proposed infiltration/detention basin bottom will be approximately 838.0). These elevations were all at least 2 feet above the observed

groundwater table. To establish a design infiltration rate, the highest test result of over 180 inches per hour, which was performed in granular soils, is discarded as being too high to be representative of the overall infiltration BMP area. The results from the remaining three infiltration tests are averaged using a geometric mean, per the recommendation of the Pennsylvania Stormwater BMP Manual. This result is then reduced by applying a factor of safety of 3. The resulting design infiltration rate at this location is 2.26 inches per hour.

1.2.3 Soil Contamination

There are no known existing soil contamination issues on the project site.

1.3 PROPOSED STORMWATER BMPS

Stormwater BMPs will be implemented as necessary to meet the volume control and water quality requirements, and peak rate requirements of the Conneaut Township SWMO and 25 Pa. Code Chapter 102. The proposed BMPs are also designed to meet Antidegradation Best Available Combination of Technologies (ABACT) requirements for HQ watersheds (further discussed in Section 1.8). Calculations demonstrating how those requirements are met are summarized in Sections 1.4 through 1.6. A description of the proposed non-structural and structural stormwater management BMPs to be implemented at this site follows.

1.3.1 Protect Sensitive/Special Value Features

In terms of stormwater functional value, sensitive natural resources include existing waterbodies, floodplains, riparian areas, wetlands, woodlands, natural drainage ways, and steep slopes. To minimize stormwater impacts, land development should avoid affecting and encroaching upon such natural resources. The project site has been particularly selected to avoid such impacts in two main ways. First, the property on which the project is located was selected from several properties as having fewer overall sensitive natural resources. Had the development occurred on one of the other properties considered, more disturbance to sensitive natural resources would have resulted. Second, the developed area within the selected property was located to protect those sensitive natural resources. The drawings include an Existing Site Plan and Natural Resources Plan which identifies and maps sensitive natural resources, and shows how the area proposed for development avoids those resources.

1.3.2 Protect/Conserve/Enhance Riparian Areas

With limited exceptions, the Project has been located and designed to avoid disturbance within 150 feet of Crooked Creek and tributary streams within the Crooked Creek watershed. One exception occurs at the Erie Converter Station site, where a limited portion within the limit of disturbance (on the northwestern side of the Converter Station pad) lies within 150 feet of Stream SPA-KAS-029. However, in that area, none of the disturbed area that is within 150 feet

of that stream involves earth disturbance within 100 feet of any stream, wetlands, or other surface water. Thus, for this area, a riparian buffer equivalency demonstration is provided in Section 5.5, but no offsetting measures are required under Pennsylvania Act 162 of 2014, 35 P.S. §691.402(c)(2).

1.3.3 Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design

As shown on the Existing Site Plan and Natural Resources Plan, there are no watercourses having defined bed and banks on the converter station site. Avoidance of such watercourses was intentional in the selection of the converter station site. There are two natural drainage pathways on the property. One starts in the wetland area on the western portion of the property, forming a low area that flows northeast becoming the headwaters of an unnamed tributary to Crooked Creek. This natural drainage pathway will be undisturbed. The other starts at the southeast corner of the property and flows north across the property through a low lying area, until it crosses the north property line into the adjacent property. This natural drainage pathway will be used for stormwater management in such a way that the discharge across the north property line will continue to cross the property line in the same location as it does currently.

1.3.4 Surface Infiltration/Detention Basin

One surface infiltration/detention basin is proposed on the eastern portion of the site. This location for the basin was selected because soils have moderate to high infiltration rates, and the groundwater table is at least 2 feet below the bottom elevation of the proposed basin. This location is also convenient because it is lower than most of the developed area of the site, and as such stormwater conveyance channels will be able to flow by gravity to the basin.

The basin will serve both the purposes of infiltration and detention. As an infiltration basin, the basin will store and infiltrate runoff water over the relatively level surface area. As a detention basin, the basin will store runoff water temporarily until it is released through an outlet structure specially designed to meet peak rate control criteria. The basin will be surrounded by berms having sideslopes not steeper than 1 foot vertical to 3 foot horizontal. As shown on the drawings, the outlet for the infiltration/detention basin is a precast concrete catch basin with a cast iron grate, which discharges via a 15 inch corrugated plastic pipe. The inlet to the outlet structure includes a 4 inch pipe with a valve which will be normally closed, but which may be manually opened for draining the basin for maintenance.

Detailed design information is as follows:

Infiltration basin bottom area: 66,679 square feet (1.53 acres) at outlet structure overflow
Impervious area upgradient: 5.9 acres (3.9:1 loading ratio)
Total area upgradient: 17.7 acres (11.6:1 loading ratio)
Design infiltration rate: 2.26 inches per hour
Time to infiltrate 2.95 feet (depth to outlet structure overflow): 15.7 hours
Approximate groundwater elevation: 836

Bottom elevation of infiltration/detention basin: 838
Peak water surface elevation: 840.9 (refer to peak rate control calculations)
Emergency spillway crest elevation: 841.25
Top of berm elevation: 842.75

Summaries of the stage-area and stage-discharge relationships for the basin are included in Section 5.3, as are routing results. Explanations of the volume control and peak rate control functions of the infiltration/detention basin are given in Sections 1.4 and 1.5.

1.3.5 Vegetated Swales

A vegetated swale will be used on the north side of the proposed converter station to convey runoff from the developed area into the infiltration/detention basin. Vegetated swales will also be used to divert offsite runoff around the west side of the converter station site. The vegetated swales are broad, shallow, trapezoidal channels planted with dense meadow grasses. The vegetated swales are intended to slow the rate of runoff from impervious surfaces, and to allow some minor infiltration through the swale bottom. The dense vegetation and earthen bottom will settle and/or filter sediments and other pollutants in the runoff water.

Detailed calculations of the conveyance capacity of the vegetated swales are presented in Section 5.4.

1.4 VOLUME CONTROL

The volume control requirement is that the post-development total runoff volume shall not exceed the pre-development total runoff volume for all storms equal to or less than the 2-year, 24-hour storm. This is accomplished by storing the additional runoff on site and allowing it to infiltrate in the proposed infiltration/detention basin. Per the Conneaut Township SMO and the application for an NPDES Permit, PaDEP Worksheet 4 is used to calculate the volume control requirement for the project. Worksheet 4 for the Erie Converter Station site is included in Section 4.

The runoff volume calculations utilize the Soil Conservation Service (SCS) Runoff Curve Number method, as documented in USDA NRCS Technical Release 55 "Urban Hydrology for Small Watersheds" (TR-55). For the portion of the project area requiring stormwater management (the project property area less protected sensitive natural resources, as documented on PaDEP Worksheets 2 and 3) both the pre-development and post-development runoff volumes are calculated. The difference is due to the proposed impervious areas, which includes 5.54 acres for the converter station, and 0.24 acres for the site access driveway. For the purpose of this PCSM Plan, the entire fenced area of the converter station is conservatively assumed to be impervious. In reality, the converter station fenced area will consist of buildings, driveways, concrete pads, electrical equipment, and graveled yard areas, not all of which will be impervious, although the exact layout of these features within the fenced area of the converter station has yet to be finalized.

Per the Erie County Act 167 Plan, the 2-year, 24-hour storm is 2.56 inches. As required by the Conneaut Township SWMO, existing non-forested, non-gravel pervious areas must be considered meadow in good condition. As shown on Worksheet 4 in Section 4, the 2-year volume increase that must be controlled is 44,986 cubic feet. This increase in runoff volume is mitigated by the storage and infiltration capacity of the proposed infiltration/detention basin. Volume reduction calculations are as follows:

Storage volume in basin = 60,623 ft^3 (storage volume in basin below outlet structure overflow elevation 840.25; refer to infiltration/detention basin stage-storage table in Section 5.3)

Infiltration volume = 57,891 ft^3 (infiltration volume from routing of 2-year design storm through infiltration/detention basin; refer to Section 5.3)

Both the storage volume provided in the basin and the calculated infiltration volume from routing the 2-year design storm exceed the volume increase that must be controlled. Because the total volume capable of being stored and/or infiltrated by the infiltration basin exceeds the 2-year volume increase, the volume control requirement is met.

1.5 PEAK RATE CONTROL

The peak rate control requirement is that the peak rate of runoff after development must be no greater than 100 percent of the peak rate of runoff before development for the 1-, 2-, 10-, 25-, 50- and 100-year design storms. (100 percent refers to the release rate requirement for the project area, as specified in the Conneaut Township SWMO). This is accomplished by storing the additional runoff on site and allowing it to infiltrate in the proposed infiltration/detention basin, and also to discharge from the proposed infiltration/detention basin at a controlled rate using a specially designed outlet structure.

The peak rate calculations utilize the SCS Unit Hydrograph Method modeled with HydroCAD computational software. Curve number values are selected from TR-55, as appropriate for cover type and hydrologic soil group. As for the volume control calculations, the entire fenced area of the converter station is conservatively assumed to be impervious. In reality, the converter station fenced area will consist of buildings, driveways, concrete pads, electrical equipment, graveled yard areas, not all of which will be impervious, although the exact layout of these features within the fenced area of the converter station has yet to be finalized.

The times of concentration for both the pre-development and post-development conditions are calculated using the SCS Segmental Method. For the proposed fenced converter station area, the time of concentration is conservatively assumed to be 0.1 hour, which is the minimum used in the SCS procedure. Per the Erie County Act 167 Plan, the 24-hour rainfall totals for the various storm return intervals are as follows:

Return Interval (Year)	24-hour Rainfall Total (inches)
1	2.13
2	2.56
10	3.71
25	4.46
50	5.09
100	5.76

For the converter station site, peak rates of runoff are calculated separately for the drainage to the west of the site, which does not pass through the proposed infiltration/detention basin, and the drainage to the north of the site, which does pass through the proposed infiltration/detention basin. Maps of these "west" and "north" drainage areas are included in Section 5.1. These drainage areas include those offsite areas from which runoff flows into the project property. For the proposed development, runoff from the entire fenced area of the converter station will be diverted into the drainage to the north of the site, which passes through the proposed infiltration/detention basin.

A summary of the peak rate control calculations and results is as follows. Detailed HydroCAD output is included in Sections 5.2 and 5.3. (NOTE: In the following post-development results, infiltration/detention basin routing conservatively assumes zero infiltration.)

Pre-development drainage areas:

Drainage Area	Total Area (acres)	On-site Impervious Area (acres)	Curve Number	Tc (minutes)
PRE-WEST	47.30	0.00	70	49
PRE-NORTH	18.29	0.00	75	56

Post-development drainage areas:

Drainage Area	Total Area (ft^2)	On-site Impervious Area (acres)	Curve Number	Tc (minutes)
POST-WEST	41.36	0.00	69	49
POST-BASIN1	7.00	5.65	92	6
POST-BASIN2	10.67	0.29	69	46

Post-Development Infiltration/Detention Basin Routing Summary:

Storm Frequency (Year)	Peak Inflow (CFS)	Peak Discharge (CFS)	Maximum Water Surface Elevation (Feet)	Maximum Storage Volume (Ft^3)
1	16.01	0.00	839.99	44,366
2	20.47	0.04	840.26	61,337
10	32.89	2.24	840.42	72,188
25	41.29	5.79	840.57	83,179
50	48.42	8.99	840.69	92,943
100	56.05	9.22	840.88	108,982

Peak rate of runoff to WEST of site:

Return Interval (Year)	Pre-Developed Peak Discharge (CFS)	Post-Developed Peak Discharge (CFS)
1	5.38	4.02
2	10.65	8.31
10	30.20	24.68
25	45.55	37.77
50	59.45	49.67
100	74.97	63.01

Peak rate of runoff to NORTH of site:

Return Interval (Year)	Pre-Developed Peak Discharge (CFS)	Post-Developed Peak Discharge (CFS)
1	3.61	1.43
2	6.10	2.57
10	14.25	6.42
25	20.27	10.19
50	25.59	16.28
100	31.43	22.95

For all return intervals, the post-development peak discharge is less than the pre-development peak discharge for both the drainage to the west of the site and the drainage to the north of the site. As such, the peak rate control requirement is met. It is also noted that even if the basin dewatering valve is inadvertently left open, the peak rate control requirement is still met.

1.6 WATER QUALITY

The volume control design meets Control Guideline CG-1 of the Pennsylvania Stormwater BMP Manual. Over 90 percent of the developed area will be controlled by BMPs, including vegetated swales and the infiltration/detention basin. Worksheet 10 (Section 4) lists specific nitrate prevention/reduction BMPs that are used. For these reasons, in accordance with Flow Chart D in the Pennsylvania Stormwater BMP Manual, water quality compliance has been achieved.

1.7 THERMAL IMPACTS

All surface runoff from developed areas will be conveyed to the infiltration/detention basin. Because the infiltration/detention basin is anticipated to infiltrate the net increase in runoff from the 2-year, 24-hour storm, thermal impacts to downstream surface waters are expected to be negligible. Furthermore, the proposed vegetated swales will provide for cooling of runoff from impervious surfaces.

1.8 ANTIDEGRADATION ANALYSIS

For watersheds designated as High Quality (HQ), an antidegradation analysis is required to demonstrate how designated and existing water quality uses will be maintained and protected. This procedure is as follows. First, environmentally sound nondischarge BMPs must be evaluated. If the net change in stormwater discharge during or after construction is not fully eliminated by nondischarge BMPs, the applicant must utilize ABACT BMPs to manage the change. ABACT stands for Antidegradation Best Available Combination of Technologies. If it is not possible to use ABACT BMPs to achieve no net change in stormwater discharge and

assure that existing or designated surface water uses are protected, the applicant must provide Social or Economic Justification (SEJ) to demonstrate why there is an important economic or social justification for the project.

Nondischarge BMP Evaluation. The first non-discharge BMP to consider is alternative project siting such that the development does not impact HQ waters. For this project, selection of an alternative project location which completely avoids earth disturbance to the Crooked Creek watershed is not possible because the Erie West POI is itself located within the Crooked Creek watershed. It is therefore also not possible to avoid discharges into the Crooked Creek watershed. Another nondischarge BMP is the use of Low Impact Development (LID). LID is indeed proposed for this project in the form of the following BMPs, all of which are described in Section 1.3: Protect Sensitive/Special Value Features, Protect/Conserve/Enhance Riparian Areas, Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design. Protection of riparian buffers and riparian forest buffers must be evaluated as a nondischarge BMP: refer to Section 1.3.2 for this evaluation. Infiltration BMPs are also considered nondischarge BMPs. Section 1.3 describes the use of a proposed infiltration/ detention basin to infiltrate runoff to the extent practical. Another potential nondischarge BMP is water reuse. Water reuse is not proposed, since the project will not require a significant enough amount of water to warrant water reuse as a BMP (the only anticipated regular water use will be for sanitary facilities, which is expected to be very minimal).

ABACT BMPs. Because the nondischarge BMPs described above are not in themselves sufficient to manage the entire change in stormwater discharge during and after construction, ABACT BMPs are necessary. During construction, ABACT BMPs will be employed as described in the Erosion and Sedimentation Control Plan. Post-construction stormwater management utilizes the following ABACT BMPs: Infiltration Basin, Vegetated Swales. A description of these BMPs is in Section 1.3. A description of how the proposed combination of BMPs meet the volume control, peak rate control, and water quality requirements of the Conneaut Township Stormwater Management Ordinance is in Sections 1.4, 1.5, and 1.6. Because the BMPs do meet the volume control, peak rate control, and water quality requirements, the ABACT requirements of 25 Pa. Code Chapter 102 are satisfied, and existing and designated surface water uses are protected.

1.9 CONVEYANCE FACILITIES

Conveyance facilities to be constructed include Vegetated Swale #D1 and #D2, which diverts off site runoff away from the converter station site, and Vegetated Swale #C1 and #C2, which conveys runoff from the converter station site to the infiltration/detention basin. The vegetated swales are designed to convey the peak runoff from the 10-year storm event, with a minimum of 0.5 feet of freeboard, without exceeding the maximum allowable shear stress for the channel lining material. There is also a proposed culvert across the driveway. Calculations for the capacity of the vegetated swales and culvert are in Section 5.4.

The converter station fenced area will consist of buildings, driveways, concrete pads, electrical equipment, and graveled yard areas, although the exact layout of these features within the fenced

area of the converter station has yet to be finalized. Runoff from within the converter station fenced area is expected to flow as sheet flow into Vegetated Swale #C1 and #C2, which flows to the infiltration/detention basin, or to the infiltration/detention basin itself.

1.10 SEQUENCE OF CONSTRUCTION ACTIVITIES

BMP installation and removal in relation to earth disturbance activities is projected to proceed in accordance with the following relative sequence:

1. Install rock construction entrance with wash rack.
2. Install compost filter sock at the following locations:
    a. Along edge of woods near wetlands at the west end of the site.
    b. Along north property line.
    c. Upgradient of the proposed infiltration/detention basin site.
    d. Downgradient of proposed topsoil stockpile areas.
3. Protect infiltration/detention basin area from compaction and sedimentation during construction.
4. Construct construction office area, construction parking area, and construction laydown areas.
    a. Remove and stockpile topsoil; temporarily seed stockpile.
    b. Regrade, compact, and apply aggregate surfacing as necessary.
    c. Complete site access driveways, culvert, graveled areas to be used for construction office area, graveled construction parking area, and construction laydown areas.
    d. Seed and mulch main access driveway sideslopes.
5. Install weighted sediment filter tubes downgradient of diversion channel #D1 and downgradient of driveway culvert outlet.
6. Construct diversion channel #D1 and #D2 with a temporary lining.
7. Construct sediment basin.
    a. Remove and stockpile topsoil; temporarily seed stockpile.
    b. Excavate sediment basin, place and compact fill for sediment basin berm.
    c. Install sediment basin outlet structure including skimmer device and discharge pipe.
    d. Install sediment basin emergency spillway and lining.
    e. Excavate conveyance channel #C1 and construct adjacent berm.
    f. Install temporary lining within conveyance channel #C1.
    g. Apply temporary seeding to sediment basin inner and outer slopes and to conveyance channel #C1 inner and outer slopes.
8. Construction of converter station.
    a. Strip and stockpile topsoil from converter station site; temporarily seed stockpiles.
    b. Bulk excavation/grading for the converter station site.
    c. Bulk excavation for structure foundations.
    d. Installation of converter station perimeter fence.
    e. Construction of converter station buildings and other structures.

    f. Apply finished surface of aggregate over areas within converter station that have been completed.
9. Construct infiltration/detention basin.
    a. Place and compact fill for basin berms.
    b. Apply vegetative stabilization to disturbed areas of infiltration/detention basin; apply erosion control mulch blanket to all permanent slopes of 3:1 or greater.
10. Assure that all areas upgradient of sediment basin have been stabilized.
11. Dewater sediment basin.
12. Fill sediment basin. Grade area of sediment basin.
13. Convert conveyance channel #C1 to a permanent vegetated swale #C1 and #C2 with a discharge to the infiltration/detention basin. Install temporary lining in vegetated swale.
14. Construct infiltration/detention basin outlet structure.
15. Demobilize construction office areas, construction parking areas, and construction laydown areas. Remove temporary aggregate surfacing, decompact, fine grade, and revegetate.
16. Remove rock construction entrance with wash rack.
17. Apply permanent vegetative stabilization to all remaining disturbed areas; apply erosion control mulch blanket to all permanent slopes of 3:1 or greater.
18. After all remaining disturbed areas have been stabilized with permanent vegetation, remove compost filter socks and weighted sediment filter tubes.
19. Maintain stormwater BMPs according to maintenance schedule.

1.11 INSPECTION DURING CONSTRUCTION

As required by 25 Pa. Code Chapter 102, a licensed professional shall be present on site during the critical stages of construction of stormwater management facilities. The critical stages of construction are as follows:

- Pre-construction meeting
- Measures to protect infiltration/detention basin area from compaction and sedimentation during construction
- After preparation of the subgrade for the infiltration/detention basin berm, but prior to placement of berm material
- Outlet structure construction
- After final grading of the infiltration/detention basin berm and vegetated swales

1.12 MAINTENANCE

ITC Lake Erie Connector LLC, or their successor (Owner), will be responsible for all long term inspection, operation, and maintenance of stormwater facilities on the site after construction is complete. All operation, maintenance, and repair costs will be borne by the Owner. All components of the stormwater system shall be inspected at least semi-annually in the spring and the fall after a rainfall event of 1 inch or more of rainfall, or more frequently where specified herein. All components of the stormwater system shall also be inspected after any rainfall event of 2.5 inches or more regardless of the time of year. Repairs shall be made whenever the

performance of a stormwater management BMP is compromised. Specific inspection and maintenance activities are as follows:

1.12.1 Surface Infiltration/Detention Basin

- Basin surface shall be protected from compaction during construction and construction sediment with staging or through the use of erosion control measures. Basin shall be inspected after grading to confirm that clogging due to construction sediment has not occurred.
- Avoid compaction of the basin surface.
- Check the overflow spillway for damage from erosion and repair as necessary.
- Check the outlet structure for deterioration or damage, obstructions, sediment, and general operation.
- All inlets, pipes and orifices shall be kept clear from debris. Any accumulated debris shall be removed immediately from structures or pipes.
- Remove trash and debris from basin area as necessary.
- Inspect vegetation on side slopes, bottom, and overflow berms for erosion and formation of rills, gullies or bare spots; correct as needed.
- Repair any areas that do not have adequate vegetative cover.
- Inspect the area at the beginning and end of each growing season or after every rainstorm greater than 2.5 inches. If the basin fails visibly due to sustained sediment loading, or if the basin is unable to dewater in less than 72 hours, the upper soil layer should be replaced and re-vegetated.
- If compromised, basin shall be restored per specifications of originally approved plan or modified as approved by design engineer.
- If possible, avoid dumping snow onto the basin.
- Mowing should be performed using lightweight equipment to minimize compaction of the basin surface. Mow and trim vegetation only when necessary to ensure safety, aesthetics, proper operation or to suppress weeds and invasive vegetation. Mow only when area is dry to avoid rutting.
- All vehicles or equipment shall be prohibited from driving onto or across basin.
- Avoid the use of fertilizers, herbicides, and other chemical additives.
- Properly dispose of sediment, trash, or debris removed from basin.

1.12.2 Vegetated Swales

- Inspect and correct erosion problems, damage to vegetation, and sediment and debris accumulation.
- Inspect vegetation on side slopes for erosion and formation of rills or gullies; repair or replace damaged lining as needed.
- Revegetate as necessary to eliminate bare spots.
- Inspect for uniformity in cross-section and longitudinal slope, correct as needed. Vegetated swales with sediment deposition must be cleaned whenever the total channel depth is reduced by 25 percent at any location.

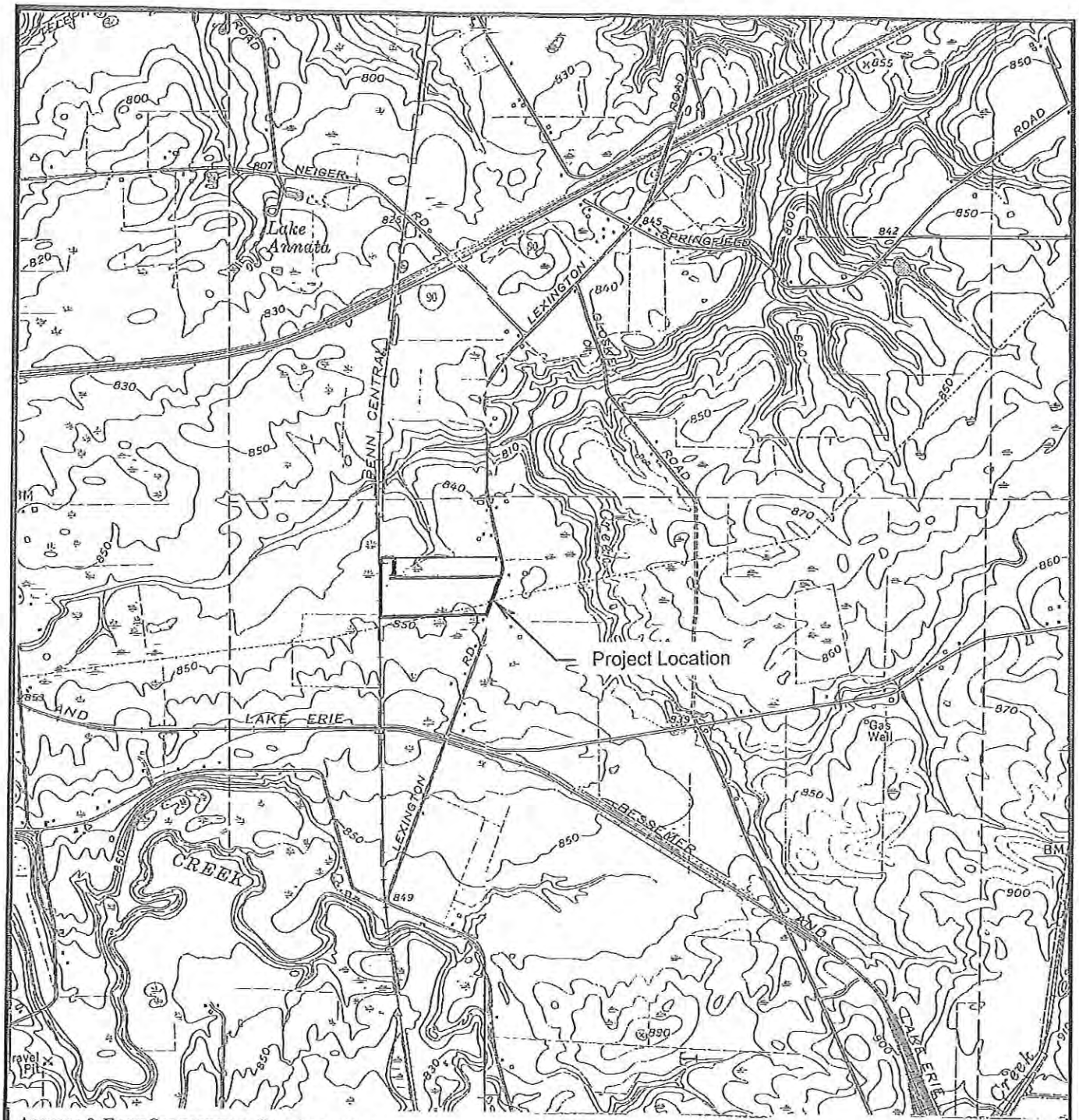
- Mow and trim vegetation only when necessary to ensure safety, aesthetics, proper operation or to suppress weeds and invasive vegetation. Mow only when area is dry to avoid rutting.
- Remove litter and trash from swales.
- Properly dispose of sediment, litter, or debris removed from vegetated swales.

1.13 CONCLUSION

This Post-Construction Stormwater Management Plan meets the requirements of the Conneaut Township Stormwater Management Ordinance and of the PaDEP at 25 Pa. Code Chapter 102, including the enhanced BMPs and ABACT requirements applicable to projects in high quality watersheds. This PCSM Plan has also been developed to be consistent with the separate Erosion and Sedimentation Control Plan for this project.

Section 2
Maps and Figures

2.1 Location Map/USGS Quad Map



ALBION & EAST SPRINGFIELD, PENNSYLVANIA
USGS 7.5 MINUTE QUADRANGLE

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING

105 Meadville Street, Edinboro PA 16412 Ph. 814.734.3640 Fax 814.734.3643

Date: 6/26/2015 Scale: 1" = 2000'

Project:

ITC Lake Erie Connector, LLC

Erie Converter Station

Conneaut Township, Erie County

Pennsylvania

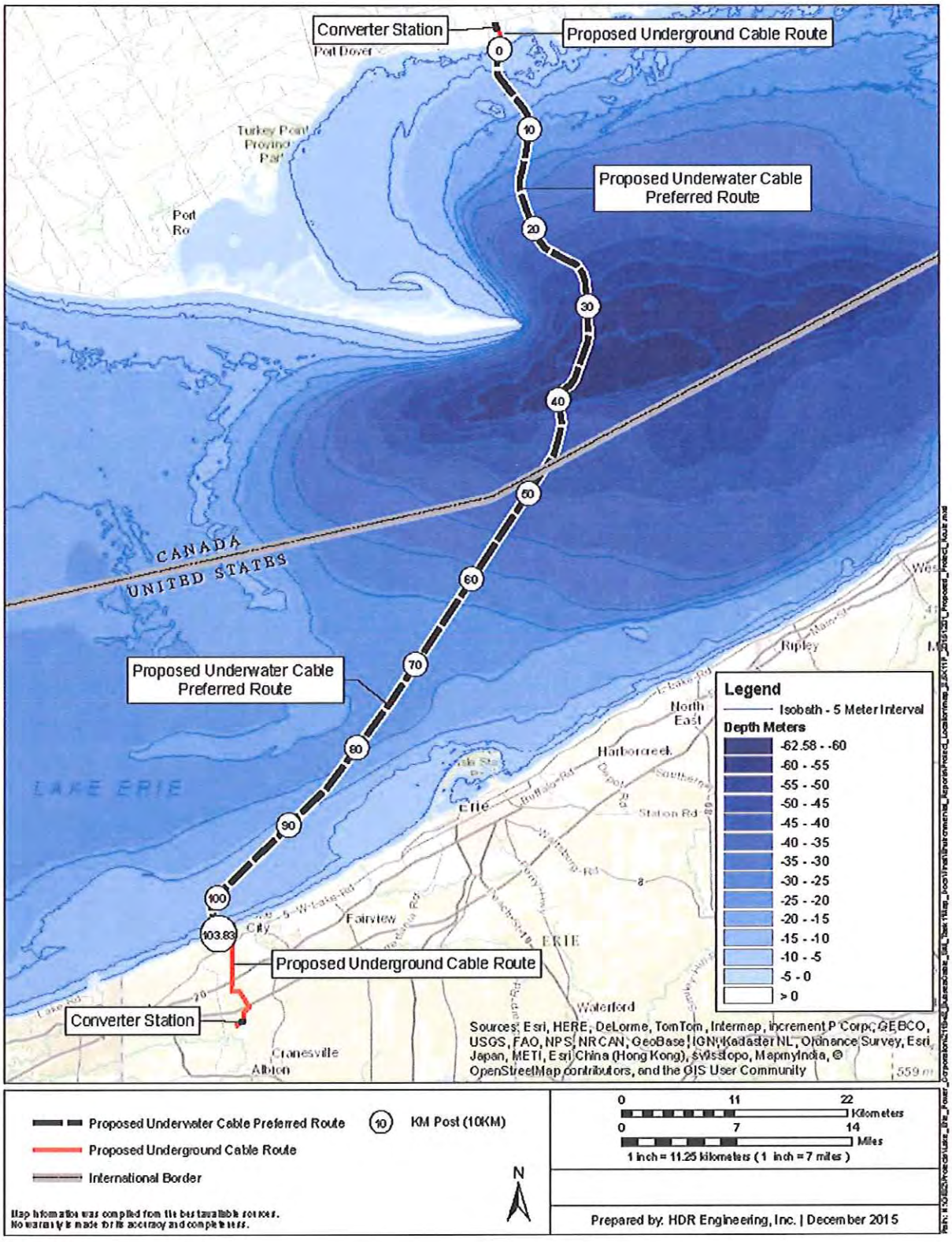
2.2 Aerial Photo

Google earth

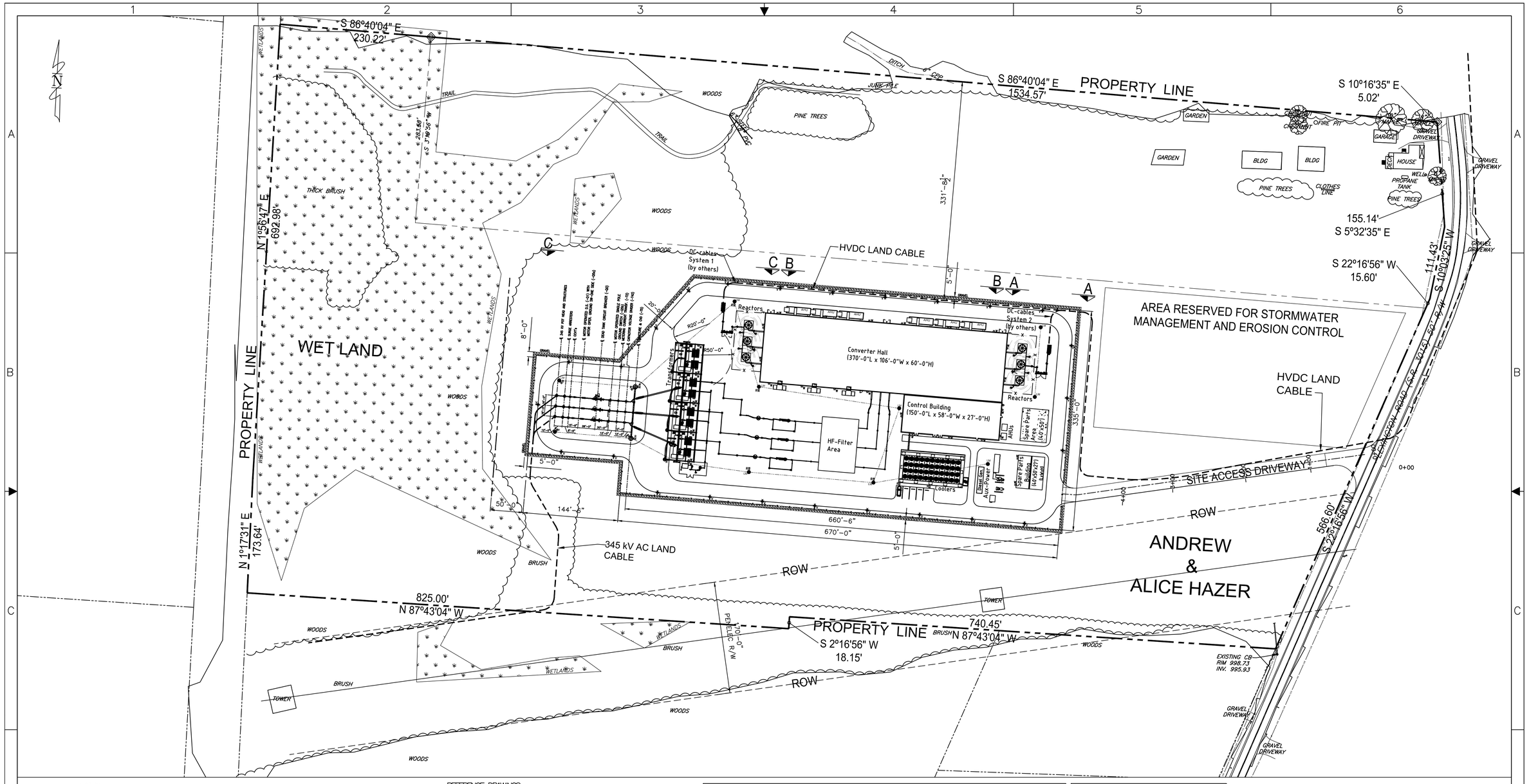
feet 1000

meters 400

2.3 Overall Project Map


Converter Station
Proposed Underground Cable Route
Port Dover
Turkey Point Provincial Park
Port Ro
Proposed Underwater Cable Preferred Route
0
10
20
30
40
50
60
70
80
90
100
103.83
CANADA
UNITED STATES
LAKE ERIE
Proposed Underwater Cable Preferred Route
Ripley
North East
Harborcreek
Erie
Fairview
ERIE
Waterford
Cranesville
Albion
Proposed Underground Cable Route
Converter Station
Legend
Isobath - 5 Meter Interval
Depth Meters
-62.58 - -60
-60 - -55
-55 - -50
-50 - -45
-45 - -40
-40 - -35
-35 - -30
-30 - -25
-25 - -20
-20 - -15
-15 - -10
-10 - -5
-5 - 0
> 0
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
559 m
Proposed Underwater Cable Preferred Route
KM Post (10KM)
Proposed Underground Cable Route
International Border
Map information was compiled from the best available sources.
No warranty is made for its accuracy and completeness.
N
0 11 22 Kilometers
0 7 14 Miles
1 inch = 11.25 kilometers (1 inch = 7 miles)
Prepared by: HDR Engineering, Inc. | December 2015

2.4 Erie Converter Station Concept Plan



NOTES:

1. EQUIPMENTS ARE REPRESENTATIVE, ACTUAL DIMENSIONS MAY CHANGE.
2. PROPERTY LINE LOCATION IS APPROXIMATED.
3. EXACT LOCATION OF THE HVDC CONVERTER STATION TO BE CONFIRM.
4. ACCESS ROAD TO THE HVDC CONVERTER STATION T.B.C. AT LATER STAGE.
5. LIGHTING WILL BE IN ACCORDANCE WITH THE IES STANDARD.

REFERENCE DRAWINGS:

LAND DEVELOPMENT PLAN
ITC LAKE ERIE CONNECTOR, LCC
ERIE CONVERTER STATION
CONNEAUT TOWNSHIP, ERIE COUNTY
PENNSYLVANIA
DRAWING No.: 2080615-3, d&h Delss & Halmi Engineering, Inc.

FIXTURE SCHEDULE

TYPE	SYMBOL	MANUFACTURER & CAT. No.	DESCRIPTION	INPUT POWER
R		HOLOPHANE RS2L-100HP-12-S-A21	100W, HPS AREA/ROADWAY POLE MOUNTED LUMINAIRE WITH MOUNT. BCKT.	120V 1PH
V		COOPER LIGHTING VXM-250HPS-480-SL-BK-PRCPR-FF-T	250W, HPS ROADWAY POLE MOUNTED AREA LUMINAIRE WITH MOUNTING BCKT.	480V 2PH
W		HOLOPHANE W4-070HP-12-C-G	70W, HPS WALLPACK IV LUMINAIRE, WALL MOUNTED.	120V 1PH

GRAPHICAL SYMBOL

PRELIMINARY
ONLY FOR QUOTATION

Rev	Date	Description	Eng	Chk	App
K	03/27/15	UPDATED AS PER SIEMENS AG ONE-LINE DIAGRAM, DWG No. EM TS 2 HVDC	M.Zurita	K.Seider	O. Macchione
J	03/05/15	BUILDINGS DIMENSIONS UPDATED	M.Zurita	K.Seider	O. Macchione
H	02/23/15	FIVE Ft OF GRAVEL ALL AROUND THE PERIMETRAL FENCE WAS ADDED	M.Zurita	K.Seider	O. Macchione
G	12/30/14	PROPERTY LINE UPDATED, HVDC FOOTPRINT RELOCATED	M. Zurita	R Munoz	O Macchione
F	11/24/14	PROPERTY LINE UPDATED, DC CABLE ROUTE CHANGED, AC SWITCHYARD UPDATED	M.Zurita	R Munoz	O Macchione
E	10/13/14	AS MARKED	M.Zurita	R Munoz	O Macchione

Rev	Date	Description	Eng	Chk	App
Q	01/25/16	REVISED FENCED AREA AND DRIVEWAY AT THE NORTHWEST CORNER	M. Zurita	R. Munoz	O.Macchione
P	11/13/15	UPDATED AS PER LAND DEVELOPM. PLAN BY h&d, ADDED LUMINARIES & FIXTURE SCH.	M. Zurita	R. Munoz	O.Macchione
N	09/14/15	ADDED BUILDINGS DIMS., UPDATED PROPERTY LINE AND CONVERTER STATION NAME	M. Zurita	R. Munoz	O.Macchione
M	05/06/15	ADDED CCVTs (A-Ph, C-Ph), UPDATED CLIENT NAME IN TITLE BLOCK	M. Zurita	R. Munoz	O.Macchione
L	04/03/15	ADDED CCVT (PHASE B)	J. Pearson	M. Zurita	R. Munoz

P. E. License

PROJ. ORDER: F-P00100 | SCALE 1"=70'-0" | FOR PROPOSAL

SIEMENS
ENERGY INC.
HIGH VOLTAGE SYSTEMS

ITC LAKE ERIE CONNECTOR LLC
Lake Erie HVDC Project
ERIE CONVERTER STATION – PA, USA
GENERAL ARRANGEMENT

DOC. NO. F-P00100-L001-01-Q | SHEET: 01 NEXT: 02 | REV Q

F-P00100-L001-01-Q

Confidential Document

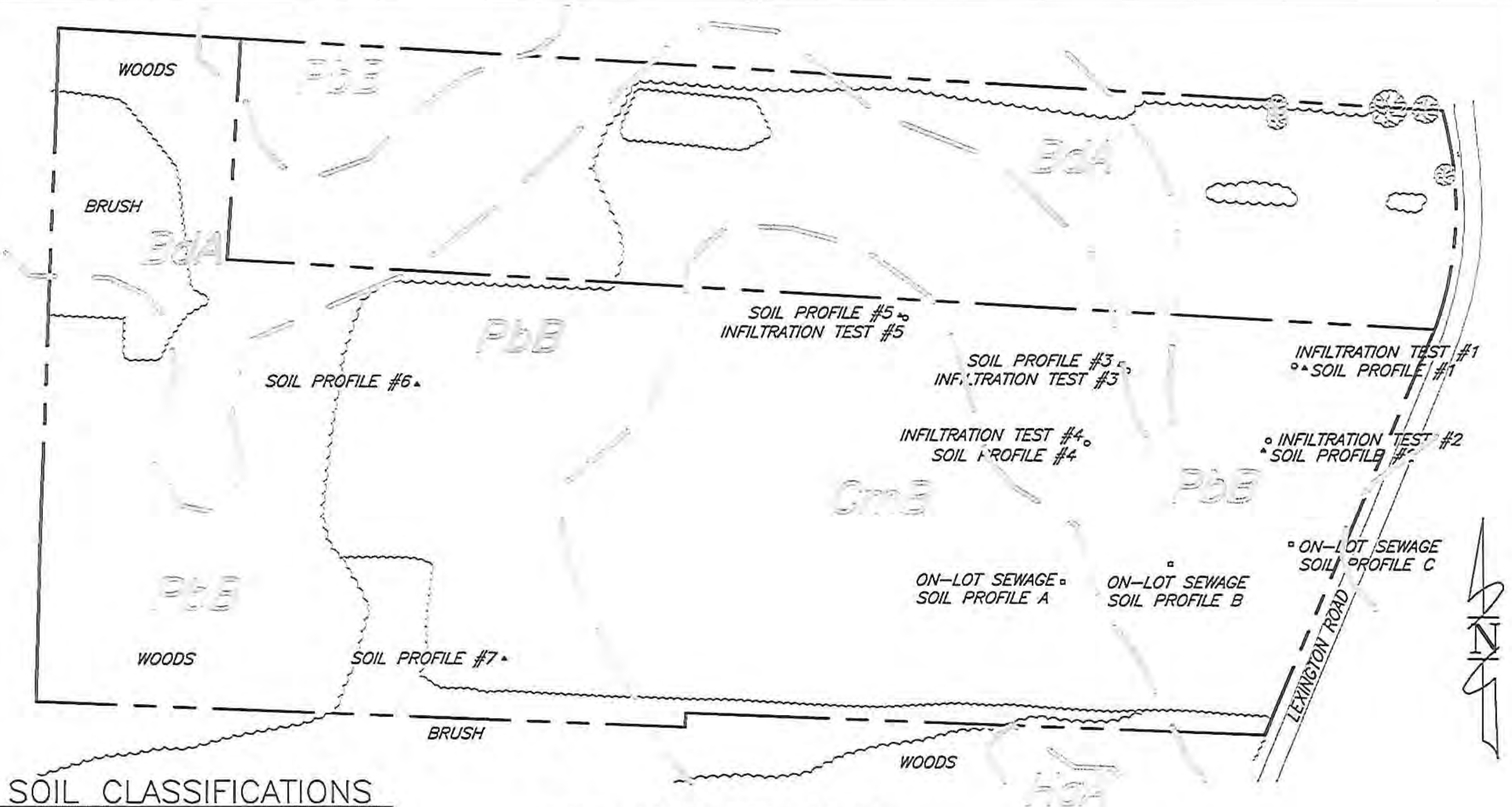
Section 3
Soils Information

3.1 County Soils Map and Soils Information

Soil types have been plotted on the site plan using shape files available on the Pennsylvania Spatial Data Access (PASDA). PASDA is the official public access geospatial information clearinghouse for the Commonwealth of Pennsylvania and has served for fifteen years as Pennsylvania's node on the National Spatial Data Infrastructure, Geospatial One-Stop, and the National Biological Information Infrastructure. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

Soil descriptions are excerpted from the 1960 "Soil Survey for Erie County Pennsylvania" prepared by the United States Department of Agriculture (USDA) Soil Conservation Service. The 1960 soil survey was used for the soil descriptions this report as the data is consistent with the soil mapping available on the PASDA database. Newer soil maps, descriptions, and limitations available from other sources such as the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey are not consistent with the data available on PASDA, limitations identified in the March 2012 Pa. DEP "Erosion and Sediment Pollution Control Manual," nor are they consistent with the soil hydrologic soil group data contained in Exhibit A of NRCS TR-55 which is the most generally accepted modeling method for stormwater management calculations. For these reasons, the PASDA and 1960 "Soil Survey for Erie County Pennsylvania" were used to maintain consistency of data.

Soil use limitations for each of the soil types identified on the site are excerpted from Appendix E of the March 2012 Pa. DEP "Erosion and Sediment Pollution Control Manual."



SOIL CLASSIFICATIONS

BdA BIRDSALL SILT LOAM, 0%-2% SLOPES.

CmB CONOTTON GRAVELLY SANDY LOAM, MODERATELY WELL DRAINED VARIANT, 3%-8% SLOPES.

HaA HALSEY LOAM, 0%-3% SLOPES.

PbB PLATEA SILT LOAM, 2%-8% SLOPES.

SOILS MAP PER NRCS

SCALE:
0 200 400 feet

ITC LAKE ERIE CONNECTOR, LLC ERIE CONVERTER STATION	DATE: 6/26/2015 SCALE: 1"=200' REV.:
CONNEAUT TOWNSHIP, ERIE COUNTY PENNSYLVANIA	DRAWN BY: JEFFREY T. BERNOSKY
Deiss & Halmi Engineering, Inc. ENVIRONMENTAL AND CIVIL ENGINEERING 105 Meadville Street, Edinboro PA 16412 Ph. 814-734-3640 Fax 814-734-3643	APPROVED BY: DRAWING No.: SOILS MAP

Soil types identified on the site are as follows:

- BdA – Birdsall Silt Loam, HSG D
- CmB – Conotton Gravelly Sandy Loam, Moderately Well Drained Variant, HSG B
- HaA – Halsey Loam, HSG C
- PbB – Platea Silt Loam, HSG C

The location and boundaries of the mapped soil types in the project area are shown on the drawings. Representative profiles of the soil types present at the site are as follows (adapted from the USDA SCS, Official Series Description):

Birdsall silt loam (BdA): This is a deep, very poorly drained to poorly drained soil derived from lacustrine deposits of glacial origin. The following profile is representative of this soil:

0 to 10 inches	Very dark grayish-brown silt loam; moderate, fine, granular structure; friable when moist; pH 5.4; diffuse, smooth lower boundary
10 to 18 inches	yellowish-brown silt loam with many, fine, distinct mottles of grayish brown; moderate, medium, granular structure; friable when moist; pH 5.4; clear, smooth lower boundary
18 to 26 inches	yellowish-brown silty clay loam with common, coarse, distinct mottles of grayish brown; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and sticky when wet; pH 6.0; gradual, smooth lower boundary
26 to 36 inches	dark grayish-brown silty clay loam with common medium, distinct mottles of yellowish brown; weak, medium, subangular blocky structure; hard when dry, firm when moist, and nonsticky when wet; pH 6.4

Connotton moderately well drained variants (CmA): This is a deep, moderately well-drained, moderately coarse textured to medium textured soil derived from acid shale bedrock and from sandstone and granite of glacial origin sorted and deposited by wave action. The soils have a firm, compact layer that is moderately permeable to air and water. The following profile is representative of this soil:

0 to 7 inches	dark-brown gravelly sandy loam; weak, coarse, granular structure; friable when moist; contains about 25% gravel; pH 5.6; abrupt, smooth lower boundary

7 to 12 inches reddish-brown coarse sandy loam; moderate, coarse, granular structure; friable when moist; pH 6.0; gradual, smooth lower boundary

12 to 20 inches yellowish-red coarse sandy loam; moderate, medium, subangular blocky structure; friable when moist; pH 6.0; clear, wavy lower boundary

20 to 28 inches dark-brown coarse sandy loam; moderate, thick, platy structure; friable when moist; pH 5.8; clear, wavy boundary

28 to 33 inches dark grayish-brown coarse sandy loam with common, fine, distinct mottles of light olive brown and strong brown; strong, coarse, subangular blocky structure; hard when dry, firm when moist; pH 5.6; clear, wavy lower boundary

33 to 72 inches+ dark-brown loamy, sandy gravel; stratified; single grain (structureless); friable when moist; pH 6.0; contains more than 45 percent gravel

Halsey Series (HaA): The Halsey soils are deep and are very poorly drained. They occur in depressions on the gravelly beach ridges along the lake plain and also on gravelly outwash terraces along stream valleys in the upland. The parent material consisted of alternate layers of sand, silt, and gravel mixed with some clay. It was derived from acid shale bedrock and sediments of sandstone and granite of glacial origin. This material was sorted and deposited by water.

0 to 7 inches very dark grayish-brown loam; moderate, fine, granular structure; friable when moist; pH 5.8; gradual, smooth lower boundary

7 to 12 inches dark-brown silt loam with many, medium, distinct mottles of strong brown; moderate, coarse, granular structure; friable when moist; pH 6.0; clear, smooth lower boundary

12 to 15 inches very dark grayish-brown silty clay loam with many, medium, distinct mottles of gray and dark reddish brown; strong, medium, granular structure; friable when moist, slightly sticky when wet; pH 5.8; abrupt, smooth lower boundary

15 to 25 inches grayish-brown silt loam with many, coarse, distinct mottles of dark brown; moderate, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.2; gradual, smooth lower boundary.

25 to 30 inches yellowish-brown loam with many, coarse, distinct mottles of gray; weak, medium, subangular blocky structure; friable when moist, slightly sticky when wet; pH 6.6; gradual, smooth lower boundary.

30 to 42 inches + variegated brownish-yellow and dark yellowish-brown, stratified loamy sand to sandy loam; single grain (structureless) to weak, medium, subangular blocky structure; friable when moist; pH 7.0

Platea silt loam (PbB): The Platea series consists of deep, somewhat poorly drained soils on the upland. The parent material was silty glacial till containing a few rounded pebbles of granite and sandstone. Moderately well drained variants of the Platea series occupy sites having favorable internal drainage.

0 to 8 inches dark-brown silt loam; weak, fine, granular structure; friable when moist; pH 4.8; clear, wavy lower boundary.

8 to 15 inches brown silt loam with common, medium, distinct mottles of light brownish gray and strong brown; compound structure—weak, medium, platy and weak, medium, subangular blocky; friable when moist, nonplastic when wet; pH 4.8; clear, wavy lower boundary.

15 to 28 inches yellowish-brown silt loam with common, medium, distinct mottles of gray and strong brown; moderate, medium, blocky structure; hard when dry, firm when moist, and slightly plastic when wet; pH 5.6; clear, irregular lower boundary.

28 to 38 inches dark yellowish-brown silt loam with common, coarse, distinct mottles of gray and dark brown; very coarse prisms that break to moderate, medium, blocky or platy structure; thick coating of clay on the structural units; hard when dry, firm when moist, and slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.

38 to 48 inches dark-brown silt loam with medium, distinct, mottles of gray; very coarse prisms that break to moderate, medium, platy structure; thick coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 5.8; gradual, wavy lower boundary.

48 to 60 inches dark yellowish-brown silt loam with a few, medium, distinct mottles of gray; very coarse prisms that break to moderate, medium, platy structure; distinct, thin coating of clay on the structural units; firm when moist, slightly plastic when wet; pH 6.8; gradual, wavy lower boundary.

60 to 80 inches olive-brown silt loam; moderate, thick, platy structure; firm when moist, slightly plastic when wet; pH 7.2.

Soil Name	Cutbanks Cave	Corrosive to Concrete/Steel	Droughty	Easily Erodible	Flooding	Depth to Saturated Zone/ Seasonal High Water Table	Hydric/Hydric Inclusions	Low Strength/ Landslide Prone	Slow Percolation	Piping	Poor Source of Topsoil	Frost Action	Shrink-Swell	Potential Sinkhole	Ponding	Wetness
Birdsall	X	c/s				X	X	X	X	X	X	X	X		X	X
Conotton	X	c/s	X	X		X	X	X	X	X	X	X				
Halsey	X	c/s		X	X	X	X	X	X	X	X	X				X
Platea	X	c/s		X		X	X	X	X	X		X				X

Summary of soil limitations

Proposed measures to address soil limitations:

1. Cutbanks Cave. There will be no exposed cutbanks upon completion of the project. The contractor shall adhere to all OSHA regulations regarding excavation and shoring/bracing or sloping trench walls.

2. Corrosive to Concrete/Steel. Concrete and steel structures shall be designed by the supplier for direct burial.

3. Droughty. This limitation will not have an adverse effect on the project.

4. Easily Erodible. All disturbed surfaces will be stabilized either with asphalt, or with well-established vegetation to prevent erosion. Slopes of 3H:1V and steeper will be stabilized using an erosion control mulch blanket until a uniform 70% vegetative cover has been established.

5. Flooding. The area of the proposed project has been investigated and is not subject to flooding.

6. Depth to Saturated Zone/Seasonal High Water Table. Various test pits have been dug on the property to identify the seasonal high water table. Structural stormwater BMPs will be designed taking the limiting zone into consideration.

7. Hydric/Hydric Inclusions. Wetlands have been delineated within the project area. The area proposed for development on the site has been located to protect the delineated wetlands.

8. Low Strength/Landslide Prone. The proposed grades and construction activities located in these areas are not subject to landslides.

9. Slow Percolation. Infiltration testing has been completed at various locations on the site. Stormwater management features have been designed taking the infiltration rate into account. The site is graded to avoid ponding, except in the stormwater management area.

10. Piping. Berms shall be constructed of acceptable material that is not susceptible to piping.

11. Poor Source of Topsoil. The project is not dependent upon a significant depth of topsoil. What topsoil is available on site will be stockpiled and redistributed on areas that are to be seeded. Any additional topsoil that is required beyond what is available on site will be imported from a supplier.

12. Frost Action. This limitation will not have an adverse effect on the proposed activity.

13. Shrink/Swell. This limitation will not have an adverse effect on the proposed activity.

14. Ponding. The project site has been investigated and sufficient topography exists such that ponding on the site is not a concern. Stormwater management features have been designed taking this limitation into account. The site is graded to avoid ponding, except in the stormwater management area.

15. Wetness. The project site has been investigated and sufficient topography exists such that wetness on the site is not a concern.

3.2 On-site Soils Test Pit Reports

Several soil investigation test pits were excavated at various locations on the project site as shown on the Drawings. Each soil horizon was identified and described using the methods employed by the Pa. DEP for soil investigations for on-lot disposal of sewage. The description for each horizon includes the horizon depth, soil color (as determined using a Munsell Soil Color Chart), texture, structure, indications of mottling, masses of loose fragments. The limiting zone (high water table) was also identified for each test pit.

Infiltration tests were performed adjacent to those soil investigation test pits that had adequately deep limiting zones and soil textures and structures that would support infiltration. The locations and depths of infiltration test sites are shown on the drawings. A double ring infiltrometer was used to measure the vertical movement of water through the bottom of the test area. A double ring infiltrometer consists of two concentric metal rings. The rings are driven into the ground and filled with water. The outer ring helps to prevent divergent (horizontal) flow. The drop in water level over time in the inner ring is used to calculate an infiltration rate.

Abbreviations

BOUNDARY DISTINCTNESS

Abrupt A	Clear C	Gradual G	Diffused D

COARSE FRAGMENT MODIFIER

Gravelly	GR	Very gravelly	VGR	Extremely gravelly	EGR
Cobbly	CB	Very cobbly	VCB	Extremely cobbly	ECB
Channery	CH	Very channery	VCH	Extremely channery	ECH
Flaggy	FL	Very flaggy	VFL	Extremely flaggy	EFL
Stony	ST	Very stony	VST	Extremely stony	EST
Bouldery	BD	Very boulder	VBD	Extremely boulder	EBD

TEXTURAL CLASS

Sand – S	Coarse sand – COS	Fine sand – FS
Very fine sand – VFS	Loamy sand – LS	Loamy coarse sand – LCOS
Loamy fine sand – LFS	Loamy very fine sand – LVFS	Sandy loam – SL
Coarse sandy loam – COSL	Fine sandy loam – FSL	Very fine sandy loam – VFSL
Loam – L	Silt loam – SIL	Silt – SI
Sandy clay loam – SCL	Clay loam – CL	Silty clay loam – SICL
Sandy clay – SC	Clay – C	Silty clay - SIC

STRUCTURE

Grade:	Structureless	0	Shape:	Granular	GR
	Weak	1		Platy	PL
	Moderate	2		Subangular blocky	SBK
	Strong	3		Angular blocky	ABK
				Prismatic	PR
				Massive	MA
				Single grain	SG

MOIST CONSISTENCE

Loose	LO
Very friable	VFR
Friable	FR
Firm	FI
Very firm	VFI
Extremely firm	EFI

REDOX FEATURES

Abundance:	Few	F	Contrast:	Faint	F
	Common	C		Distinct	D
	Many	M		Prominent	P

GRADE

M	Massive	1	Weak	3	Strong
SG	Single Grain	2	Moderate		

SIZE

vf	very fine	vc	Very course	c	very course
m	medium	f	fine		

BOUNDARY

a	abrupt	c	clear	g	gradual	d	difuse
s	smooth	w	wavy	I	irregular	b	broken

ER-BWQ-290 Appendix A
Revised 5-07

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. N/A Municipality Conneaut Twp. County Erie
Site Location Lexington Road, 1/2 m. North of RR Subdivision Name
☐ SUITABLE Soil Type LamB Slope ____% Depth to Limiting Zone 52" Ave. Perc. Rate ____
☐ UNSUITABLE ☐ Mottling ☒ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments
☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tighe SEO# 2269 Date: 1/22/15

Inches			Description of Horizon
0	TO	9"	10YR 3/4; SL; SG; m; G-R; fr; 0-15% gravelly; a; S; Plowline
9	TO	16"	10YR 3/4; SL; 1; vf; SBK; fr; 0-15% gravelly; c; S
16"	TO	31"	10YR 3/1; SL; SG; c; GR; lo; 15-35% gravelly; g; i
31"	TO		
31"	TO	52"	10YR 4/3; S; SG; c; G-R; lo; 35-60% gravelly d; i
	TO		
52"	TO	59"	Seeped water to 52" no other Data
	TO		
	TO		
	TO		
	TO		
	TO		
	TO		

Depth to Limiting Zone: 52 Inches

Pit # 1

ER-BWQ-290 Appendix A
Revised 5-87

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. N/A Municipality Conneaut County Erie
Site Location Lexington Rd 1/2 m. North of R.R. Tracks Subdivision Name _____
☐ SUITABLE Soil Type ConB Slope ____ % Depth to Limiting Zone 48 (10") Ave. Perc. Rate ____
☐ UNSUITABLE ☐ Mottling ☒ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments
☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tighe SEO # 2269 Date: 1/22/15

Inches			Description of Horizon
0	TO	10"	10YR 4/2, SL, SG, M, GR, fr, a, s (Plow line)
10"	TO	14"	10YR 5/4, CL, Z, f, SBK, vfi, c, s
____	TO	____	Few, Fine, faint iron mottles
14"	TO	34"	10YR 5/4, CL, Z, f, SBK, vfi, g, w
____	TO	____	Many, Coarse, Distinct mottles (iron)
34"	TO	48"	10YR 5/4, LCOS, SG, c, GR, lo, 35-60% gravelly
____	TO	____	g, l did not observe mottling
48	TO	52"	Water seeps in to 48"
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	

Depth to Limiting Zone: 48, (10") Inches

Soil Pit #2

ER-BWQ-290 Appendix A
Revised 5-07

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. _____ Municipality Conneaut County Erie
Site Location Lexington Rd. 1/2 M. North of R.R. Tracks Subdivision Name _____
☐ SUITABLE Soil Type PbB Slope ____% Depth to Limiting Zone 11" Ave. Perc. Rate ____
☐ UNSUITABLE ☒ Mottling ☐ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments
☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tight Date: 1/22/15

Inches			Description of Horizon
0	TO	11"	10YR 4/3, SiCL, 2, m, SBK, fr, 0-15% gravelly
____	TO	____	a, s, Plowing at 11"
11"	TO	20"	10YR 5/3, SiCL, 2, m, SBK, fr, 0-15%
20"	TO	____	gravelly, c, s. few Faint iron, gray mottles
20"	TO	62"	10YR 6/2, CL, 2, f, SBK, fr, c, w,
____	TO	____	Red, gray common, Medium, Distinct mottles
62"	TO	____	Gley 1 6/N, Cl, M, vf, SBK, efi, c, w,
____	TO	____	Greying present.
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	

Depth to Limiting Zone: 11 Inches

Pit #3

ER-BWQ-290 Appendix A
Revised 5-87

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. _____ Municipality Conneaut County Erie

Site Location Lexington Rd. 1/2 M. North of R.R. Tracks Subdivision Name _____

☐ SUITABLE Soil Type _____ Slope _____ % Depth to Limiting Zone 35" Ave. Perc. Rate _____

☐ UNSUITABLE ☒ Mottling ☐ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments

☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tighe Date: 1/22/15

Inches			Description of Horizon
0	TO	12"	10YR 4/2, SiCL, SG, m, G-R, fr, G, S, (Plow line)
12"	TO	24"	10YR 5/6, SiCL, 1., m, G-R, fr, 0-15% gravelly, C, W
___	TO	___	
24	TO	35"	10YR 4/4, LS, SG, m, GR, lo, g, i
35	TO	39"	10YR 5/4, CL, 1., vf, SBK, fi, g, i
___	TO	___	many course distinct red mottles
39"	TO	58"	10YR 5/4, SCL, SG, c., GR, lo, C, W
___	TO	___	Has few fine faint gray mottles in Sand
58"	TO	68"	10YR 5/4 COS, SG, vc., GR, Lo, 35-60% Gravelly
___	TO	___	g, i, very porous
68"	TO	76"	10YR 5/2, CL, 1., vf, SBK, vfi, ss, g, i,
___	TO	___	couldn't see if mottling was present
76"	TO	___	CL, gleying was present

Depth to Limiting Zone: 35 Inches

Pit # 4

ER-BWQ-290 Appendix A
Revised 5-87

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. _____ Municipality Conneaut County Erie

Site Location Lexington Rd. 1/2 m. north of R.R. Track Subdivision Name _____

☐ SUITABLE Soil Type _____ Slope 14 % Depth to Limiting Zone 14" Ave. Perc. Rate _____

☐ UNSUITABLE ☒ Mottling ☐ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments

☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:

Soils Description Complete by: M. Tighe Date: 1/22/15

Inches			Description of Horizon
0	TO	14"	10YR 3/3, Si, 1, m, SBK, fr, c, s
14"	TO	24"	10YR 5/1, CL, 1, f, SBK, fr, g, l, 3" line of Stratified Clay (fill) mottles 14"
____	TO	____	
24"	TO	33"	10YR 5/2, CL, 1, vf, SBK, vfr, c, w,
____	TO	____	many prominent iron mottles
33"	TO	41"	10YR 5/2, SCL, SG, m, GR, lo, c, w – Fine Sand
41"	TO	50"	10YR 5/3, CL, 1, f, SBK, fr, c, w, iron mottles
50"	TO	62"	10YR 5/3 CL, 2, vf, SBK, fi, vs, c, s
62"	TO	81"	10YR 5/3 CL, 1, f, SBK, vfi, s, c, w
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	

Depth to Limiting Zone: 14 Inches

pit # 5

ER-BWQ-290 Appendix A
Revised 5-07

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. _____ Municipality Conneaut County Erie

Site Location Lexington Rd. 1/2 m. North of RR track Subdivision Name _____

☐ SUITABLE Soil Type _____ Slope _____% Depth to Limiting Zone 14" Ave. Perc. Rate _____

☐ UNSUITABLE ☒ Mottling ☐ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments

☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tighe Date: 1/22/15

Inches			Description of Horizon
0	TO	11"	10YR 4/3, SCL, 1, m, SBK, fr, c, s
11"	TO	18"	10YR 4/6, CL, 1, f, SBK, fr, c, w
____	TO	____	Common, Medium, Distinct red mottles
18"	TO	27"	10YR 6/4, SiCL, 2, vf, SBK, fr - some sand
27"	TO	38"	10YR 6/4, SiCL, 2, vf, SBK, fi
38"	TO	46"	10YR 6/4, CL, 2, vf, SBK, fi - some sand
46"	TO	72"	10YR 6/4, CL, 2, vf, SBK, fi - all clay
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	
____	TO	____	

Depth to Limiting Zone: 14" Inches

Pit # 6

ER-BWQ-290 Appendix A
Revised 5-07

SITE INVESTIGATION AND PERCOLATION TEST REPORT FOR ON-LOT DISPOSAL OF SEWAGE

Application No. _____ Municipality Conneaut County Erie

Site Location Lexington Rd. 1/2 m North of RR tracks Subdivision Name _____

☐ SUITABLE Soil Type Bdf Slope ____ % Depth to Limiting Zone 7" Ave. Perc. Rate ____

☐ UNSUITABLE ☒ Mottling ☐ Seeps or Ponded Water ☐ Bedrock ☐ Fractures ☐ Coarse Fragments
☐ Perc. Rate ☐ Slope ☐ Unstabilized Fill ☐ Floodplain ☐ Other _____

INSTRUCTIONS FOR COMPLETION OF THIS FORM ARE LOCATED ON THE REVERSE

SOILS DESCRIPTION:
Soils Description Complete by: M. Tighe Date: 1/22/15

Inches			Description of Horizon
0	TO	7"	10YR 3/3, CL, 1, M, SBK, fr, SS, C, W
____	TO	____	few, faint, red mottles
7"	TO	20"	10YR 4/1, CL, 1, f, SBK, fr, SS, C, W
____	TO	____	Common, coarse, prominent red mottles
____	TO	____	throughout rest of Horizons
20"	TO	28"	10YR 4/1, CL, 2, f, SBK, fr, S, C, W
28"	TO	36"	10YR 4/3, CL, 1, f, SBK, vfr, S, C, W
36"	TO	46"	10YR 4/4, CL, 1, f, SBK, fr, SS, 0-15%
____	TO	____	gravelly, C, W
46"	TO	72"	10YR 4/3, CL, 1, vf, SBK, fr, S, C, W
____	TO	____	
____	TO	____	
____	TO	____	

Depth to Limiting Zone: 7" Inches

Pit #7

3.3 On-site Soils Infiltration Test Reports

Several soil investigation test pits were excavated at various locations on the project site as shown on the Drawings. Each soil horizon was identified and described using the methods employed by the Pa. DEP for soil investigations for on-lot disposal of sewage. The description for each horizon includes the horizon depth, soil color (as determined using a Munsell Soil Color Chart), texture, structure, indications of mottling, masses of loose fragments. The limiting zone (high water table) was also identified for each test pit.

Infiltration tests were performed adjacent to those soil investigation test pits that had adequately deep limiting zones and soil textures and structures that would support infiltration. The locations and depths of infiltration test sites are shown on the drawings. A double ring infiltrometer was used to measure the vertical movement of water through the bottom of the test area. A double ring infiltrometer consists of two concentric metal rings. The rings are driven into the ground and filled with water. The outer ring helps to prevent divergent (horizontal) flow. The drop in water level over time in the inner ring is used to calculate an infiltration rate.

DOUBLE RING INFILTROMETER TEST

CALCULATIONS AND RESULTS

Prepared by: Andrew Halmi
Deiss & Halmi Engineering, Inc.

Test date: 1/22/2015
Report date: 1/23/2015

Project: Lake Erie Power Converter Station

Location: Test Pit #1 - Northeast portion of stomwater management area

	Depth (inches)	Elevation
Ground Surface:	0	995.85
Test Location:	26	993.68
Limiting Zone:	N/A	

Inner Ring Diameter (in): 6
Outer Ring Diameter (in): 12

Inner Ring

Time (hours)	Elapsed Time (hour:min)	Drop (in)	Infiltration Rate (inches/hour)
9:49 AM	0:00	N/A	Presoak
	0:02	6.000	180.00
	0:04	6.250	187.50
	0:06	6.000	180.00
	0:08	6.500	195.00
	0:10	6.500	195.00
	0:12	6.125	183.75
	0:14	5.875	176.25
	0:16	6.125	183.75

Summary

- Infiltration rate: 183.75 inches per hour

Comments

2 minute time intervals used due to rapid infiltration.
.5 hour presoak used because of rapid infiltration and moist soil

DOUBLE RING INFILTROMETER TEST

CALCULATIONS AND RESULTS

Prepared by: Andrew Halmi
Deiss & Halmi Engineering, Inc.

Test date: 1/22/2015
Report date: 1/23/2015

Project: Lake Erie Power Converter Station

Location: Test Pit #2 - Southeast portion of stomwater management area

	Depth (inches)	Elevation
Ground Surface:	0	995.33
Test Location:	13	994.25
Limiting Zone:	N/A	

Inner Ring Diameter (in): 12
Outer Ring Diameter (in): 24

Inner Ring

Time (hours)	Elapsed Time (hour:min)	Drop (in)	Infiltration Rate (inches/hour)
10:14 AM		N/A	Presoak
11:01 AM		N/A	refill
11:11 AM	0:10	1.375	8.25
11:13 AM	0:59		refill
11:23 AM	1:09	1.938	11.63
11:27 AM	1:13		refill
11:37 AM	1:23	1.500	9.00
11:38 AM	1:24		refill
11:48 AM	1:34	1.500	9.00
11:49 AM	1:35		refill
11:59 AM	1:45	1.250	7.50
12:00 PM	1:46		refill
12:10 PM	1:56	1.625	9.75
12:11 PM	1:57		refill
12:21 PM	2:07	1.438	8.63
12:22 PM	2:08		refill
12:32 PM	2:18	1.500	9.00

Summary

- **Infiltration rate: 9.0 inches per hour**

Comments

10 minute time intervals used

.5 hour presoak used because of lack of water and moist soils

DOUBLE RING INFILTROMETER TEST

CALCULATIONS AND RESULTS

Prepared by: Andrew Halmi
Deiss & Halmi Engineering, Inc.

Test date: 1/22/2015
Report date: 1/23/2015

Project: Lake Erie Power Converter Station

Location: Test Pit #3 - Northwest portion of stomwater management area

	Depth (inches)	Elevation
Ground Surface:	0	995.00
Test Location:	0	995.00
Limiting Zone:	N/A	

Inner Ring Diameter (in): 6
Outer Ring Diameter (in): 12

Inner Ring

Time (hours)	Elapsed Time (hour:min)	Drop (in)	Infiltration Rate (inches/hour)
10:30 AM	0:00	N/A	Presoak
11:00 AM	0:30		refill
11:30 AM	1:00	3.875	7.75
11:31 AM	1:01		refill
12:01 PM	1:31	4.000	8.00
12:04 PM	1:34		refill
12:35 PM	2:05	3.750	7.26
12:36 PM	2:06		refill
1:06 PM	2:36	3.438	6.88
1:36 PM	3:06	3.438	6.87
2:06 PM	3:36	3.438	6.87
2:36 PM	4:06	3.250	6.50
3:06 PM	4:36	3.313	6.62

Summary

- **Infiltration rate: 6.62 inches per hour**

Comments

30 minute time intervals used
Test stabilized at 0.875 inches/hour

DOUBLE RING INFILTROMETER TEST

CALCULATIONS AND RESULTS

Prepared by: Andrew Halmi
Deiss & Halmi Engineering, Inc.

Test date: 1/22/2015
Report date: 1/23/2015

Project: Lake Erie Power Converter Station

Location: Test Pit #4 - Southwest portion of stomwater management area

	Depth (inches)	Elevation
Ground Surface:	0	998
Test Location:	46	994.17
Limiting Zone:	N/A	

Inner Ring Diameter (in): 6
Outer Ring Diameter (in): 12

Inner Ring

Time (hours)	Elapsed Time (hour:min)	Drop (in)	Infiltration Rate (inches/hour)
11:36 AM	0:00	N/A	Presoak
12:09 PM	0:33		Refill
12:19 PM	0:43	0.813	4.88
12:20 PM	0:44		Refill
12:30 PM	0:54	0.875	5.25
12:30 PM	0:54		Refill
12:40 PM	1:04	0.875	5.25
12:41 PM	1:05		Refill
12:51 PM	1:15	0.813	4.88
12:51 PM	1:15		Refill
1:01 PM	1:25	0.875	5.25
1:01 PM	1:25		Refill
1:11 PM	1:35	0.875	5.25
1:11 PM	1:35		Refill
1:21 PM	1:45	0.875	5.25
1:22 PM	1:46		Refill
1:32 PM	1:56	0.875	5.25

Summary

- **Infiltration rate: 5.25 inches per hour**

Comments

10 minute time intervals used

.5 hour presoak used because of moist soils

DOUBLE RING INFILTROMETER TEST

CALCULATIONS AND RESULTS

Prepared by: Andrew Halmi
Deiss & Halmi Engineering, Inc.

Test date: 1/22/2015
Report date: 1/23/2015

Project: Lake Erie Power Converter Station

Location: Test Pit #5 - Outside Northeast corner of converter station footprint

	Depth (inches)	Elevation
Ground Surface:	0	1000.5
Test Location:	31	997.9166667
Limiting Zone:	N/A	

Inner Ring Diameter (in): 6
Outer Ring Diameter (in): 12

Inner Ring

Time (hours)	Elapsed Time (hour:min)	Drop (in)	Infiltration Rate (inches/hour)
1:40 PM	0:00	N/A	Presoak
2:12 PM	0:32	0.000	0.00
2:42 PM	1:02	0.000	0.00
3:12 PM	1:32	0.000	0.00
3:42 PM	2:02	0.000	0.00

Summary

- Infiltration rate: 0.00 inches per hour

Comments

30 minute time intervals used
Clay soils did not allow for infiltration

Section 4
PaDEP NPDES Permit Worksheets

Appendix D. Worksheets

CONVERTER STATION SITE

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date:	December 23, 2015
Project Name:	Lake Erie Connector - Converter Station Site
Municipality:	Conneaut Township
County:	Erie
Total Area (acres):	33.61
Major River Basin:	Lake Erie
Watershed:	Lake Erie
Sub-Basin:	Crooked Creek
Nearest Surface Water(s) to Receive Runoff:	Unnamed tributary to Crooked Creek
Chapter 93 – Designated Water Use/Existing Water Use:	HQ-CWF; MF

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☐ No ☒

List Causes of Impairment:

Is there an established TMDL that applies: Yes ☐ No ☒

Total Maximum Daily Loads (TMDLS)

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒

Existing or planned drinking water supply? Yes ☐ No ☒

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☒ No ☐

Existing River Conservation Plan? Yes ☒ No ☐

CONVERTER STATION SITE

Worksheet 2. Sensitive Natural Resources from PA Stormwater Best Management Practices Chapter 5

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	Yes	0.00	0.00
Floodplains	N/A	0.00	0.00
Riparian Areas	No	0.00	0.00
Wetlands	Yes	5.68	5.68
Woodlands	Yes	4.74	4.69
Natural Drainage Ways	No		
Steep Slopes, 15% - 25%	N/A	0.00	0.00
Steep Slopes, over 25%	N/A	0.00	0.00
Other:			
Other:			
TOTAL EXISTING:		10.42	10.37

CONVERTER STATION SITE

Worksheet 3. Nonstructural BMP Credits from PA Stormwater Best Management Practices Manual (SW BMP Manual)

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 10.37 **Ac.**

1.2 Area of Riparian Forest Buffer Protection (see WS 2) _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading (See Chapter 8, page 21 – SW BMP Manual) 1.86 **Ac**

TOTAL 12.23 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
33.61 acres	-	12.23	=	21.38 acres

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft² x 1/4" x 1/12 = _____ ft³

Meadow _____ ft² x 1/3" x 1/12 = _____ ft³

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft² x 1/2" x 1/12 = _____ ft³

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft² x 1/3" x 1/12 = _____ ft³

For all other disconnected roof areas

Roof Area _____ ft² x 1/4" x 1/12 = _____ ft³

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft² x 1/3" x 1/12 = _____ ft³

For all other disconnected roof areas

Impervious Area _____ ft² x 1/4" x 1/12 = _____ ft³

TOTAL NON-STRUCTURAL VOLUME CREDIT* 0 ft

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: Lake Erie Connector - Converter Station Site
Drainage Area: Crooked Creek Watershed
2-Year Rainfall: 2.56 in

Total Site Area: 33.61 acres
Protected Site Area: 12.23 acres
Managed Site Area: 21.38 acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Woods (good condition)	C	5227	0.12	70	4.29	0.86	0.48	211
Meadow (good condition)	B	324086	7.44	58	7.24	1.45	0.15	3996
Meadow (good condition)	C	545371	12.52	71	4.08	0.82	0.52	23695
Meadow (good condition)	D	56628	1.30	78	2.82	0.56	0.83	3903
TOTAL:		931313	21.38					31805

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft3)
Impervious	N/A	256133	5.88	98	0.20	0.04	2.33	49741
Meadow (good condition)	B	119790	2.75	58	7.24	1.45	0.15	1477
Meadow (good condition)	C	498762	11.45	71	4.08	0.82	0.52	21670
Meadow (good condition)	D	56628	1.30	78	2.82	0.56	0.83	3903
TOTAL:		931313	21.38					76791

2-Year Volume Increase (ft^3): 44986

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

CONVERTER STATION SITE

Worksheet 5. Structural BMP Volume Credits

PROJECT: Lake Erie Connector - Converter Station Site
SUB-BASIN:

Required Control Volume (ft^3) – *from Worksheet 4*: 44,986

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - 0
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) 44,986

(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin	66,679	118,514
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): 118,514
Structural Volume Requirement (ft^3): 44,986
DIFFERENCE 73,528

CONVERTER STATION SITE

Worksheet 10 – Water Quality Compliance for Nitrate

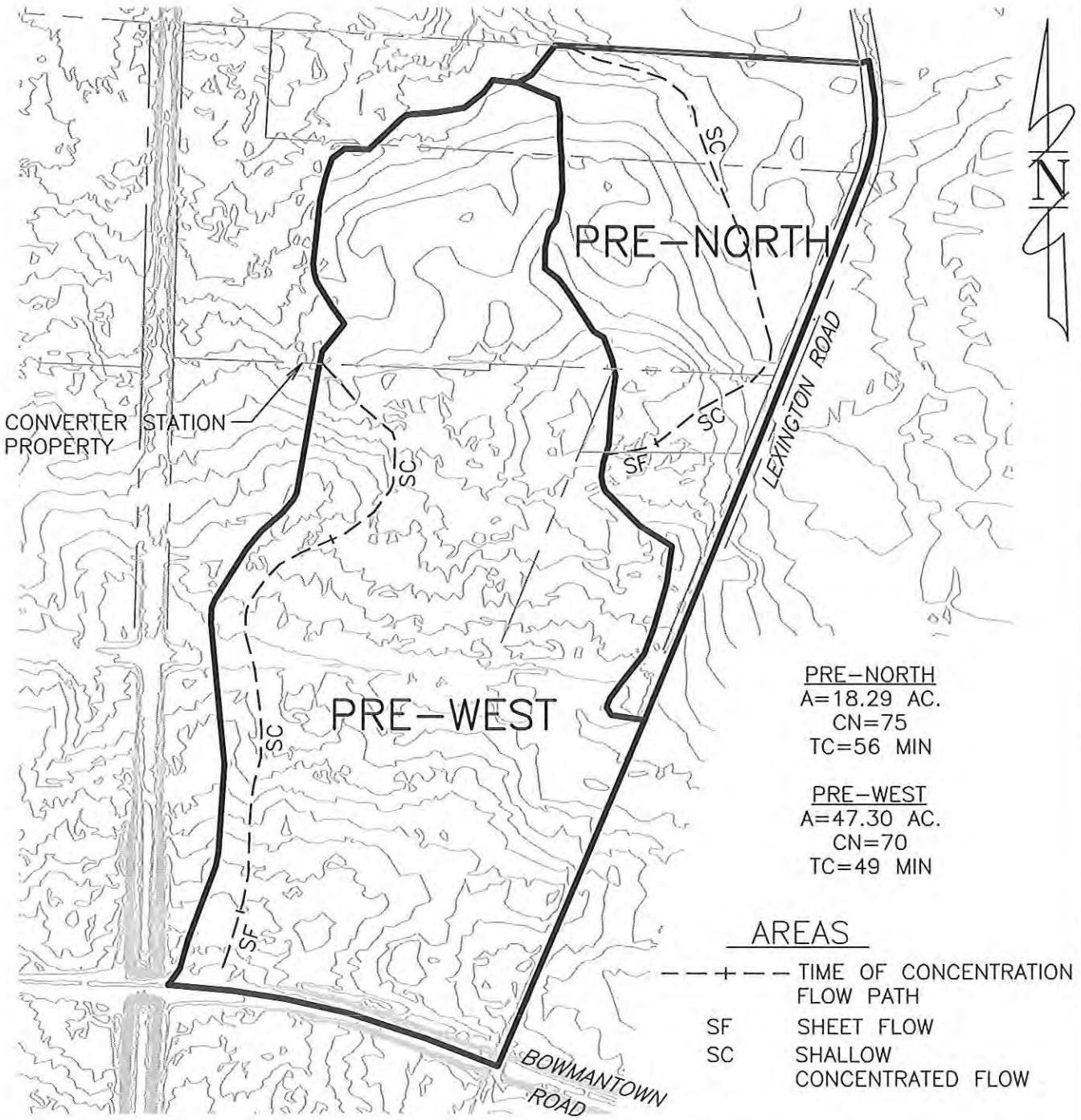
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied.

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6

	Yes	No
Primary BMPs for Nitrate:	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☒	☐
NS BMP 5.5.4 – Cluster Uses at Each Site	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area	☐	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☐	☐
NS BMP 5.9.1 – Street Sweeping/Vacuuming	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
	☐	☐
Secondary BMPs for Nitrate:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☒	☐
NS BMP 5.4.3 – Protect/Utilize Natural Drainage Features	☒	☐
NS BMP 5.6.2 – Minimize Soil Compaction	☐	☐
Structural BMP 6.4.5 – Rain Garden/Bioretention	☐	☐
Structural BMP 6.4.8 – Vegetated Swale	☒	☐
Structural BMP 6.4.9 – Vegetated Filter Strip	☐	☐
Structural BMP 6.6.1 – Constructed Wetland	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soils Amendment/Restoration	☐	☐

Section 5
Calculations

5.1 Existing and Proposed Watershed Drainage Areas



PRE-DEVELOPMENT DRAINAGE AREA

SCALE:
0 400 800 feet

ITC LAKE ERIE CONNECTOR LLC ERIE CONVERTER STATION CONNEAUT TOWNSHIP, ERIE COUNTY PENNSYLVANIA	DATE: 6/26/2015 SCALE: 1"=400' REV.: DRAWN BY: JEFFREY T. BERNOSKY APPROVED BY: DRAWING No.: PRE-DRAINAGE

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 Ph. 814-734-3640 Fax 814-734-3643

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Pre Development: WEST

Number	Description	Soil Group	CN	Area (acres)	CN*Area
1	Straight row crop (good)	C	85	4.46	379
2	Straight row crop (good)	B	78	3.77	294
3	Meadow	C	71	5.68	403
4	Meadow	B	58	3.06	177
5	Woods (good)	B	55	6.34	349
6	Woods (good)	C	70	19.09	1336
7	1/2 acre residential lot	C	70	3.14	220
8	1/2 acre residential lot	B	80	0.22	17
9	1/2 acre residential lot	D	85	0.12	10
10	Woods (good)	D	77	1.42	109
Watershed or subarea pervious curve number (CN_p) - - - - - - - - - - - - - - - -			70	47.30	3296

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Pre Development: NORTH

Number	Description	Soil Group	CN	Area (acres)	CN*Area
1	Straight row crop (good)	C	85	7.11	604
2	Straight row crop (good)	B	78	3.19	249
3	Straight row crop (good)	D	89	0.68	61
4	Woods (good)	C	70	0.89	62
5	1/2 acre residential lot	C	80	1.85	148
6	Woods (good)	B	55	1.80	99
7	1/2 acre residential lot	B	70	1.29	90
8	Meadow	B	58	0.08	5
9	1/2 acre residential lot	D	84	0.05	4
10	Meadow	C	71	0.61	43
11	Meadow	D	78	0.74	58
Watershed or subarea pervious curve number (CN_p)			75	18.29	1366

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Pre-development: WEST

Sheet Flow (Applicable to Tc only)			Segment ID	SF				
1.)	Surface description			Woods				
2.)	Manning's roughness coeff., n			0.4				
3.)	Flow length, L (total L < 300 ft.)	(ft)		140				
4.)	Two-yr. 24-hr. rainfall, P2	(in)		2.56				
5.)	Land slope, s	(ft/ft)		0.0143				Total Tt
6.)	Tt	(hr)		0.5992				0.6
Shallow Concentrated Flow			Segment ID	SC				
7.)	Surface description (paved (p),or unpaved (unp))			unp				
8.)	Flow length L	(ft)		1768				
9.)	Watercourse slope, s	(ft/ft)		0.0187				
10.)	Average velocity, V	(ft/s)		2.20				Total Tt
11.)	Tt = L/(3600 x V)	(hr)		0.2228				0.22
Channel Flow			Segment ID	CH				
12.)	Cross sectional flow area, a	(ft^2)						
13.)	Wetted perimeter, Pw	(ft)						
14.)	Hydraulic radius, r = a/Pw	(ft)						
15.)	Channel slope, s	(ft/ft)						
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V	(ft/s)						
18.)	Flow Length, L	(ft)						Total Tt
19.)	Tt = L/(3600 x V)	(hr)						0.000

Watershed or subarea Tc	(hr)	0.82
	(min)	49

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

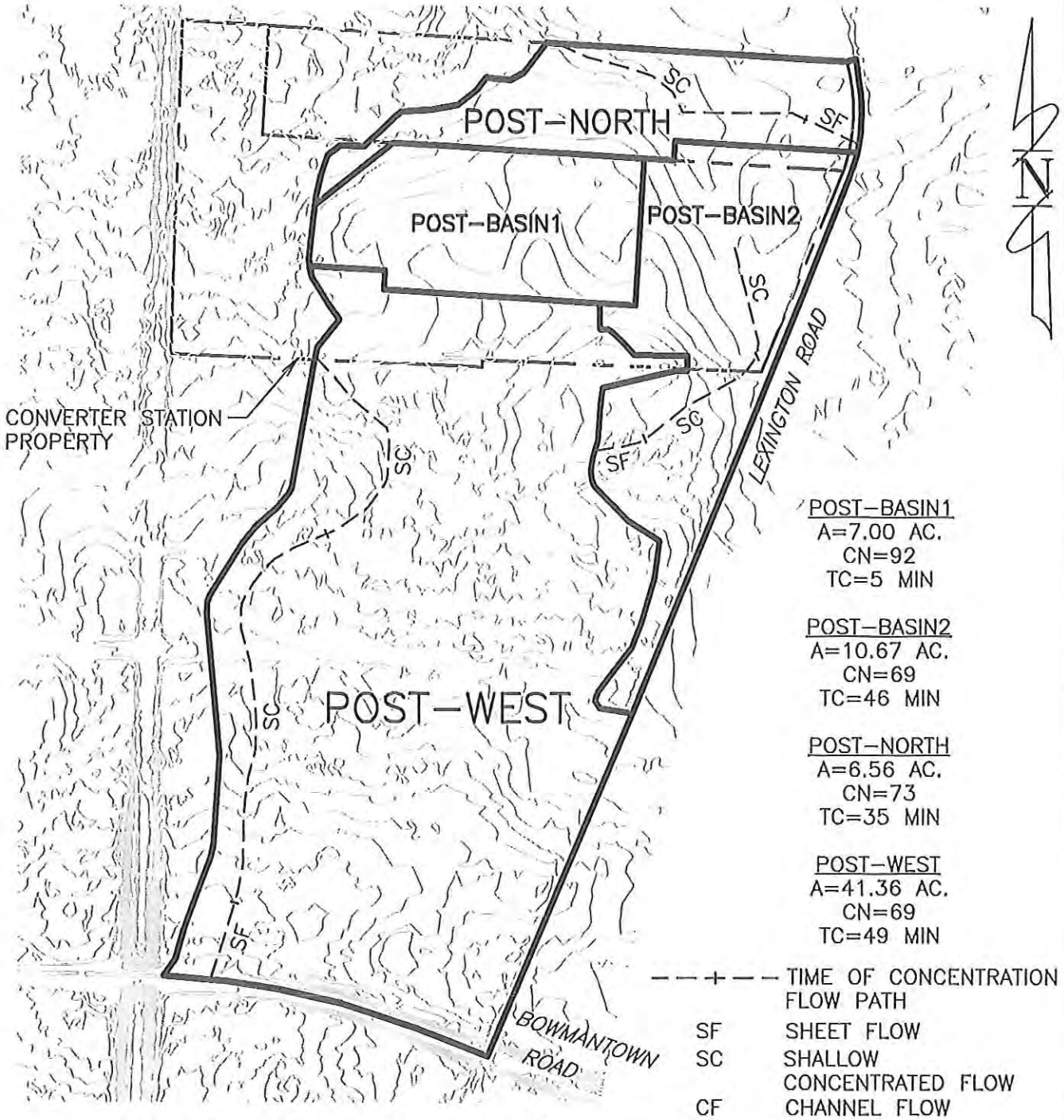
Comments: Pre-development: NORTH

Sheet Flow (Applicable to Tc only)		Segment ID	SF					
1.)	Surface description		Woods					
2.)	Manning's roughness coeff., n		0.4					
3.)	Flow length, L (total L < 300 ft.)	(ft)	138					
4.)	Two-yr. 24-hr. rainfall, P2	(in)	2.56					
5.)	Land slope, s	(ft/ft)	0.01					Total Tt
6.)	Tt	(hr)	0.6832					0.68

Shallow Concentrated Flow		Segment ID	SC	SC				
7.)	Surface description (paved (p),or unpaved (unp))		unp	unp				
8.)	Flow length L	(ft)	369	1072				
9.)	Watercourse slope, s	(ft/ft)	0.0253	0.007				
10.)	Average velocity, V	(ft/s)	2.57	1.35				Total Tt
11.)	Tt = L/(3600 x V)	(hr)	0.0399	0.2206				0.26

Channel Flow		Segment ID						
12.)	Cross sectional flow area, a	(ft^2)						
13.)	Wetted perimeter, Pw	(ft)						
14.)	Hydraulic radius, r = a/Pw	(ft)						
15.)	Channel slope, s	(ft/ft)						
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V	(ft/s)						
18.)	Flow Length, L	(ft)						Total Tt
19.)	Tt = L/(3600 x V)	(hr)						0.000

Watershed or subarea Tc	(hr)	0.94
	(min)	56



POST DEVELOPMENT DRAINAGE AREA

SCALE:
0 400 800 feet

ITC LAKE ERIE CONNECTOR, LLC ERIE CONVERTER STATION CONNEAUT TOWNSHIP, ERIE COUNTY PENNSYLVANIA	DATE: 6/26/2015 SCALE: 1"=400' REV.: DRAWN BY: JEFFREY T. BERNOSKY APPROVED BY: DRAWING No.: POST-DRAINAGE

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 Ph. 814-734-3640 Fax 814-734-3643

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6-

Location: Conneaut Township, Erie County

Comments: Post Construction: Basin 1

Number	Description	Soil Group	CN	Area (acres)	CN*Area
1	Impervious	n/a	98	5.65	554
2	Meadow	B	58	0.47	27
3	Meadow	C	71	0.88	62
4					
5					
6					
7					
8					
9					
Watershed or subarea pervious curve number (CN_p)			92	7.00	644

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Post Development: Basin 2

Number	Description	Soil Group	CN	Area (acres)	CN*Area
1	Impervious	n/a	98	0.29	29
2	Meadow	B	58	0.83	48
3	Meadow	C	71	4.97	353
4	Meadow	D	78	0.32	25
5	Woods	B	58	1.58	92
6	Woods	C	65	0.69	45
7	Woods	D	79	0.00	0
8	1/2 acre residential lot	B	70	1.27	89
9	1/2 acre residential lot	C	80	0.73	58
Watershed or subarea pervious curve number (CN_p) - - - - - - - - - - - - - - - -			69	10.67	737

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Power

By: A. Halmi Date: 1/27/2015

Location: Lake Erie Connector - Converter Station Site

Comments: Post-Development: West

Number	Description	Soil Group	CN	Area (sq. ft.)	CN*Area
1	1/2 acre residential lot	B	85	0.22	19
2	1/2 acre residential lot	C	80	3.14	252
3	1/2 acre residential lot	D	70	0.12	8
4	Meadow	B	58	3.05	177
5	Meadow	C	71	7.03	499
6	Woods (good)	B	55	4.14	228
7	Woods (good)	C	70	22.23	1556
8	Woods (good)	D	77	1.44	111
9					
10					
Watershed or subarea pervious curve number (CN_p)			69	41.36	2849

CURVE NUMBER (CN) WORKSHEET

Project: Lake Erie Power

By: A. Halmi Date: 6/17/2015

Location: Lake Erie Connector - Converter Station Site

Comments: Post-Development: North

Number	Description	Soil Group	CN	Area (sq. ft.)	CN*Area
1	1/2 acre residential lot	C	80	1.15	92
2	1/2 acre residential lot	D	85	0.05	5
3	Meadow	B	58	0.45	26
4	Meadow	C	71	3.78	269
5	Meadow	D	78	1.12	88
6					
7					
8					
9					
10					
Watershed or subarea pervious curve number (CN_p)			73	6.56	479

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Post Development; Basin 1

Sheet Flow (Applicable to Tc only)

			Segment ID					
1.)	Surface description							
2.)	Manning's roughness coeff., n							
3.)	Flow length, L (total L < 300 ft.)	(ft)						
4.)	Two-yr. 24-hr. rainfall, P2	(in)						
5.)	Land slope, s	(ft/ft)						Total Tt
6.)	Tt	(hr)						0

Shallow Concentrated Flow

			Segment ID					
7.)	Surface description (paved (p),or unpaved (unp))							
8.)	Flow length L	(ft)						
9.)	Watercourse slope, s	(ft/ft)						
10.)	Average velocity, V	(ft/s)						Total Tt
11.)	Tt = L/(3600 x V)	(hr)						0

Channel Flow

			Segment ID					
12.)	Cross sectional flow area, a	(ft^2)						
13.)	Wetted perimeter, Pw	(ft)						
14.)	Hydraulic radius, r = a/Pw	(ft)						
15.)	Channel slope, s	(ft/ft)						
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V	(ft/s)						
18.)	Flow Length, L	(ft)						Total Tt
19.)	Tt = L/(3600 x V)	(hr)						0.000

Watershed or subarea Tc (hr) 0

(min) 6

The minimum Tc used in the TR-55 procedure is 0.1 hour.

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Post Development; Basin 2

			Segment ID					
Sheet Flow (Applicable to Tc only)				SF				
1.)	Surface description			Woods				
2.)	Manning's roughness coeff., n			0.4				
3.)	Flow length, L (total L < 300 ft.)		(ft)	138				
4.)	Two-yr. 24-hr. rainfall, P2		(in)	2.56				
5.)	Land slope, s		(ft/ft)	0.01				Total Tt
6.)	Tt		(hr)	0.6832				0.68

			Segment ID					
Shallow Concentrated Flow				SC	SC			
7.)	Surface description (paved (p),or unpaved (unp))			unp	unp			
8.)	Flow length L		(ft)	369	289			
9.)	Watercourse slope, s		(ft/ft)	0.0253	0.0087			
10.)	Average velocity, V		(ft/s)	2.57	1.50			Total Tt
11.)	Tt = L/(3600 x V)		(hr)	0.0399	0.0535			0.09

			Segment ID					
Channel Flow								
12.)	Cross sectional flow area, a		(ft^2)					
13.)	Wetted perimeter, Pw		(ft)					
14.)	Hydraulic radius, r = a/Pw		(ft)					
15.)	Channel slope, s		(ft/ft)					
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V		(ft/s)					
18.)	Flow Length, L		(ft)					Total Tt
19.)	Tt = L/(3600 x V)		(hr)					0.000

Watershed or subarea Tc	(hr)	0.77
	(min)	46

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Post Development; West

Sheet Flow (Applicable to Tc only)		Segment ID	SF					
1.)	Surface description		Woods					
2.)	Manning's roughness coeff., n		0.4					
3.)	Flow length, L (total L < 300 ft.)	(ft)	140					
4.)	Two-yr. 24-hr. rainfall, P2	(in)	2.56					
5.)	Land slope, s	(ft/ft)	0.0143					Total Tt
6.)	Tt	(hr)	0.5992					0.6

Shallow Concentrated Flow		Segment ID	SC					
7.)	Surface description (paved (p),or unpaved (unp))		unp					
8.)	Flow length L	(ft)	1768					
9.)	Watercourse slope, s	(ft/ft)	0.0187					
10.)	Average velocity, V	(ft/s)	2.20					Total Tt
11.)	Tt = L/(3600 x V)	(hr)	0.2228					0.22

Channel Flow		Segment ID	CH					
12.)	Cross sectional flow area, a	(ft^2)						
13.)	Wetted perimeter, Pw	(ft)						
14.)	Hydraulic radius, r = a/Pw	(ft)						
15.)	Channel slope, s	(ft/ft)						
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V	(ft/s)						
18.)	Flow Length, L	(ft)						Total Tt
19.)	Tt = L/(3600 x V)	(hr)						0.000

Watershed or subarea Tc	(hr)	0.82
	(min)	49

TIME OF CONCENTRATION (Tc) WORKSHEET

Project: Lake Erie Connector - Converter Station Site

By: A. Halmi Date: 6/17/2015

Location: Conneaut Township, Erie County

Comments: Post Development; North

Sheet Flow (Applicable to Tc only)

			Segment ID	SF				
1.)	Surface description			Dense Grass				
2.)	Manning's roughness coeff., n			0.24				
3.)	Flow length, L (total L < 300 ft.)	(ft)		155				
4.)	Two-yr. 24-hr. rainfall, P2	(in)		2.56				
5.)	Land slope, s	(ft/ft)		0.0129				Total Tt
6.)	Tt	(hr)		0.4499				0.45

Shallow Concentrated Flow

			Segment ID	SC				
7.)	Surface description (paved (p),or unpaved (unp))			unp				
8.)	Flow length L	(ft)		720				
9.)	Watercourse slope, s	(ft/ft)		0.009				
10.)	Average velocity, V	(ft/s)		1.53				Total Tt
11.)	Tt = L/(3600 x V)	(hr)		0.1305				0.13

Channel Flow

			Segment ID					
12.)	Cross sectional flow area, a	(ft^2)						
13.)	Wetted perimeter, Pw	(ft)						
14.)	Hydraulic radius, r = a/Pw	(ft)						
15.)	Channel slope, s	(ft/ft)						
16.)	Manning's roughness coeff. , n							
17.)	Velocity, V	(ft/s)						
18.)	Flow Length, L	(ft)						Total Tt
19.)	Tt = L/(3600 x V)	(hr)						0.000

Watershed or subarea Tc (hr) 0.58

(min) 35

5.2 Pre-Development HydroCAD Output

PRE-WEST

PRE-NORTH

Subcat Reach Pond Link

Drainage Diagram for LEC Converter Station PRE
Prepared by Deiss & Halmi Engineering, Inc., Printed 1/22/2016

Summary for Subcatchment 1S: PRE-WEST

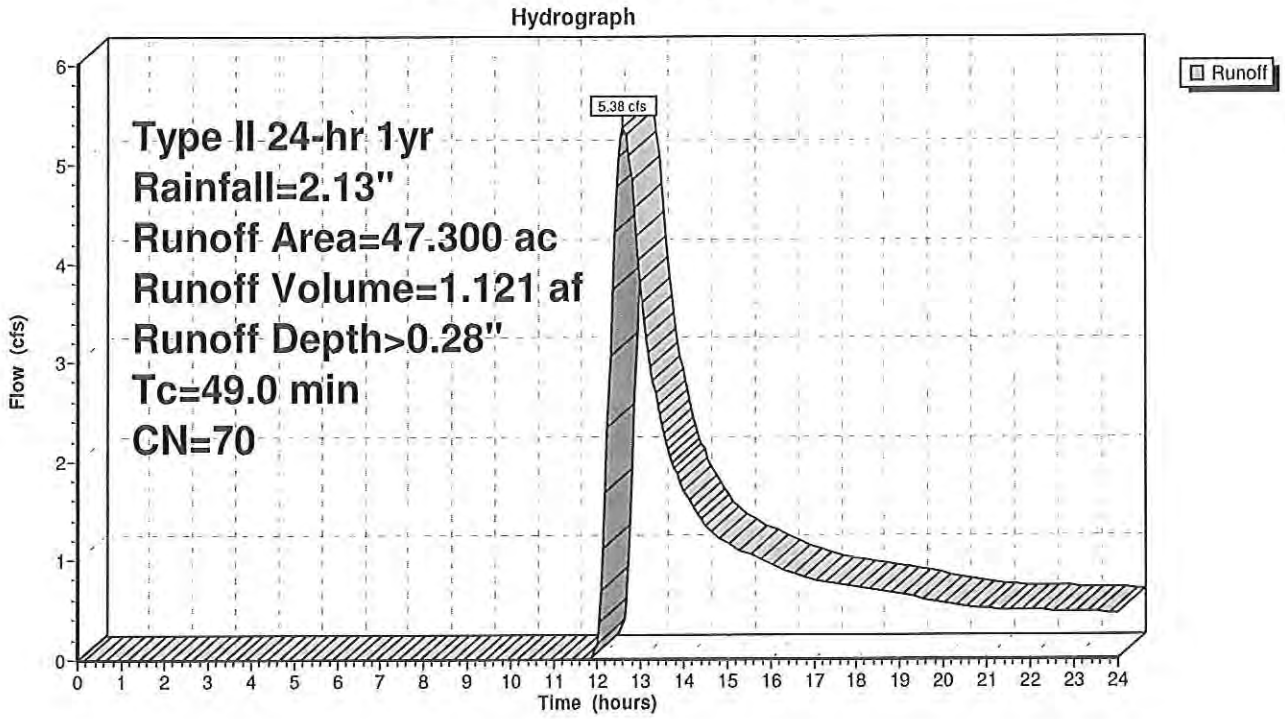
Runoff = 5.38 cfs @ 12.62 hrs, Volume= 1.121 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

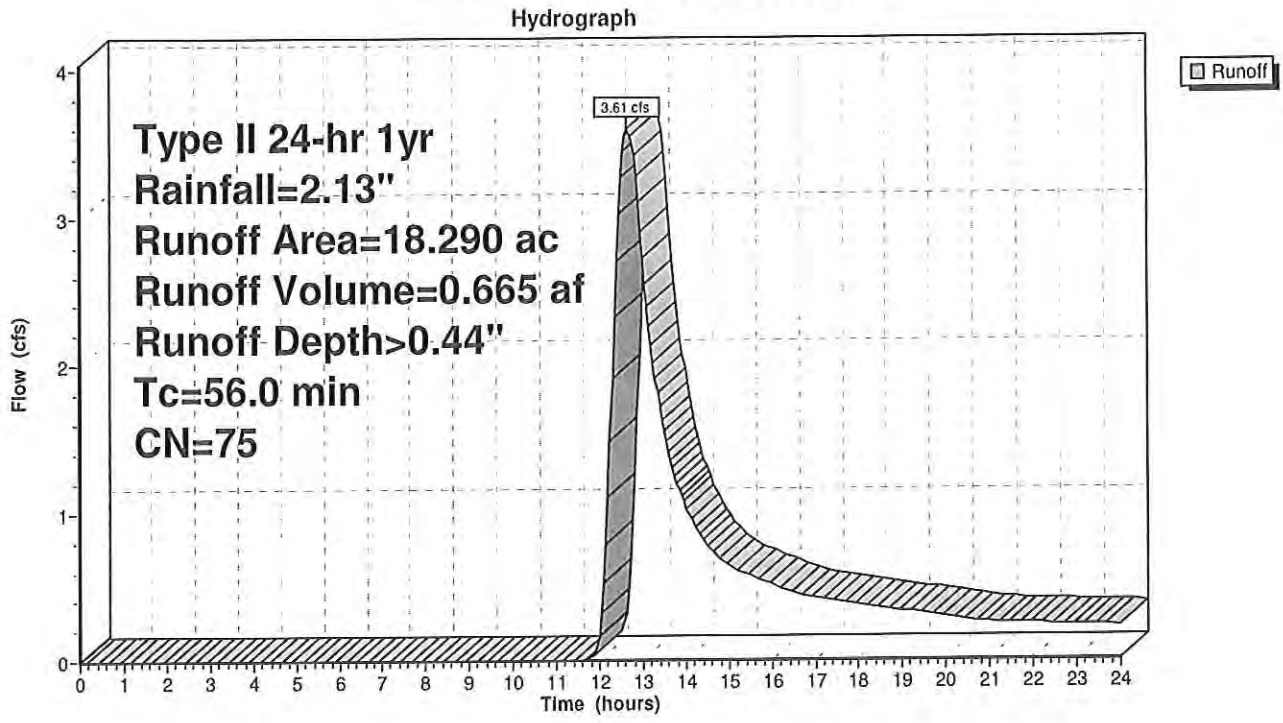
Runoff = 3.61 cfs @ 12.66 hrs, Volume= 0.665 af, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					Direct Entry,

Subcatchment 2S: PRE-NORTH



Summary for Subcatchment 1S: PRE-WEST

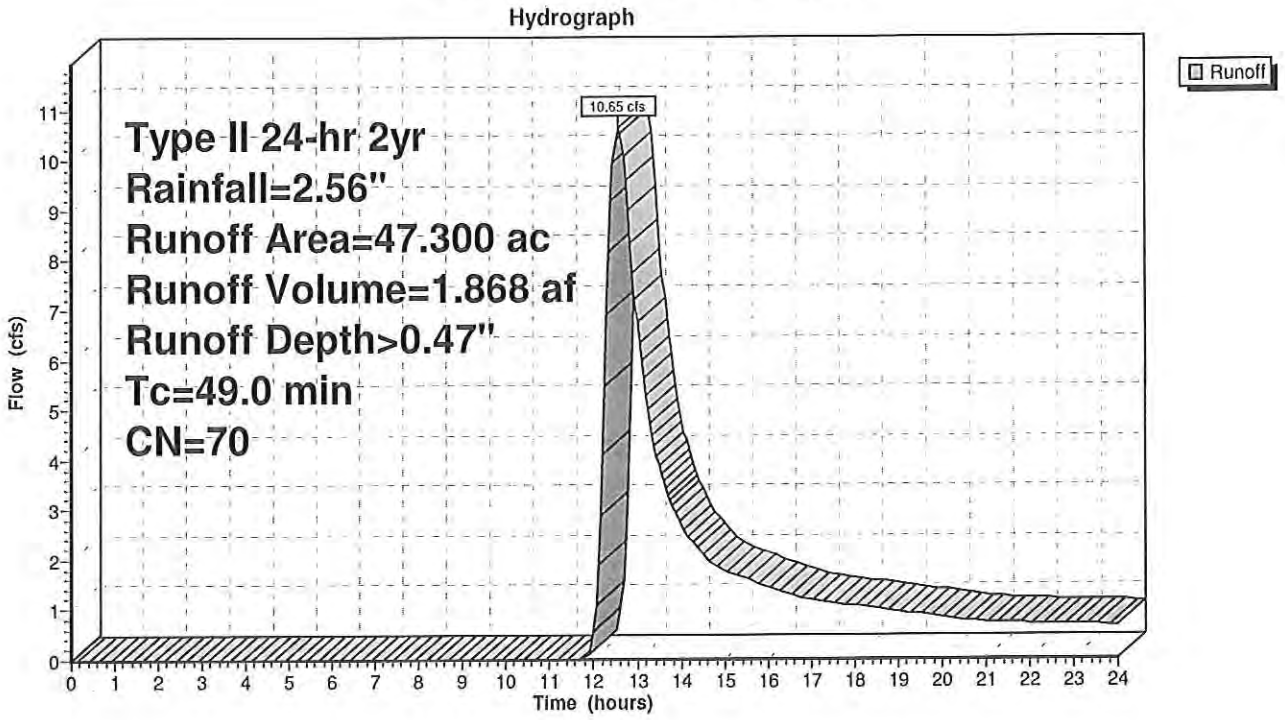
Runoff = 10.65 cfs @ 12.58 hrs, Volume= 1.868 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

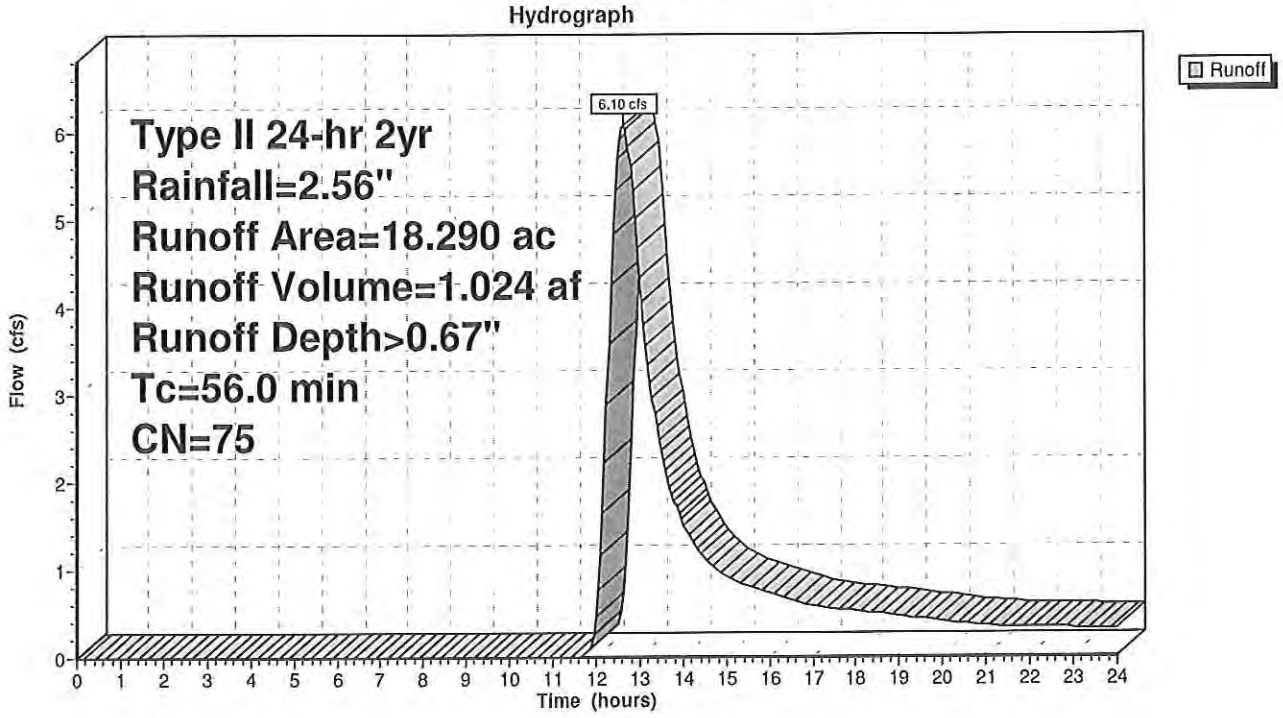
Runoff = 6.10 cfs @ 12.64 hrs, Volume= 1.024 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					Direct Entry,

Subcatchment 2S: PRE-NORTH



Summary for Subcatchment 1S: PRE-WEST

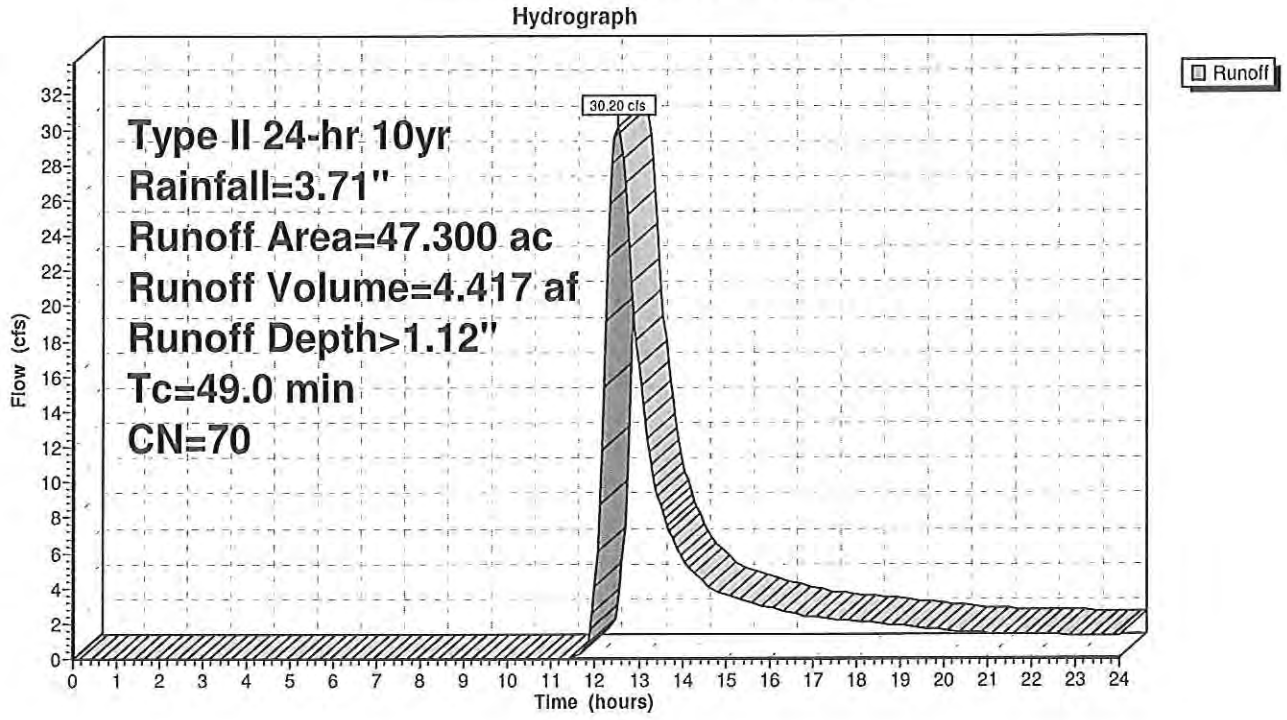
Runoff = 30.20 cfs @ 12.52 hrs, Volume= 4.417 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

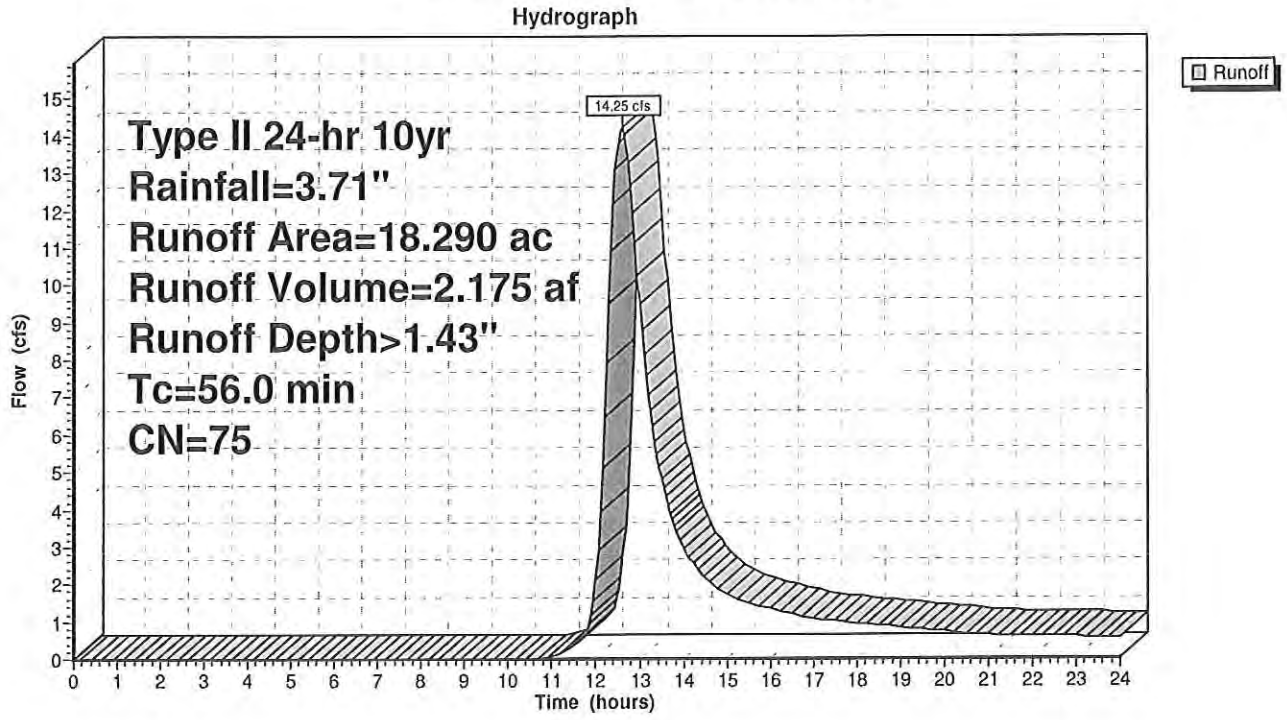
Runoff = 14.25 cfs @ 12.60 hrs, Volume= 2.175 af, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					**Direct Entry,**

Subcatchment 2S: PRE-NORTH



Summary for Subcatchment 1S: PRE-WEST

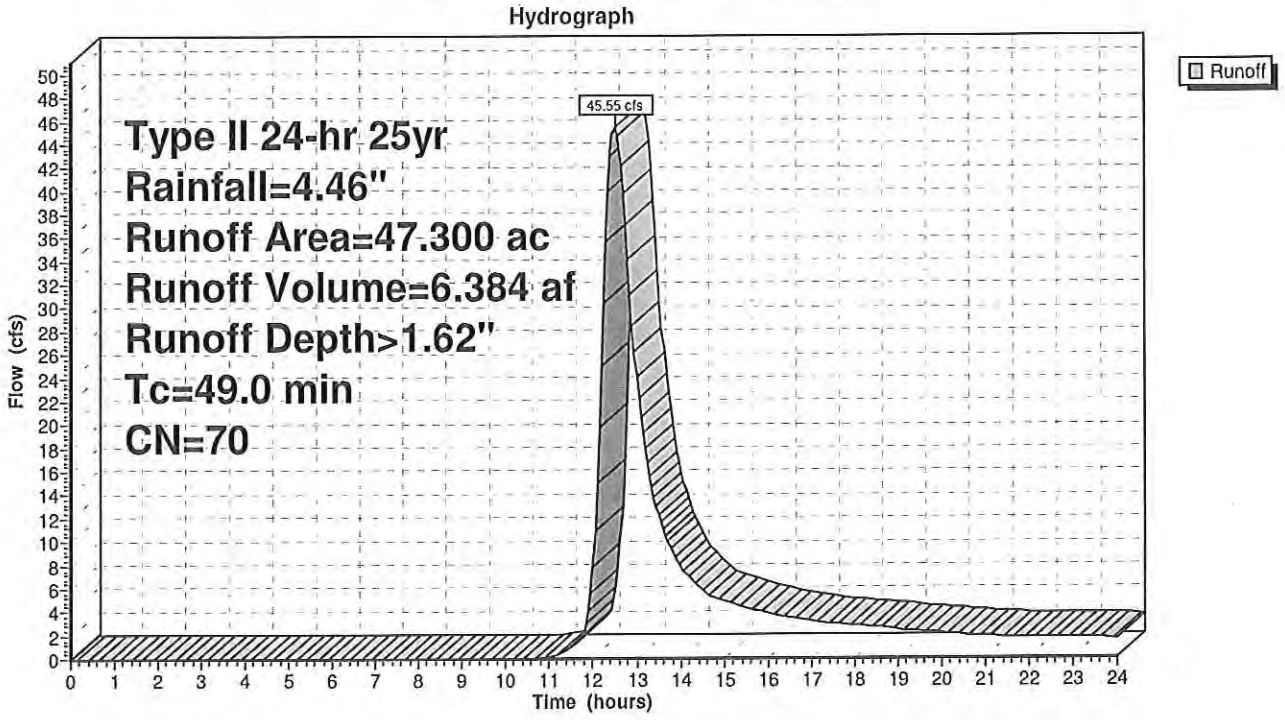
Runoff = 45.55 cfs @ 12.51 hrs, Volume= 6.384 af, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

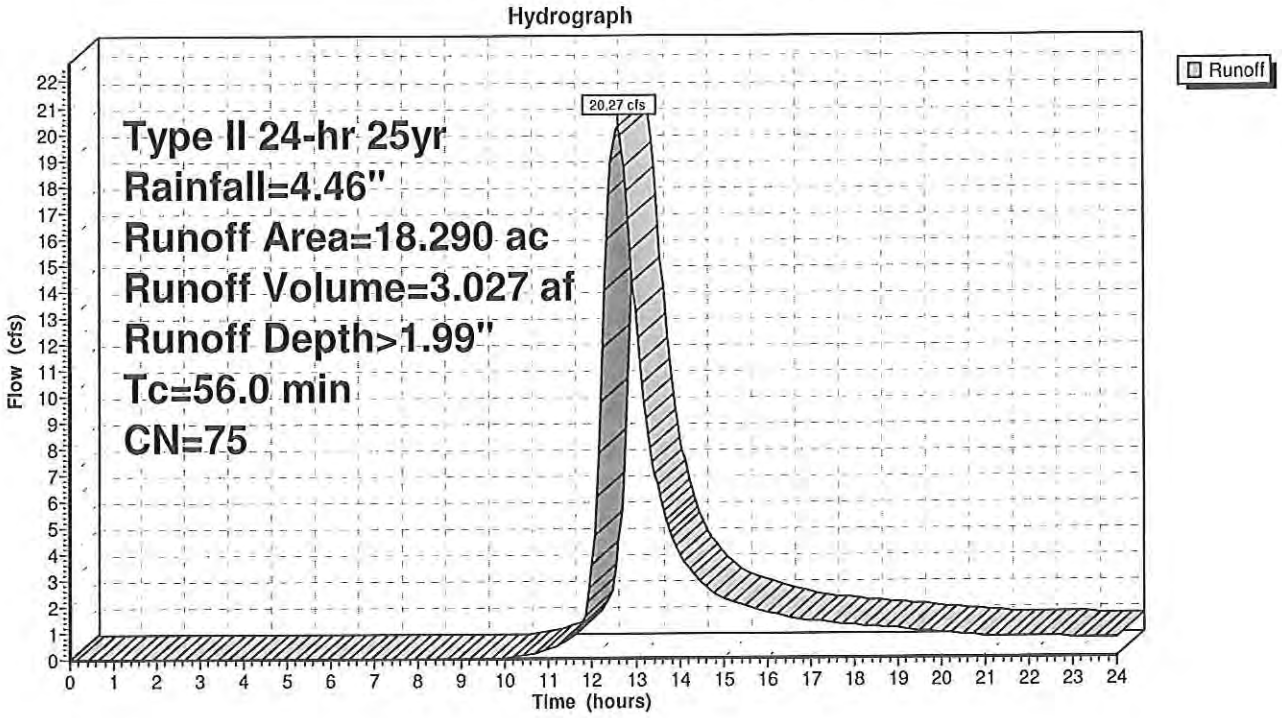
Runoff = 20.27 cfs @ 12.59 hrs, Volume= 3.027 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					Direct Entry,

Subcatchment 2S: PRE-NORTH



Summary for Subcatchment 1S: PRE-WEST

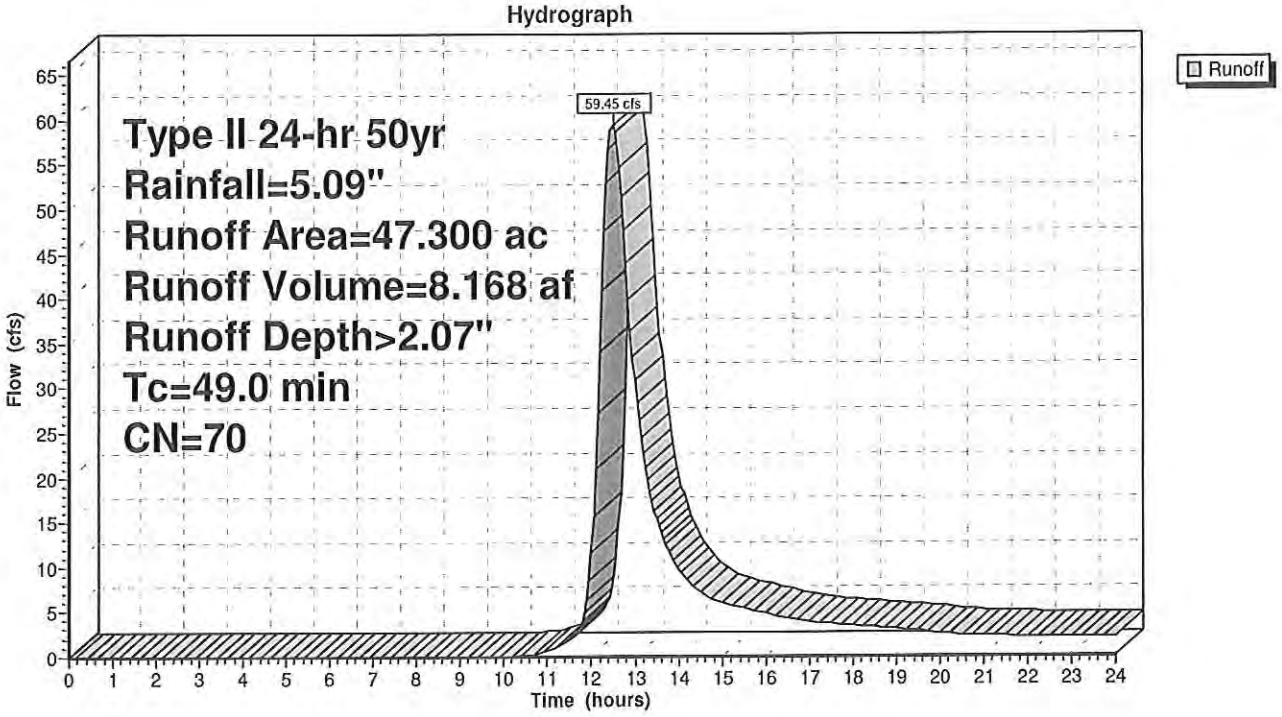
Runoff = 59.45 cfs @ 12.50 hrs, Volume= 8.168 af, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

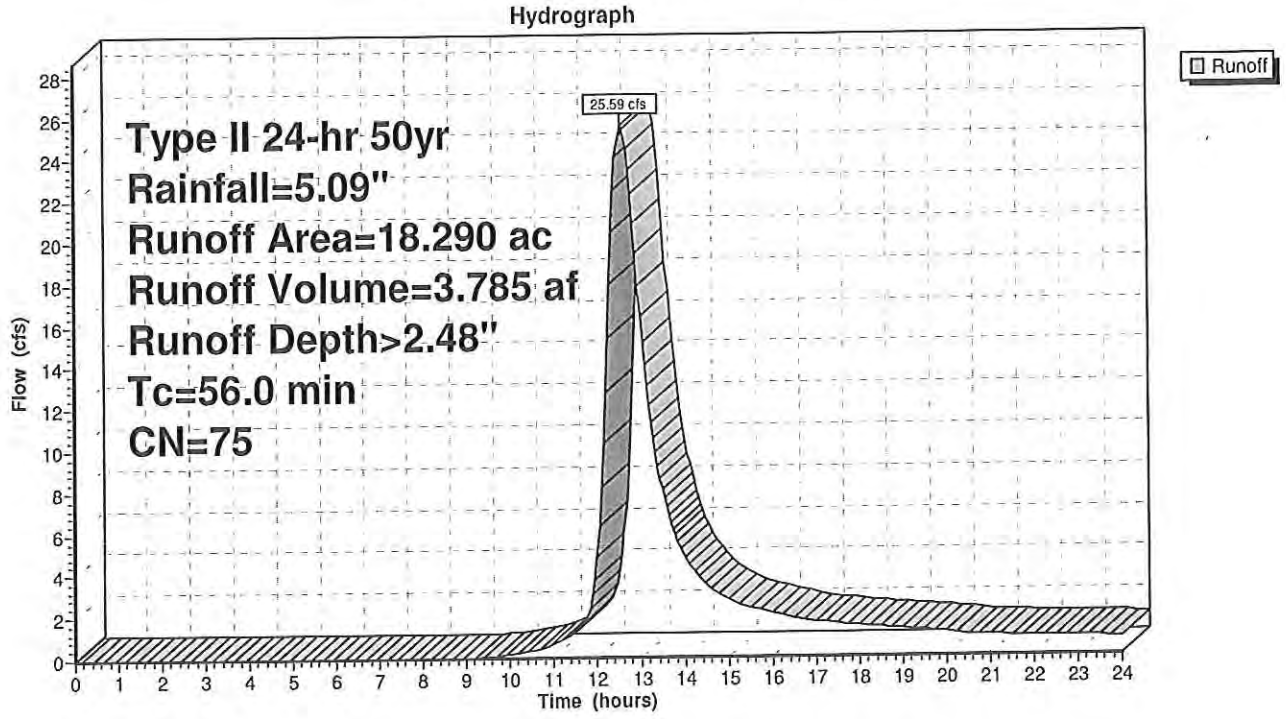
Runoff = 25.59 cfs @ 12.58 hrs, Volume= 3.785 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					**Direct Entry,**

Subcatchment 2S: PRE-NORTH



Summary for Subcatchment 1S: PRE-WEST

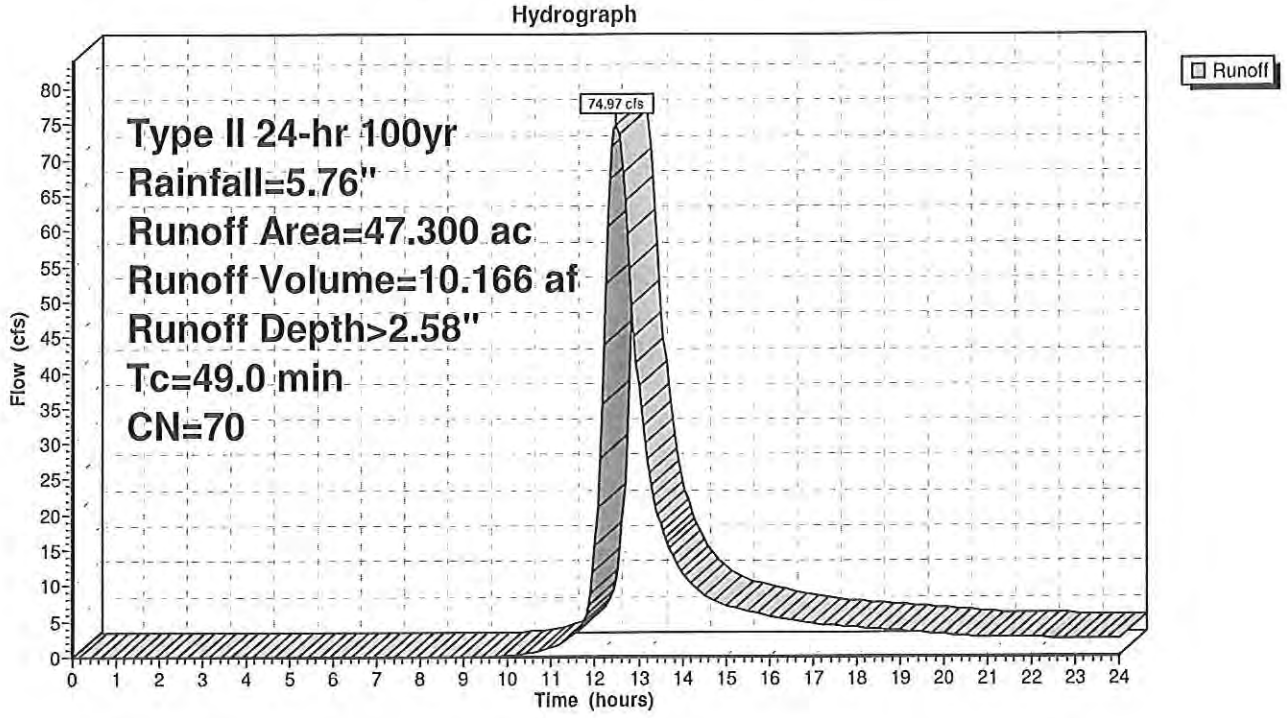
Runoff = 74.97 cfs @ 12.49 hrs, Volume= 10.166 af, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

	Area (ac)	CN	Description
*	47.300	70	
	47.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 1S: PRE-WEST



Summary for Subcatchment 2S: PRE-NORTH

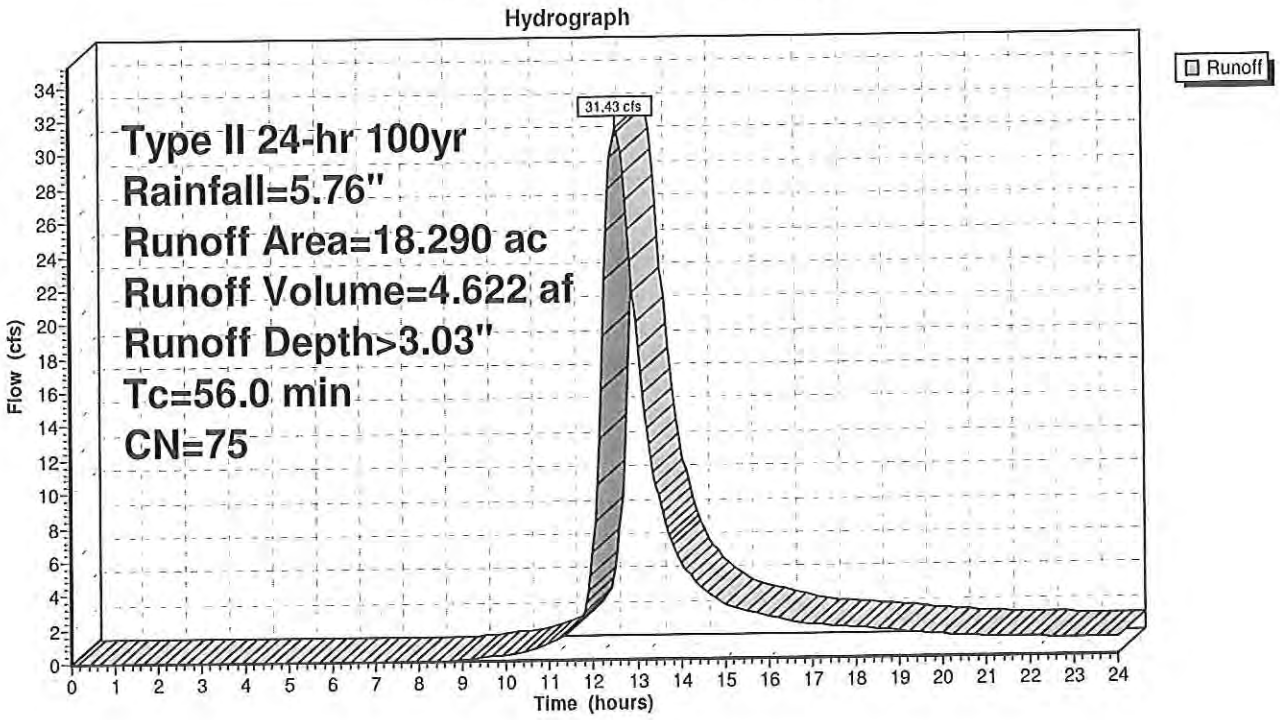
Runoff = 31.43 cfs @ 12.58 hrs, Volume= 4.622 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

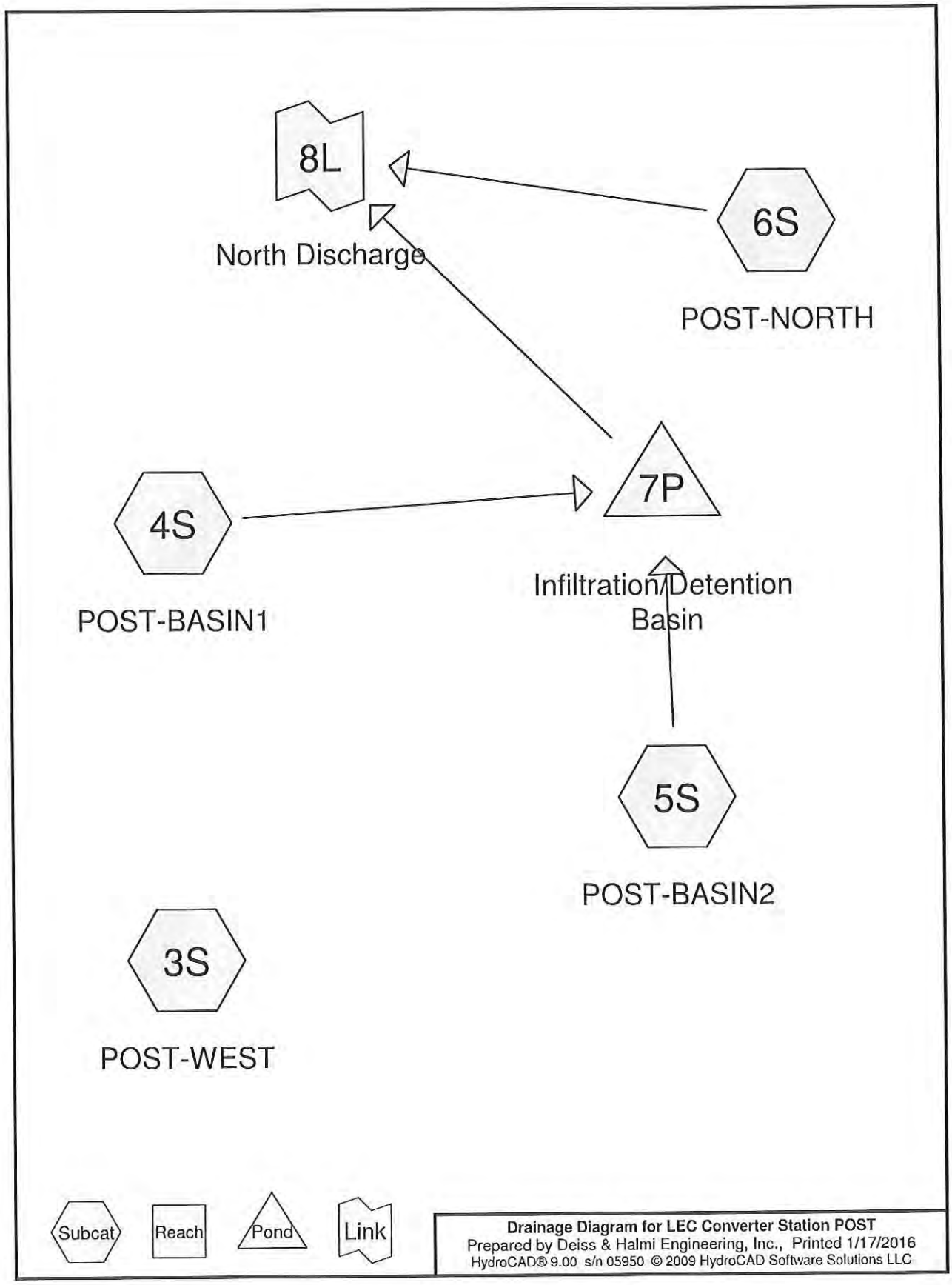
	Area (ac)	CN	Description
*	18.290	75	
	18.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.0					Direct Entry,

Subcatchment 2S: PRE-NORTH



5.3 Post-Development HydroCAD Output



Drainage Diagram for LEC Converter Station POST
Prepared by Deiss & Halmi Engineering, Inc., Printed 1/17/2016

Summary for Subcatchment 3S: POST-WEST

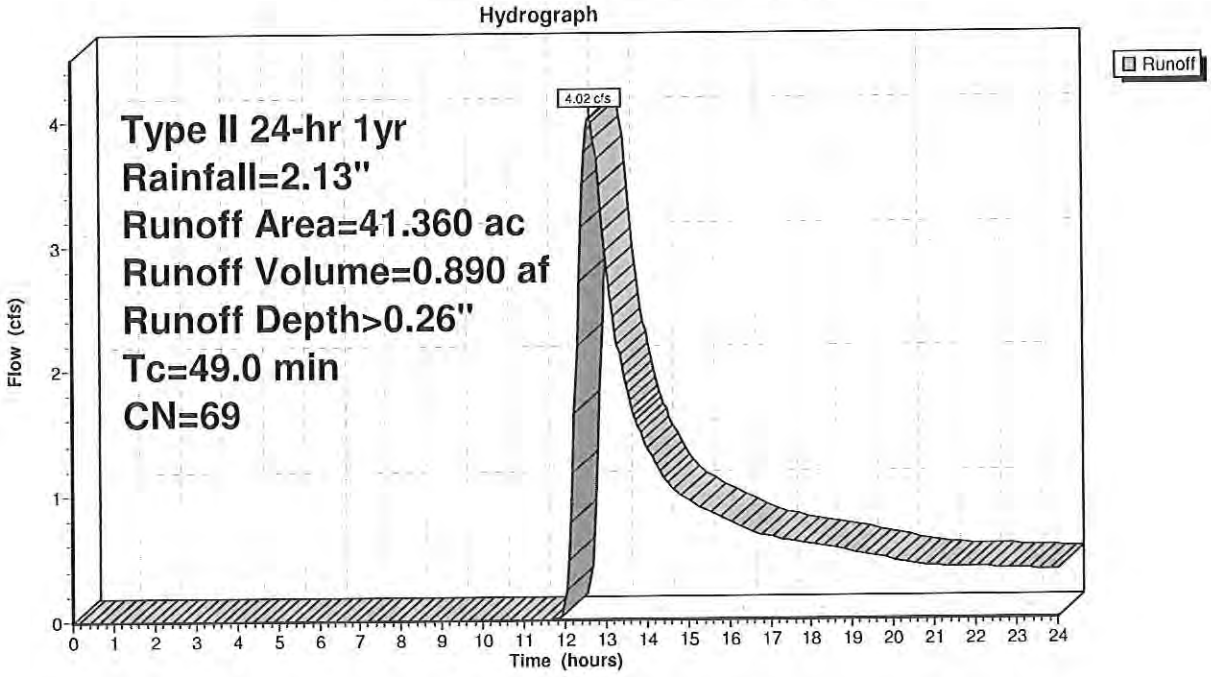
Runoff = 4.02 cfs @ 12.63 hrs, Volume= 0.890 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					Direct Entry,

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

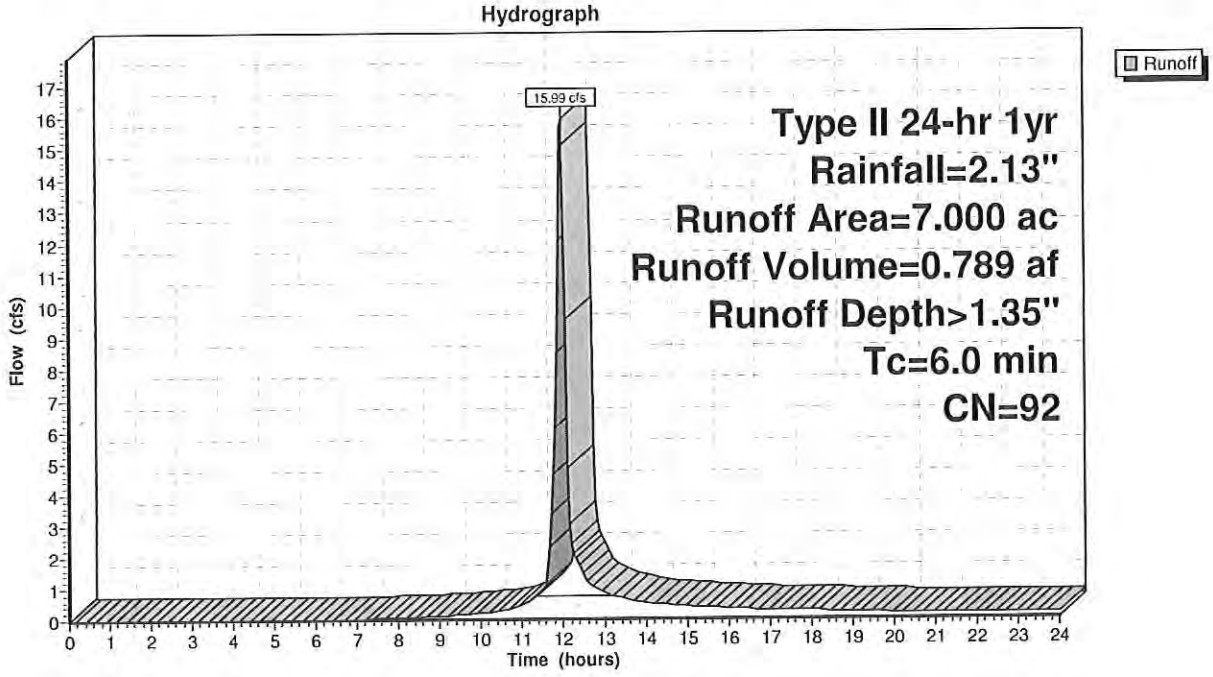
Runoff = 15.99 cfs @ 11.97 hrs, Volume= 0.789 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

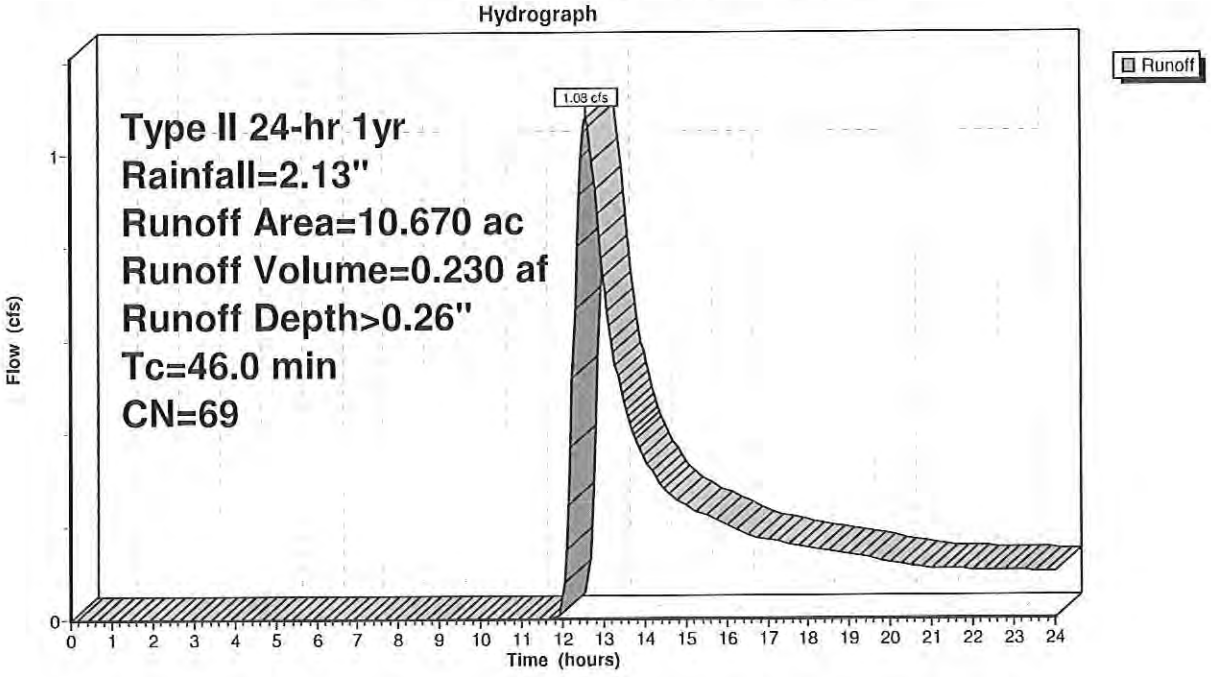
Runoff = 1.08 cfs @ 12.59 hrs, Volume= 0.230 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					**Direct Entry,**

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

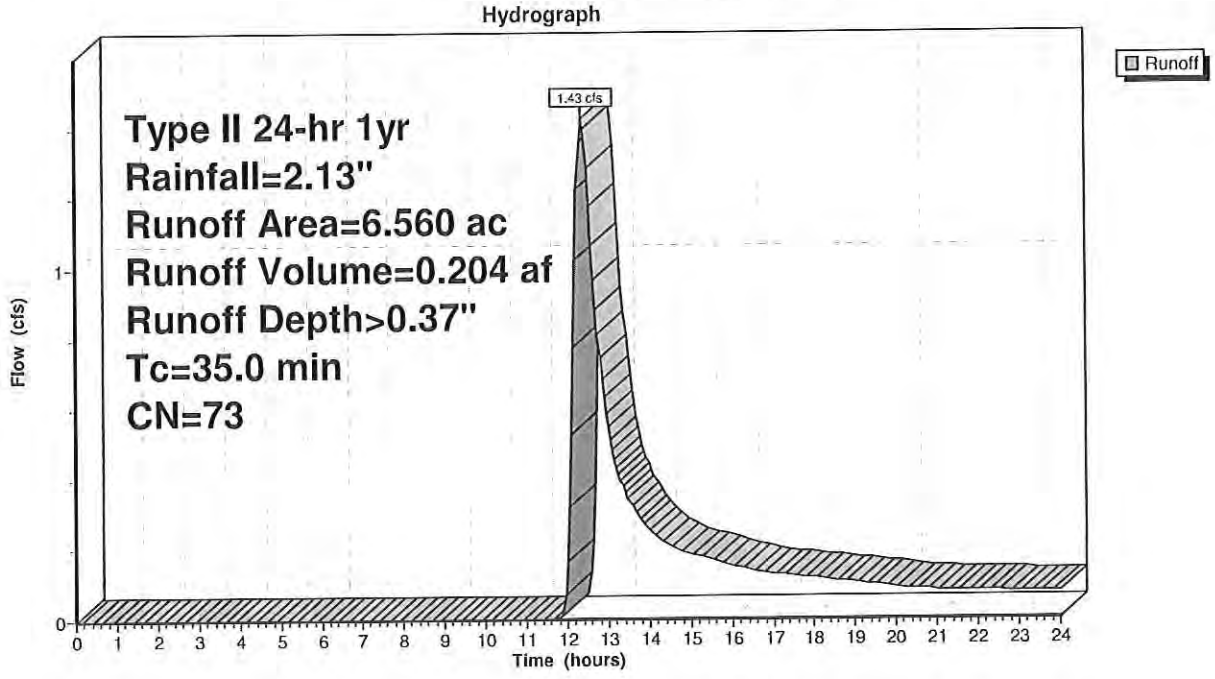
Runoff = 1.43 cfs @ 12.38 hrs, Volume= 0.204 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=2.13"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					**Direct Entry,**

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 0.69" for 1yr event
Inflow = 16.01 cfs @ 11.97 hrs, Volume= 1.019 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 839.99' @ 24.00 hrs Surf.Area= 58,449 sf Storage= 44,366 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

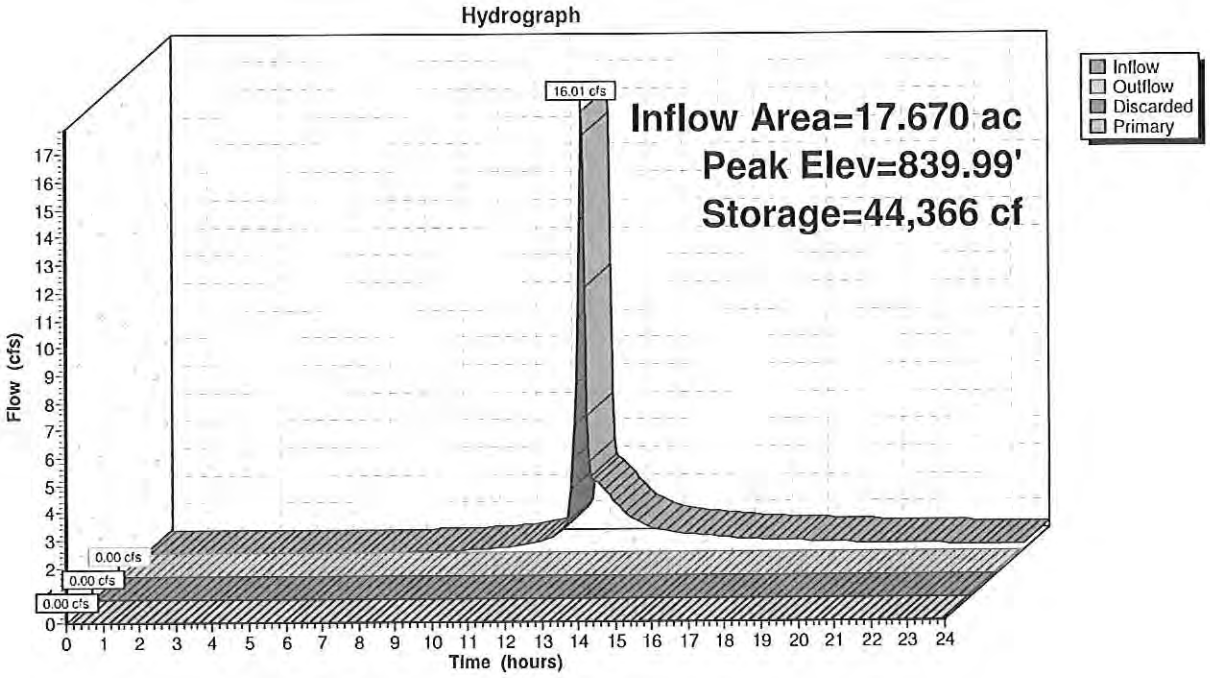
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
├**1=Culvert** (Passes 0.00 cfs of 0.42 cfs potential flow)
│ ├**2=Orifice/Grate** (Controls 0.00 cfs)
│ └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

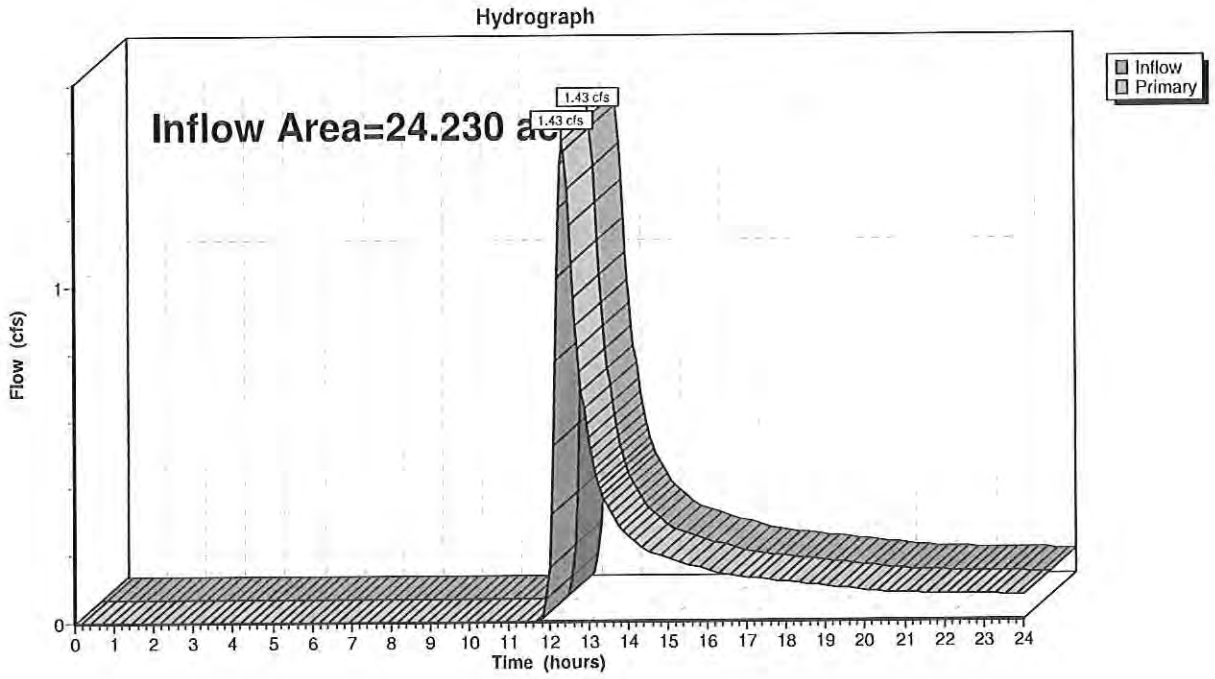


Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.10" for 1yr event
Inflow = 1.43 cfs @ 12.38 hrs, Volume= 0.204 af
Primary = 1.43 cfs @ 12.38 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 8L: North Discharge



Summary for Subcatchment 3S: POST-WEST

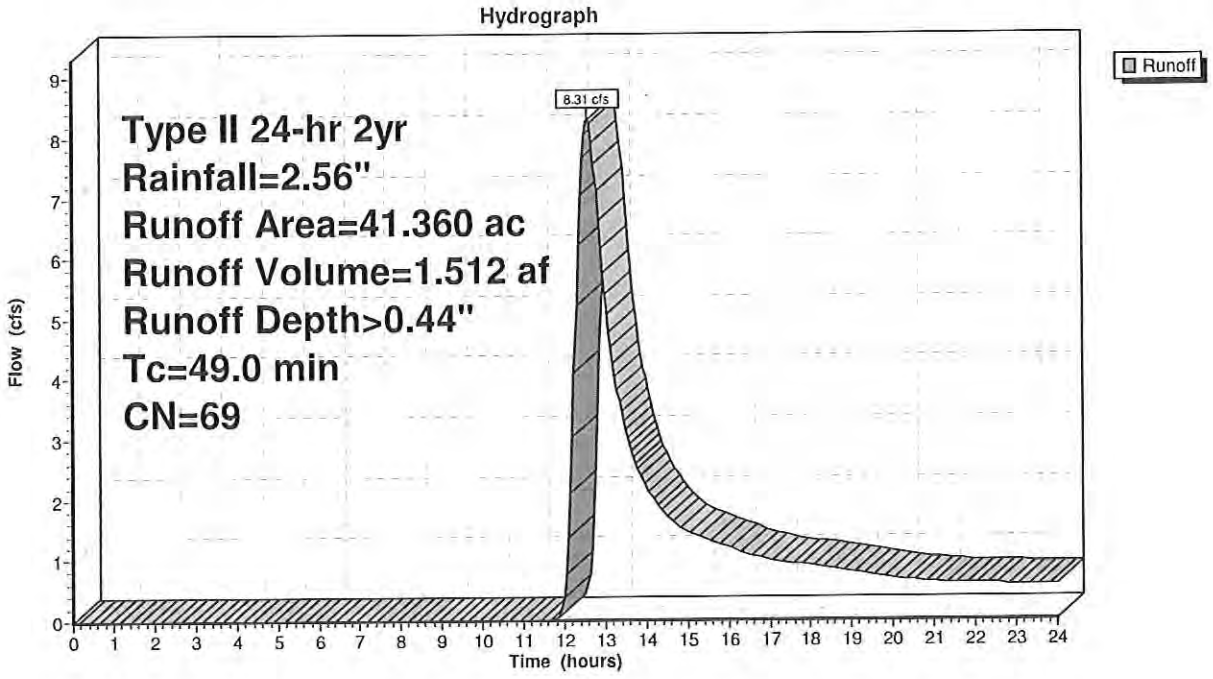
Runoff = 8.31 cfs @ 12.59 hrs, Volume= 1.512 af, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					Direct Entry,

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

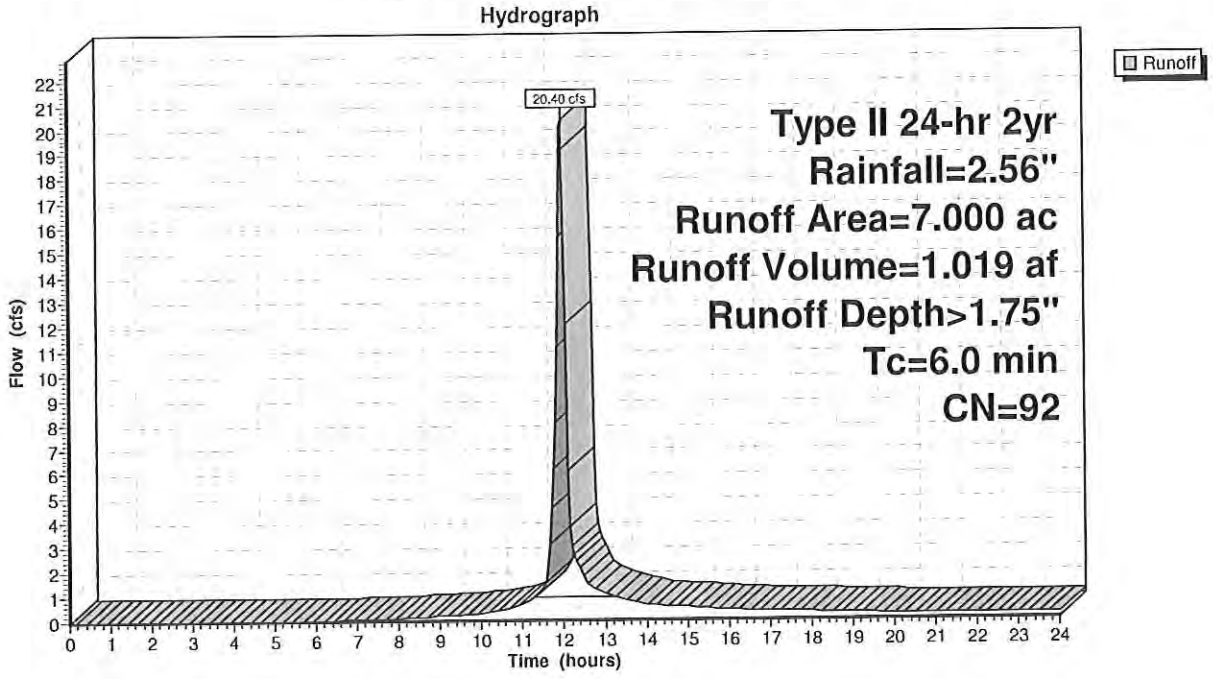
Runoff = 20.40 cfs @ 11.97 hrs, Volume= 1.019 af, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

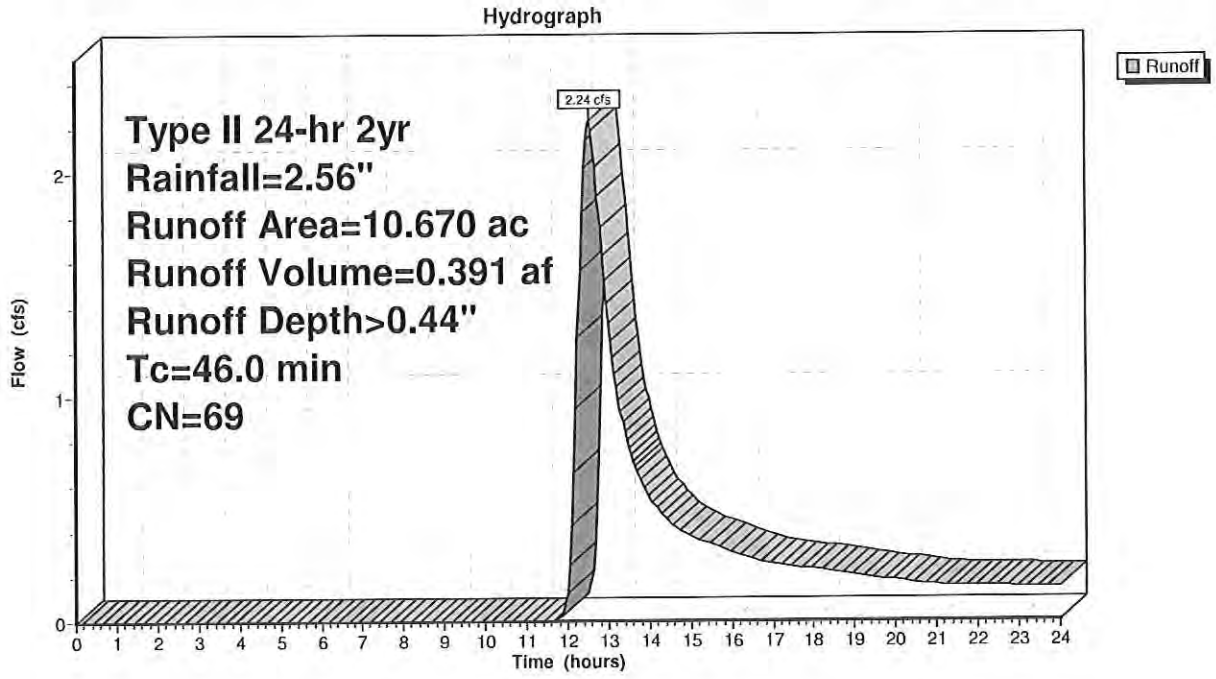
Runoff = 2.24 cfs @ 12.54 hrs, Volume= 0.391 af, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					Direct Entry,

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

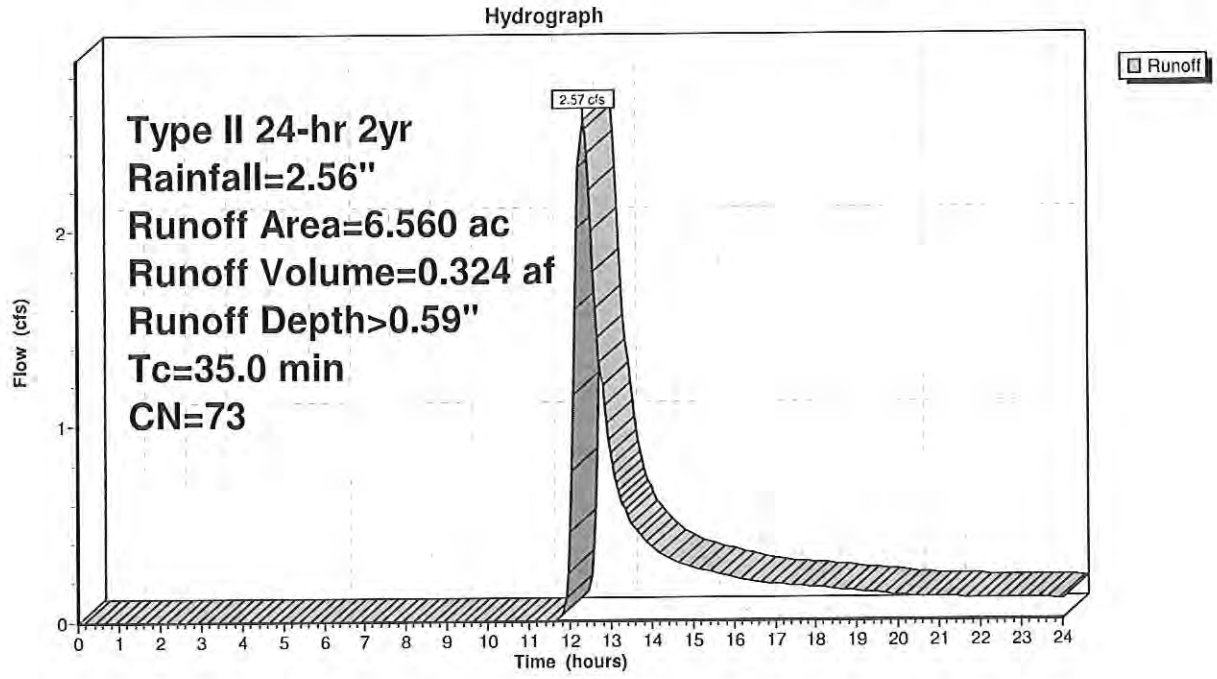
Runoff = 2.57 cfs @ 12.35 hrs, Volume= 0.324 af, Depth> 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr Rainfall=2.56"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					Direct Entry,

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 0.96" for 2yr event
Inflow = 20.47 cfs @ 11.97 hrs, Volume= 1.410 af
Outflow = 0.04 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 100%, Lag= 722.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.04 cfs @ 24.00 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 840.26' @ 24.00 hrs Surf.Area= 67,013 sf Storage= 61,337 cf

Plug-Flow detention time= 1,067.1 min calculated for 0.001 af (0% of inflow)
Center-of-Mass det. time= 592.3 min (1,428.2 - 835.9)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

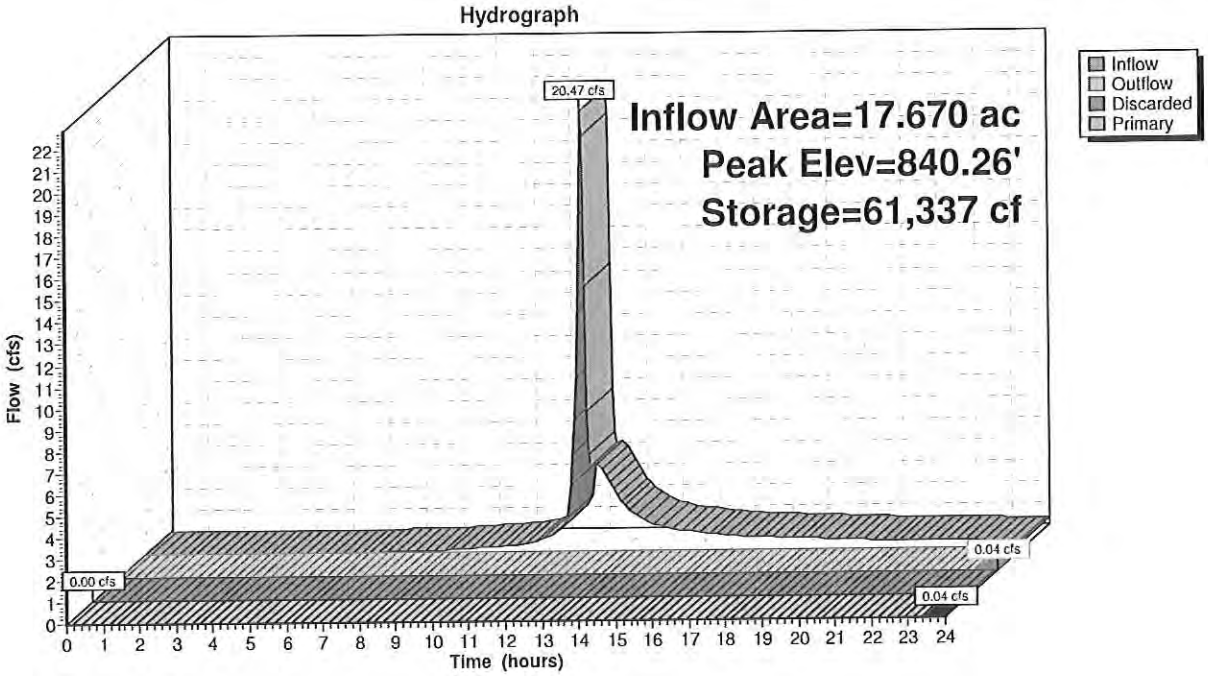
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
↑**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.04 cfs @ 24.00 hrs HW=840.26' (Free Discharge)
↑**1=Culvert** (Passes 0.04 cfs of 8.45 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.34 fps)
3=Orifice/Grate (Controls 0.00 cfs)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

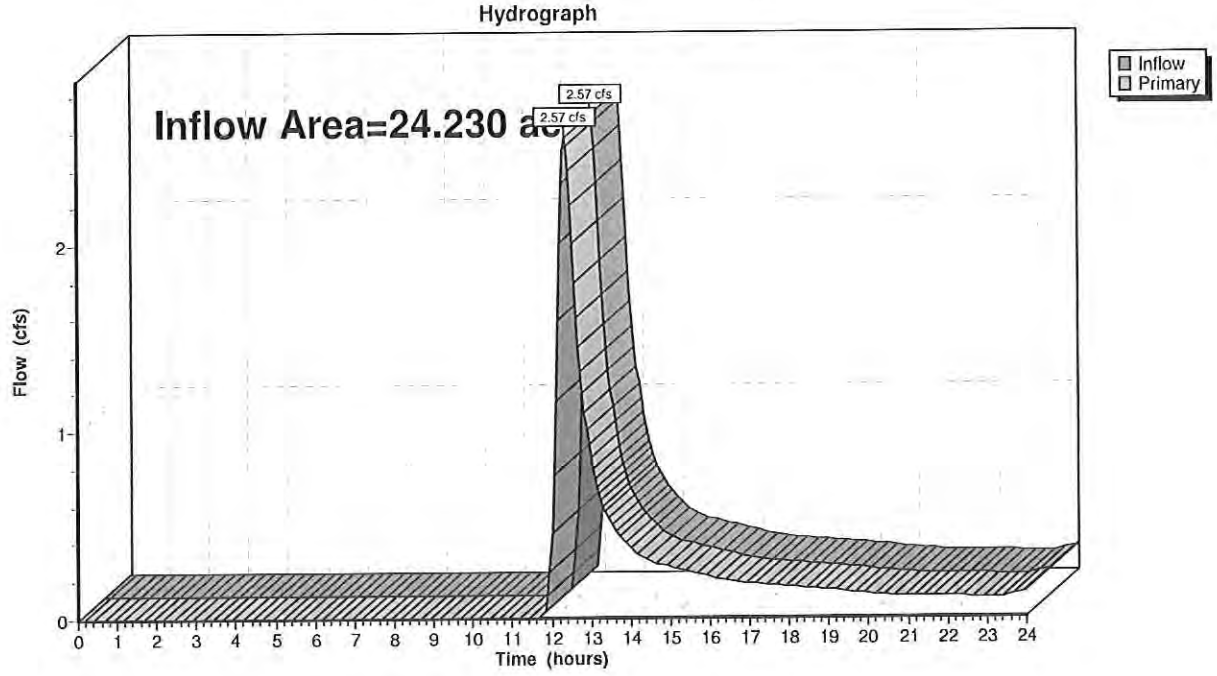


Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.16" for 2yr event
Inflow = 2.57 cfs @ 12.35 hrs, Volume= 0.325 af
Primary = 2.57 cfs @ 12.35 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 8L: North Discharge



Summary for Subcatchment 3S: POST-WEST

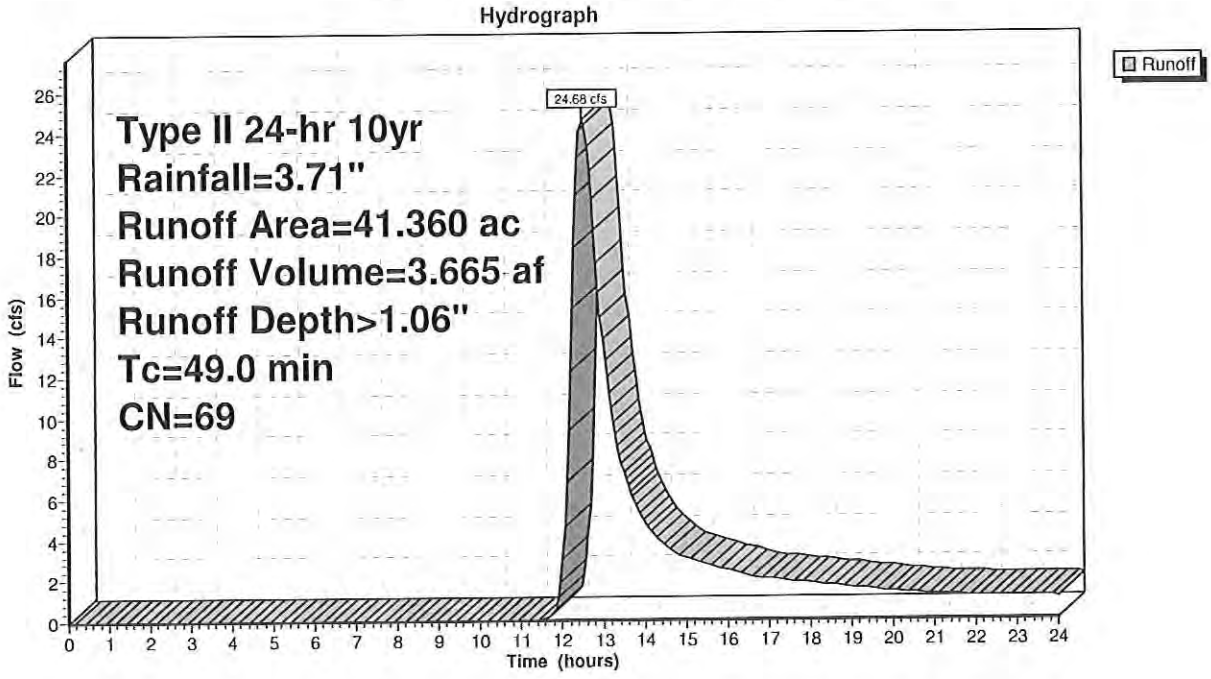
Runoff = 24.68 cfs @ 12.53 hrs, Volume= 3.665 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					Direct Entry,

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

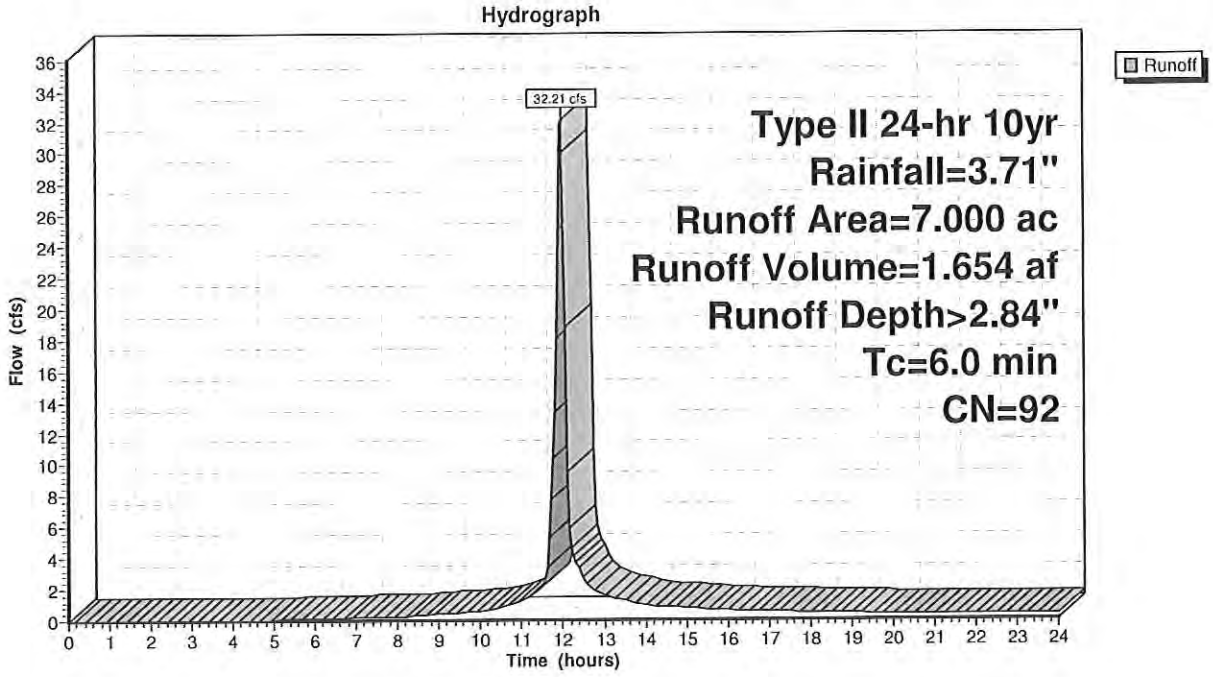
Runoff = 32.21 cfs @ 11.96 hrs, Volume= 1.654 af, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

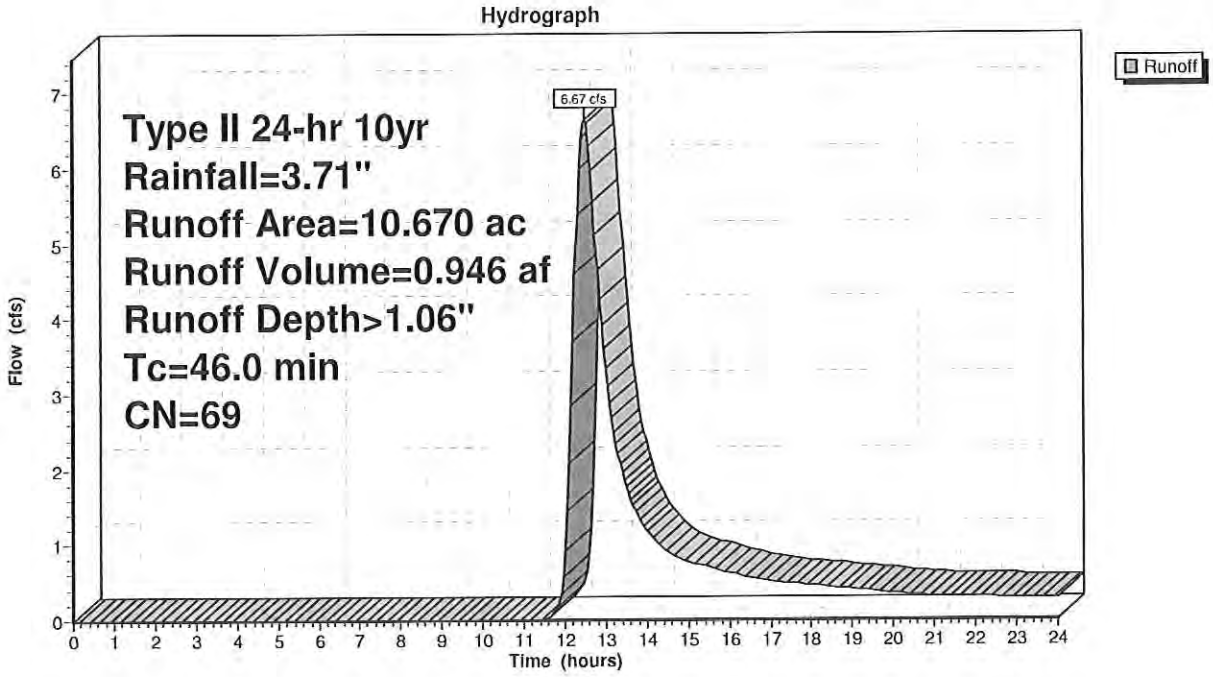
Runoff = 6.67 cfs @ 12.49 hrs, Volume= 0.946 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					Direct Entry,

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

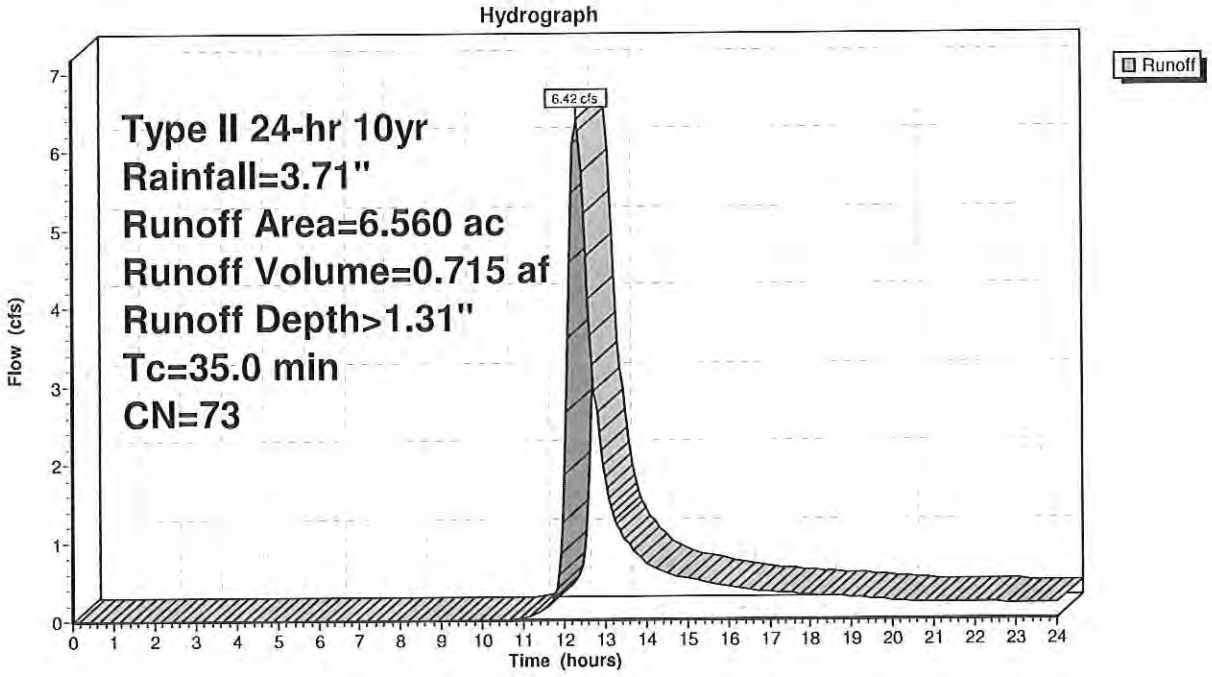
Runoff = 6.42 cfs @ 12.32 hrs, Volume= 0.715 af, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.71"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					Direct Entry,

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 1.77" for 10yr event
Inflow = 32.89 cfs @ 11.97 hrs, Volume= 2.601 af
Outflow = 2.24 cfs @ 13.93 hrs, Volume= 1.103 af, Atten= 93%, Lag= 118.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 2.24 cfs @ 13.93 hrs, Volume= 1.103 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 840.42' @ 13.93 hrs Surf.Area= 71,893 sf Storage= 72,188 cf

Plug-Flow detention time= 339.4 min calculated for 1.103 af (42% of inflow)
Center-of-Mass det. time= 202.0 min (1,028.6 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

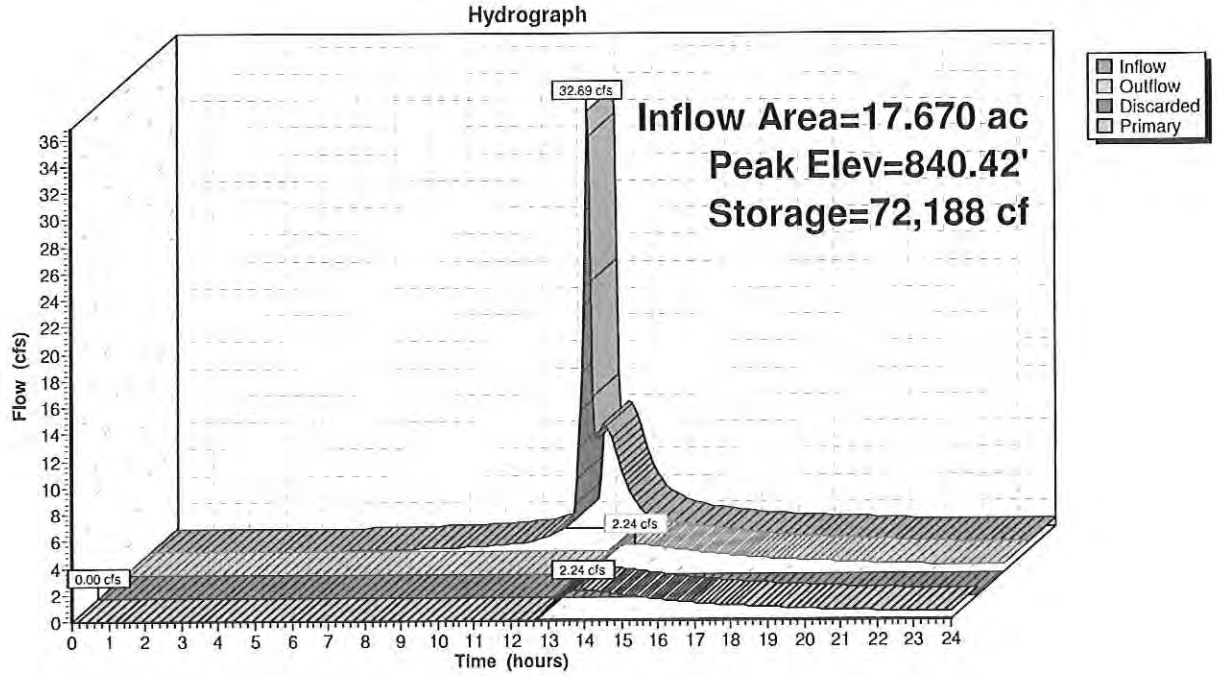
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=2.23 cfs @ 13.93 hrs HW=840.42' (Free Discharge)
└**1=Culvert** (Passes 2.23 cfs of 8.65 cfs potential flow)
  └**2=Orifice/Grate** (Weir Controls 2.23 cfs @ 1.34 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

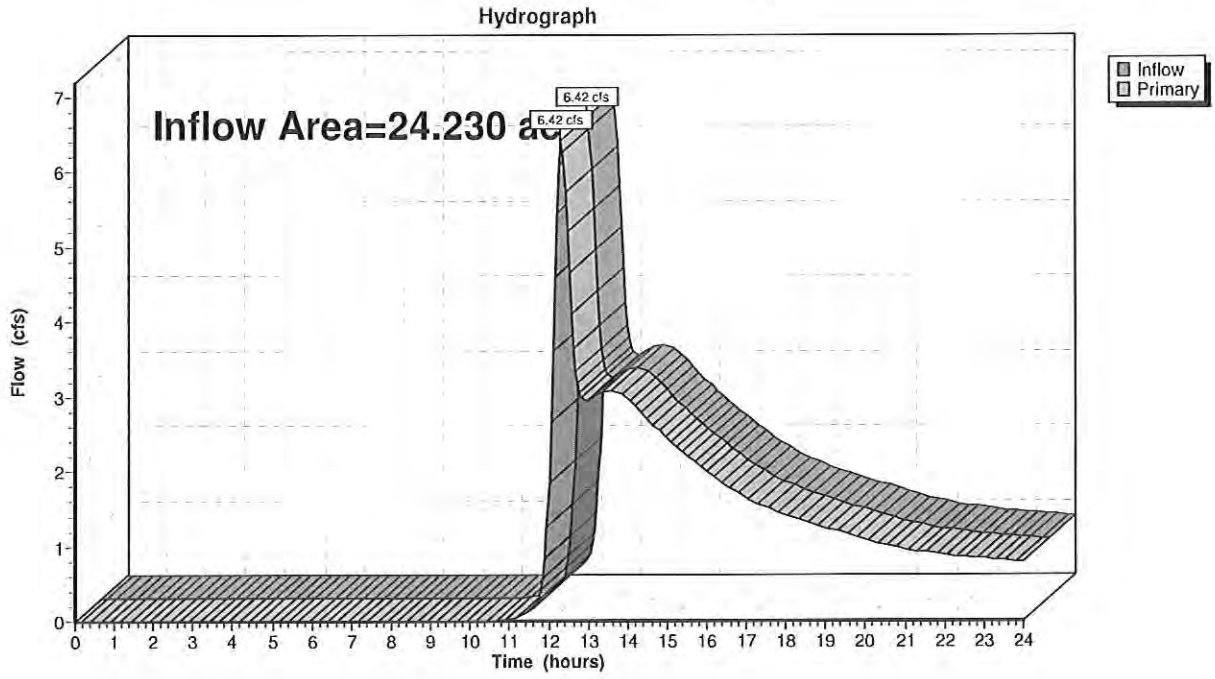


Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.90" for 10yr event
Inflow = 6.42 cfs @ 12.32 hrs, Volume= 1.818 af
Primary = 6.42 cfs @ 12.32 hrs, Volume= 1.818 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 8L: North Discharge



Summary for Subcatchment 3S: POST-WEST

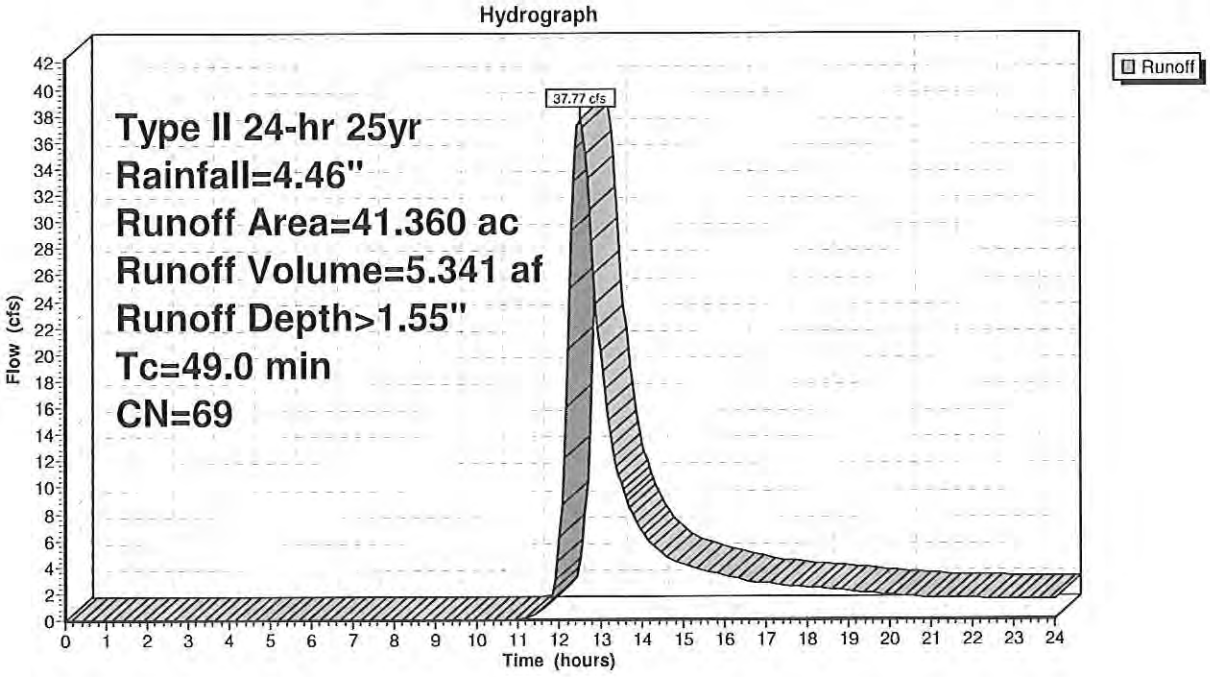
Runoff = 37.77 cfs @ 12.51 hrs, Volume= 5.341 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

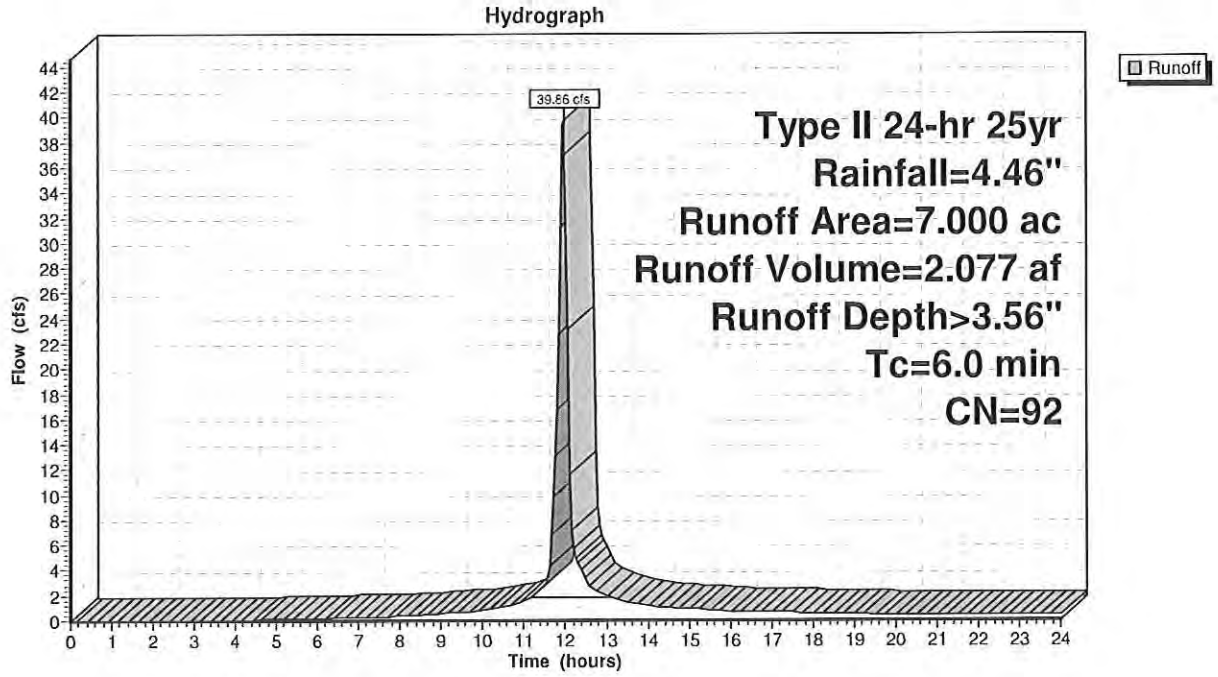
Runoff = 39.86 cfs @ 11.96 hrs, Volume= 2.077 af, Depth> 3.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

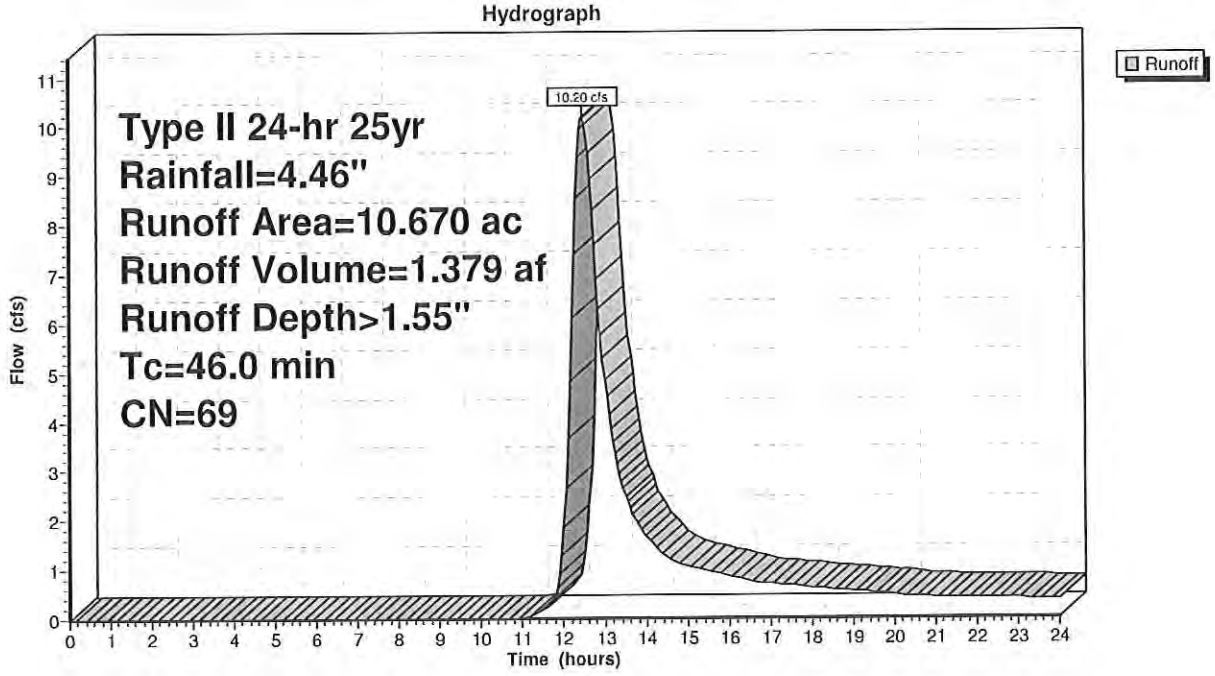
Runoff = 10.20 cfs @ 12.47 hrs, Volume= 1.379 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					Direct Entry,

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

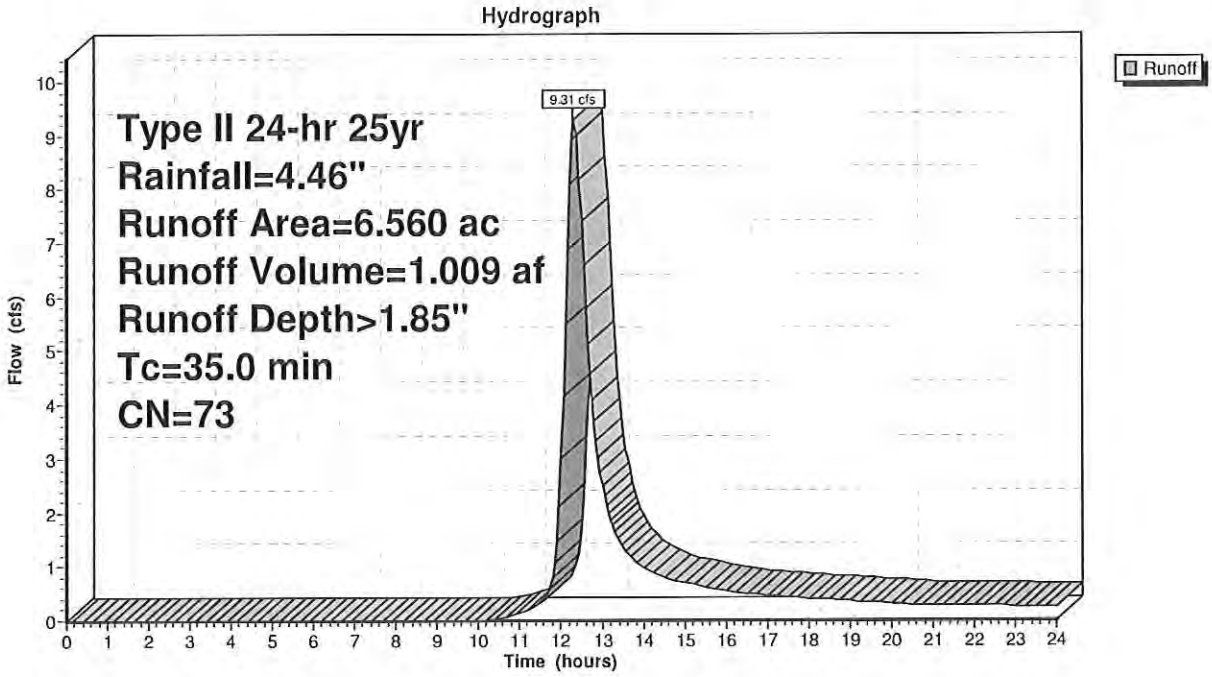
Runoff = 9.31 cfs @ 12.32 hrs, Volume= 1.009 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr Rainfall=4.46"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					**Direct Entry,**

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 2.35" for 25yr event
Inflow = 41.29 cfs @ 11.97 hrs, Volume= 3.456 af
Outflow = 5.79 cfs @ 13.13 hrs, Volume= 1.939 af, Atten= 86%, Lag= 69.9 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 5.79 cfs @ 13.13 hrs, Volume= 1.939 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 840.57' @ 13.13 hrs Surf.Area= 76,520 sf Storage= 83,179 cf

Plug-Flow detention time= 264.5 min calculated for 1.935 af (56% of inflow)
Center-of-Mass det. time= 145.2 min (967.3 - 822.1)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

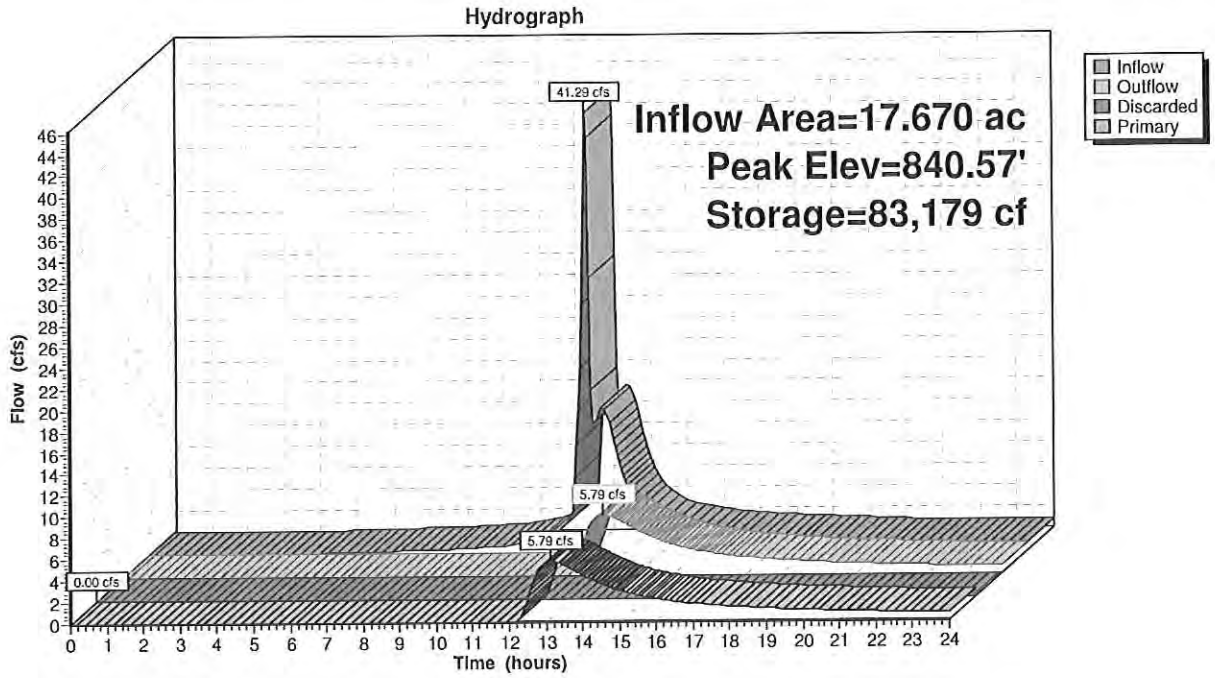
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=5.78 cfs @ 13.13 hrs HW=840.56' (Free Discharge)
└**1=Culvert** (Passes 5.78 cfs of 8.84 cfs potential flow)
  └**2=Orifice/Grate** (Weir Controls 5.78 cfs @ 1.84 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

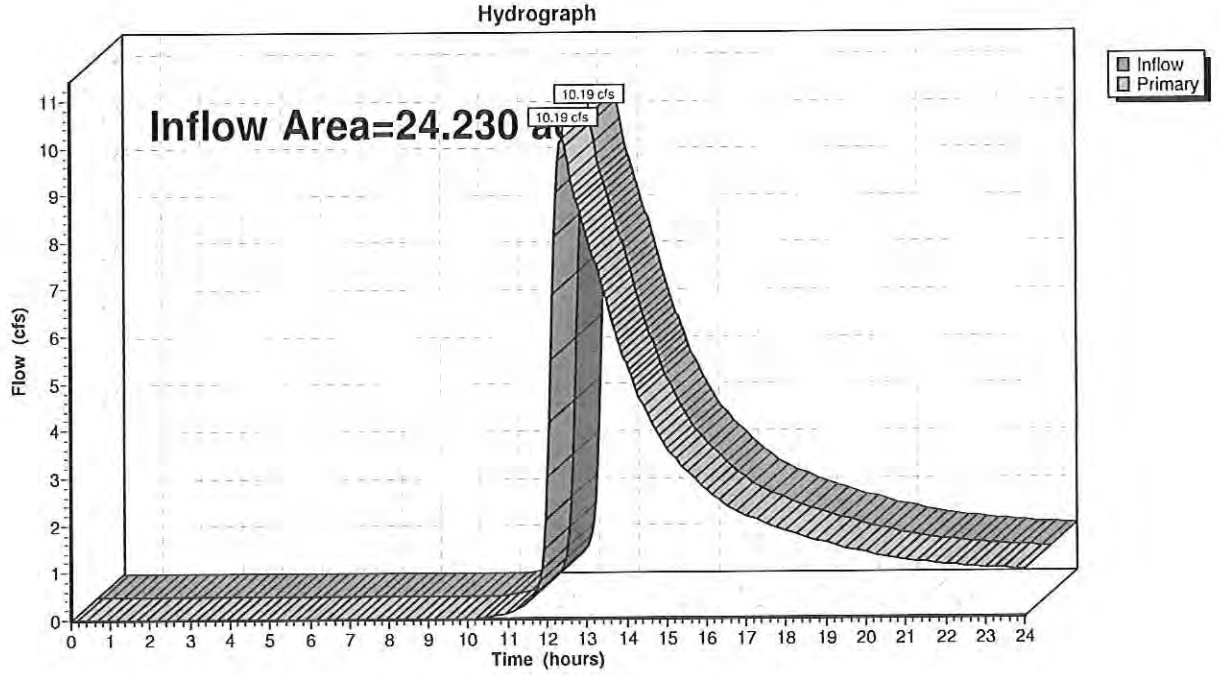


Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 1.46" for 25yr event
Inflow = 10.19 cfs @ 12.40 hrs, Volume= 2.949 af
Primary = 10.19 cfs @ 12.40 hrs, Volume= 2.949 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 8L: North Discharge



Summary for Subcatchment 3S: POST-WEST

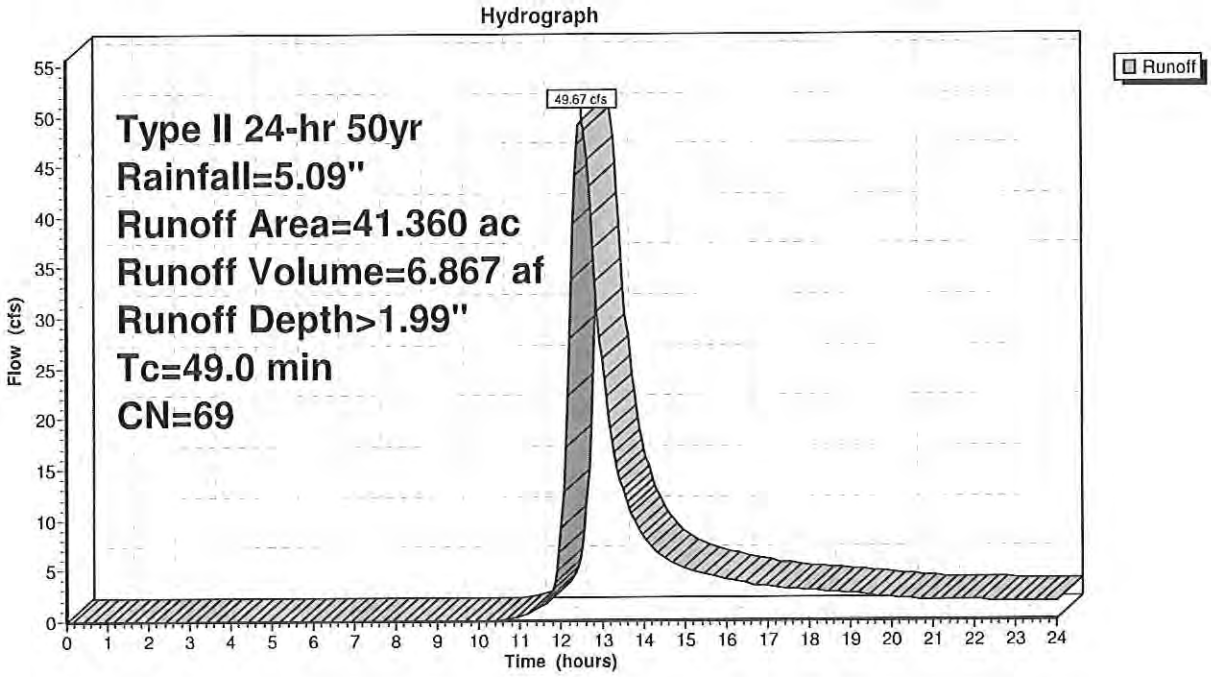
Runoff = 49.67 cfs @ 12.50 hrs, Volume= 6.867 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

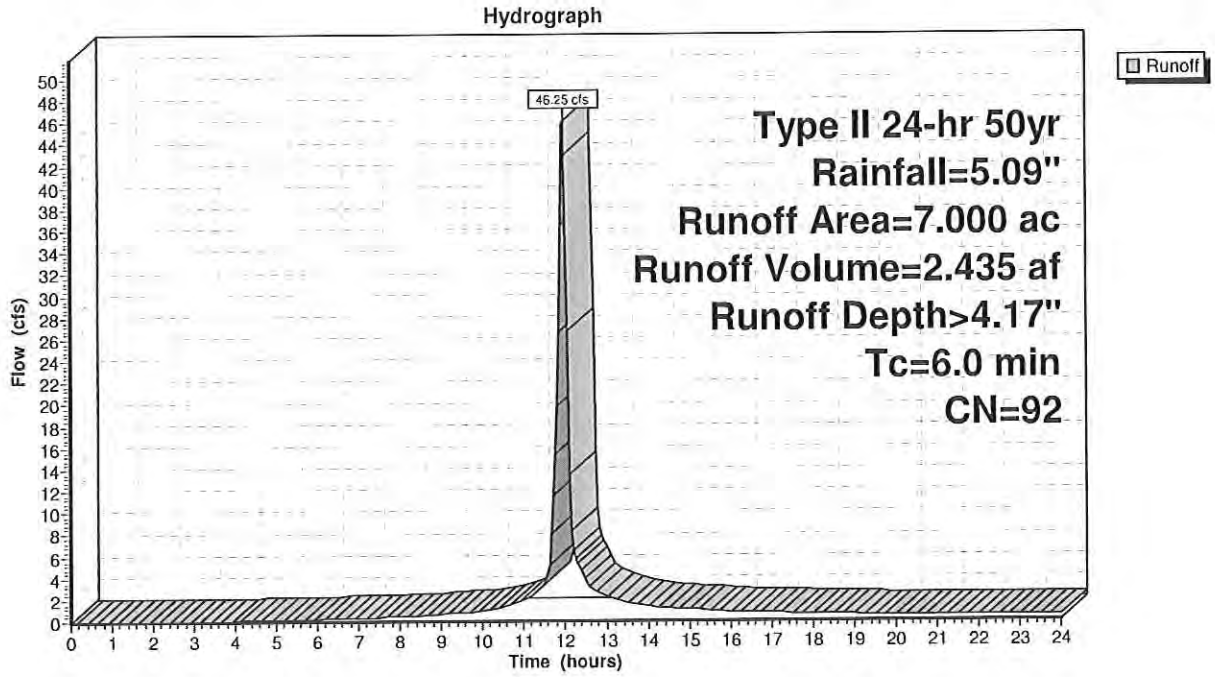
Runoff = 46.25 cfs @ 11.96 hrs, Volume= 2.435 af, Depth> 4.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

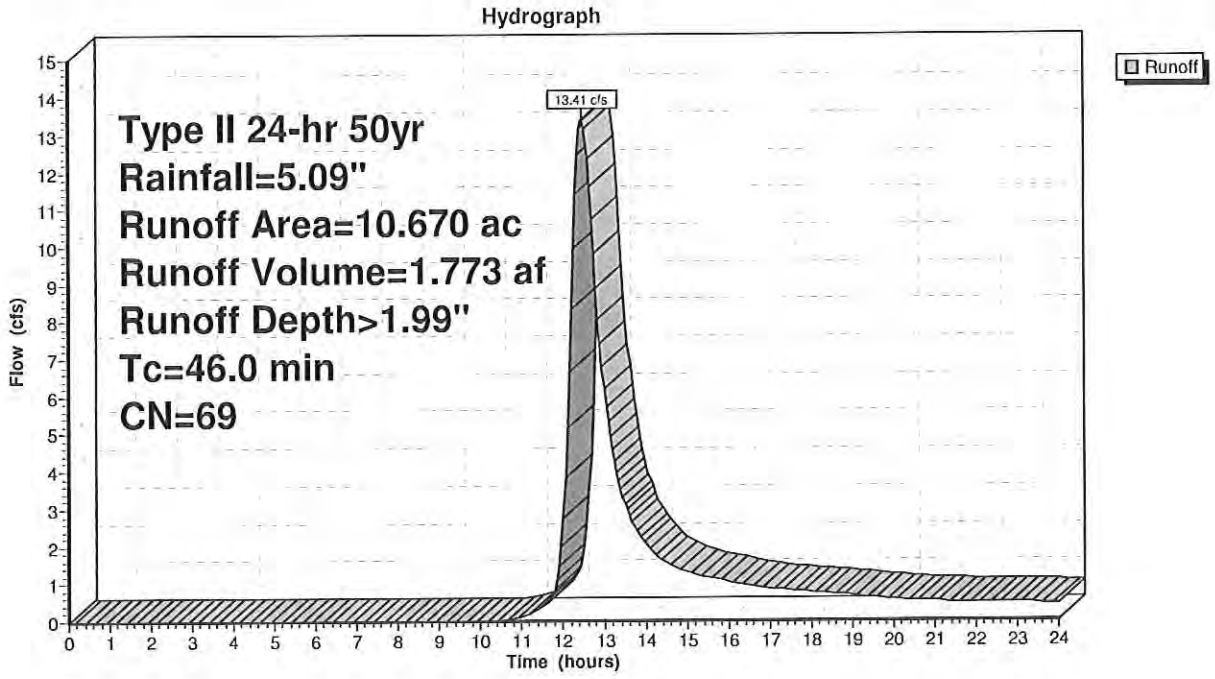
Runoff = 13.41 cfs @ 12.46 hrs, Volume= 1.773 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					Direct Entry,

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

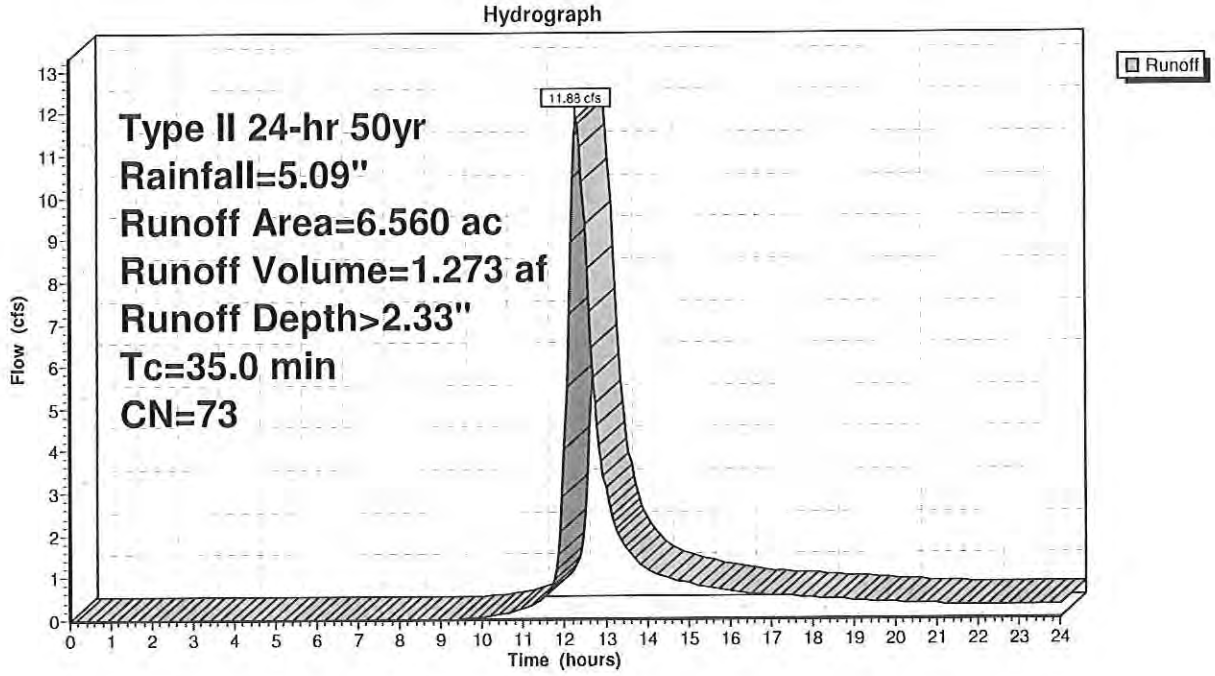
Runoff = 11.88 cfs @ 12.31 hrs, Volume= 1.273 af, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr Rainfall=5.09"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					Direct Entry,

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 2.86" for 50yr event
Inflow = 48.42 cfs @ 11.97 hrs, Volume= 4.208 af
Outflow = 8.99 cfs @ 12.96 hrs, Volume= 2.676 af, Atten= 81%, Lag= 59.8 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 8.99 cfs @ 12.96 hrs, Volume= 2.676 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 840.69' @ 12.96 hrs Surf.Area= 80,407 sf Storage= 92,943 cf

Plug-Flow detention time= 231.6 min calculated for 2.676 af (64% of inflow)
Center-of-Mass det. time= 121.6 min (940.4 - 818.8)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

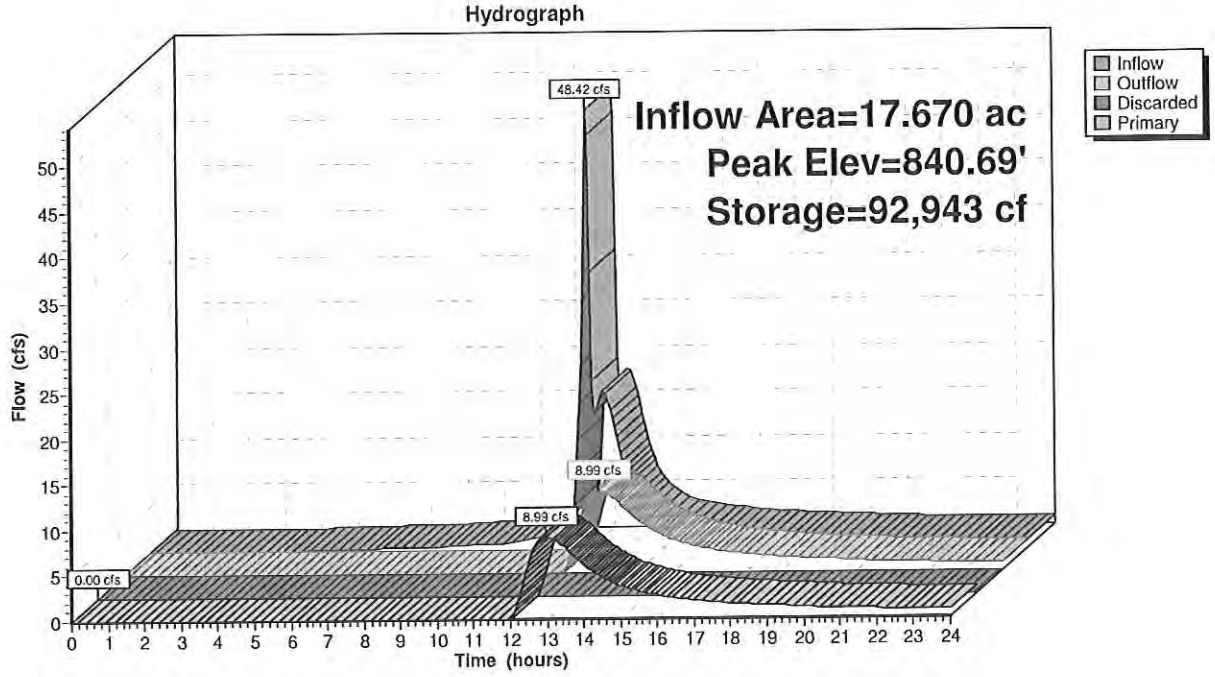
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
↑**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=8.99 cfs @ 12.96 hrs HW=840.69' (Free Discharge)
↑**1=Culvert** (Barrel Controls 8.99 cfs @ 7.33 fps)
↑**2=Orifice/Grate** (Passes 8.99 cfs of 9.52 cfs potential flow)
3=Orifice/Grate (Controls 0.00 cfs)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

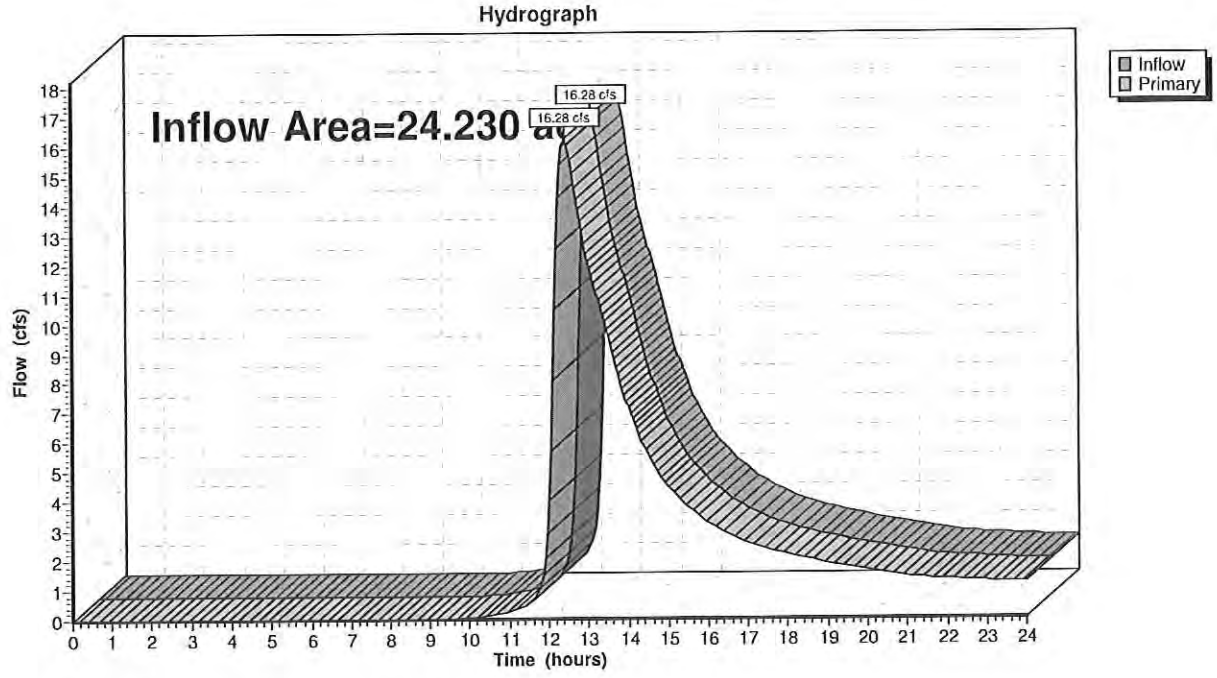


Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 1.96" for 50yr event
Inflow = 16.28 cfs @ 12.42 hrs, Volume= 3.948 af
Primary = 16.28 cfs @ 12.42 hrs, Volume= 3.948 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 8L: North Discharge



Summary for Subcatchment 3S: POST-WEST

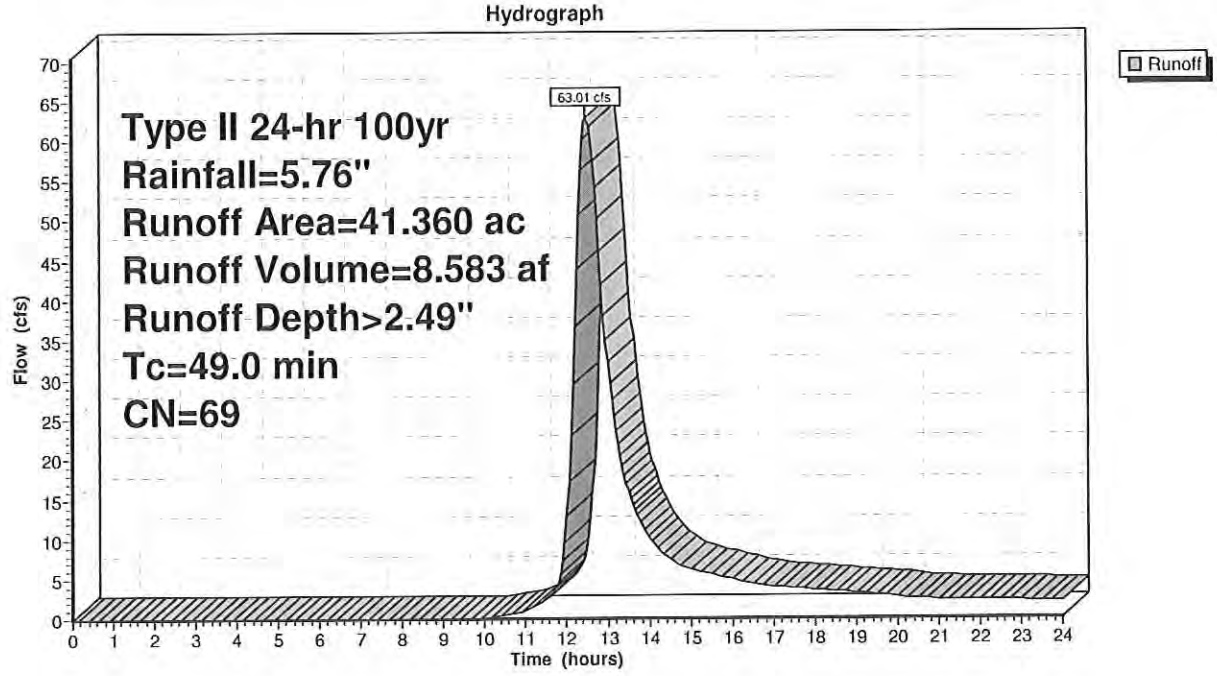
Runoff = 63.01 cfs @ 12.50 hrs, Volume= 8.583 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

	Area (ac)	CN	Description
*	41.360	69	
	41.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.0					**Direct Entry,**

Subcatchment 3S: POST-WEST



Summary for Subcatchment 4S: POST-BASIN1

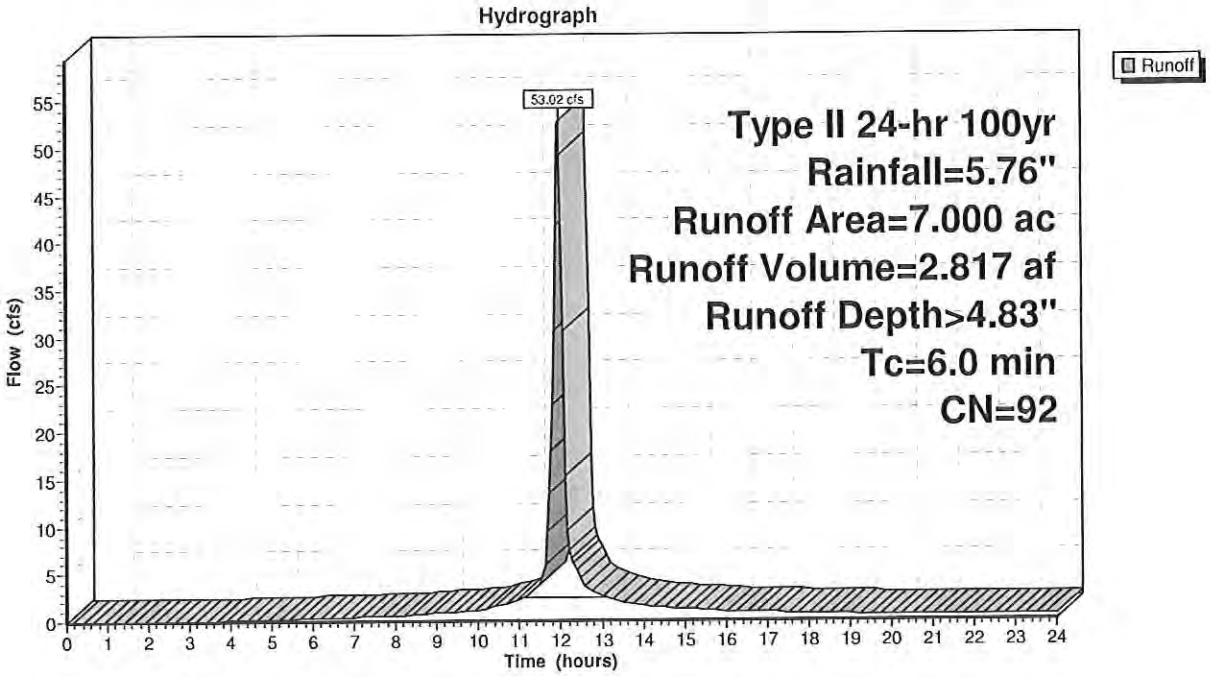
Runoff = 53.02 cfs @ 11.96 hrs, Volume= 2.817 af, Depth> 4.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

	Area (ac)	CN	Description
*	7.000	92	
	7.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 4S: POST-BASIN1



Summary for Subcatchment 5S: POST-BASIN2

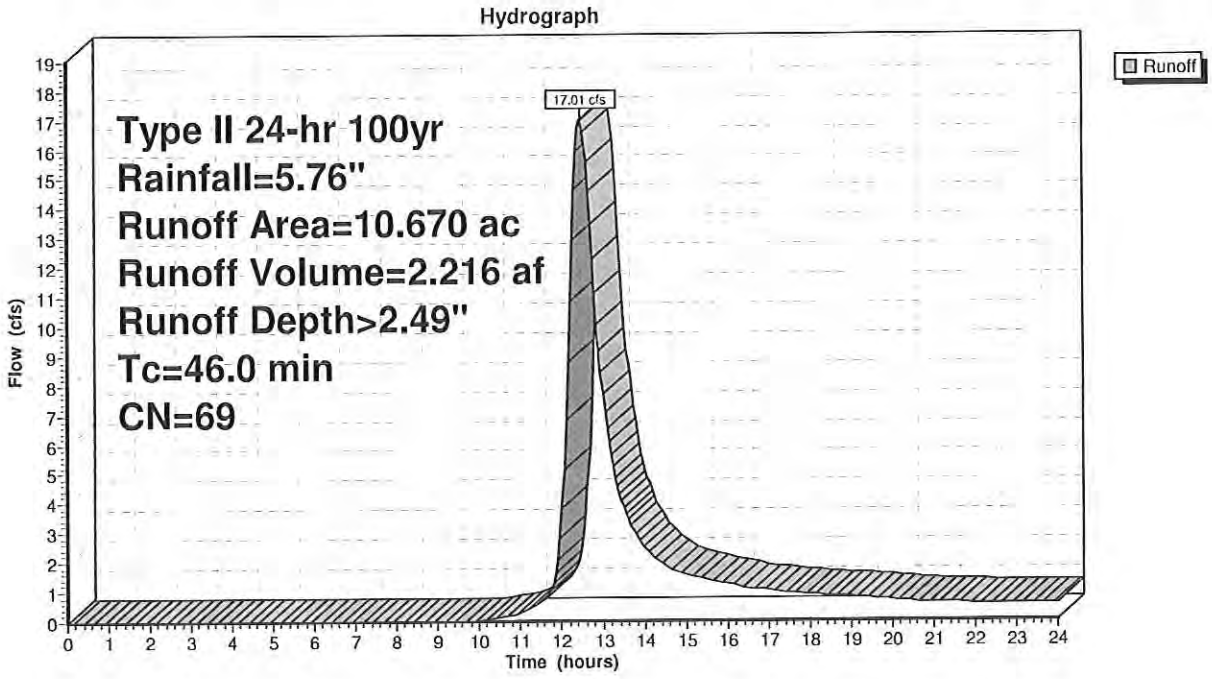
Runoff = 17.01 cfs @ 12.46 hrs, Volume= 2.216 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

	Area (ac)	CN	Description
*	10.670	69	
	10.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0					Direct Entry,

Subcatchment 5S: POST-BASIN2



Summary for Subcatchment 6S: POST-NORTH

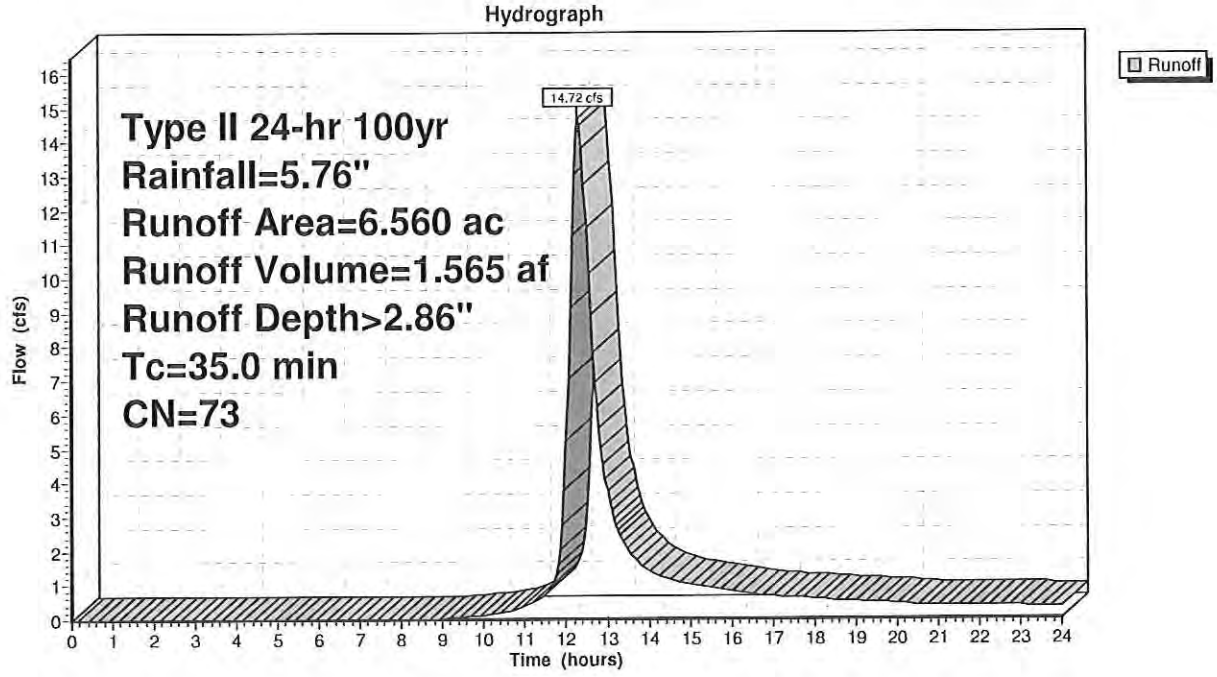
Runoff = 14.72 cfs @ 12.31 hrs, Volume= 1.565 af, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.76"

	Area (ac)	CN	Description
*	6.560	73	
	6.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.0					Direct Entry,

Subcatchment 6S: POST-NORTH



Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 3.42" for 100yr event
Inflow = 56.05 cfs @ 11.97 hrs, Volume= 5.033 af
Outflow = 9.22 cfs @ 13.08 hrs, Volume= 3.485 af, Atten= 84%, Lag= 66.9 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 9.22 cfs @ 13.08 hrs, Volume= 3.485 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 840.88' @ 13.08 hrs Surf.Area= 86,414 sf Storage= 108,982 cf

Plug-Flow detention time= 215.9 min calculated for 3.485 af (69% of inflow)
Center-of-Mass det. time= 114.5 min (930.3 - 815.8)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

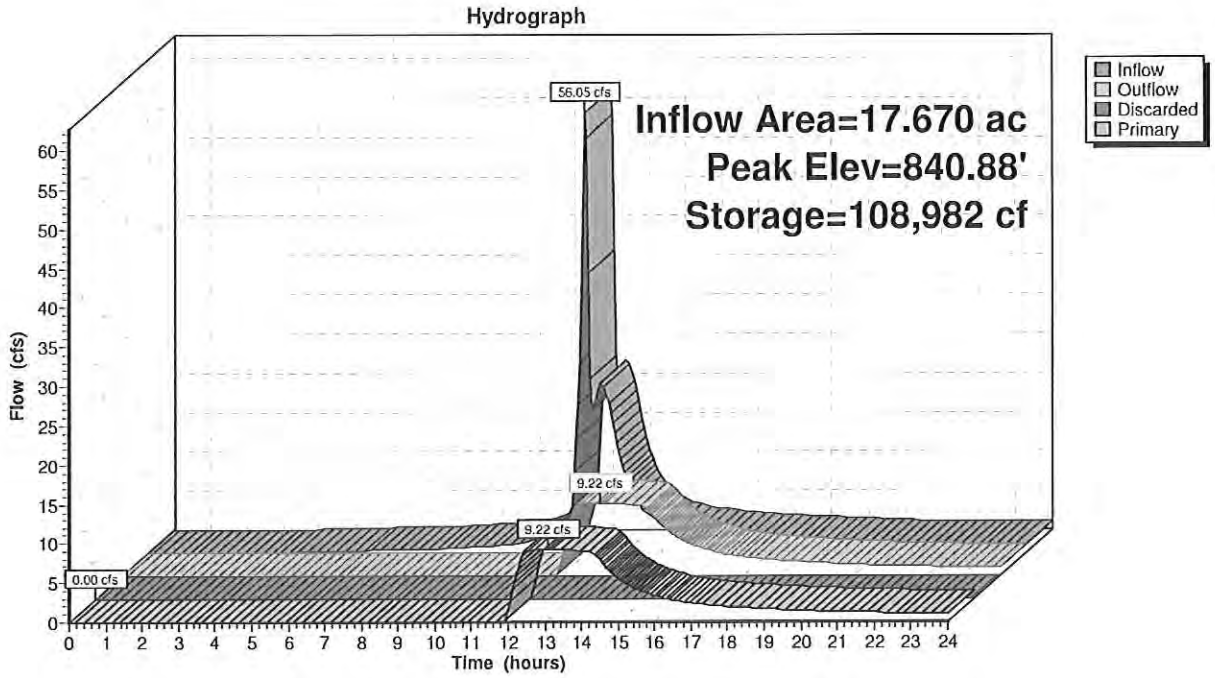
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=9.22 cfs @ 13.08 hrs HW=840.88' (Free Discharge)
└**1=Culvert** (Barrel Controls 9.22 cfs @ 7.52 fps)
  └**2=Orifice/Grate** (Passes 9.22 cfs of 16.41 cfs potential flow)
    └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin

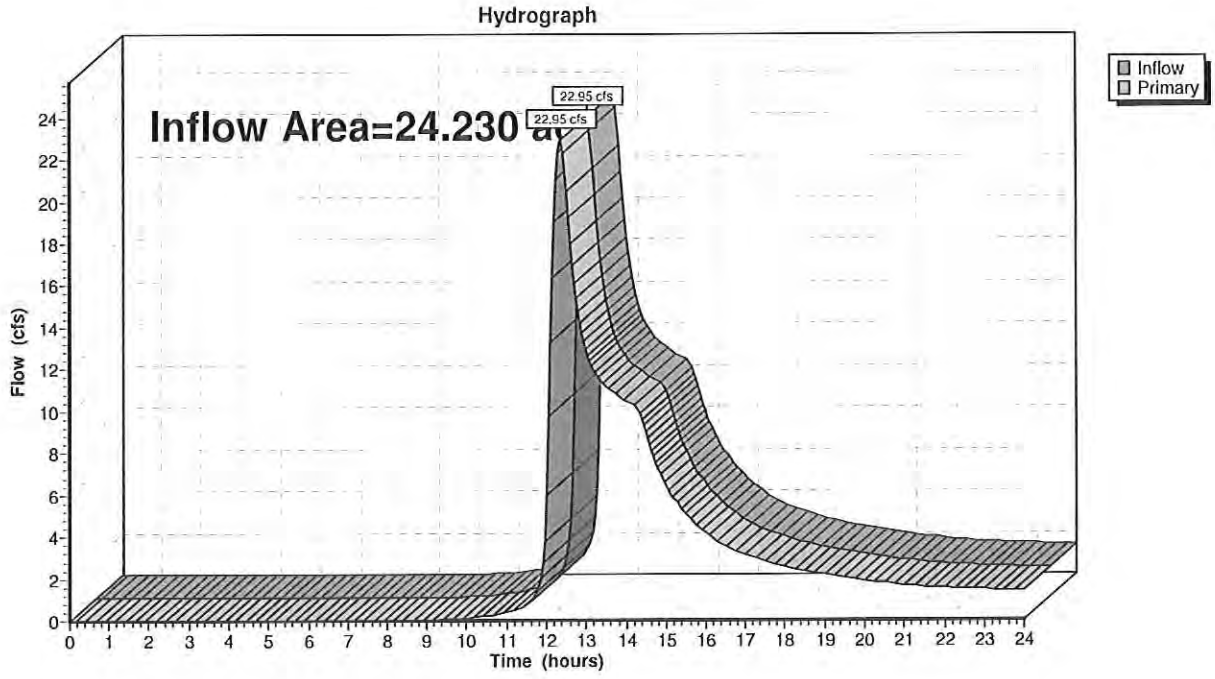


Summary for Link 8L: North Discharge

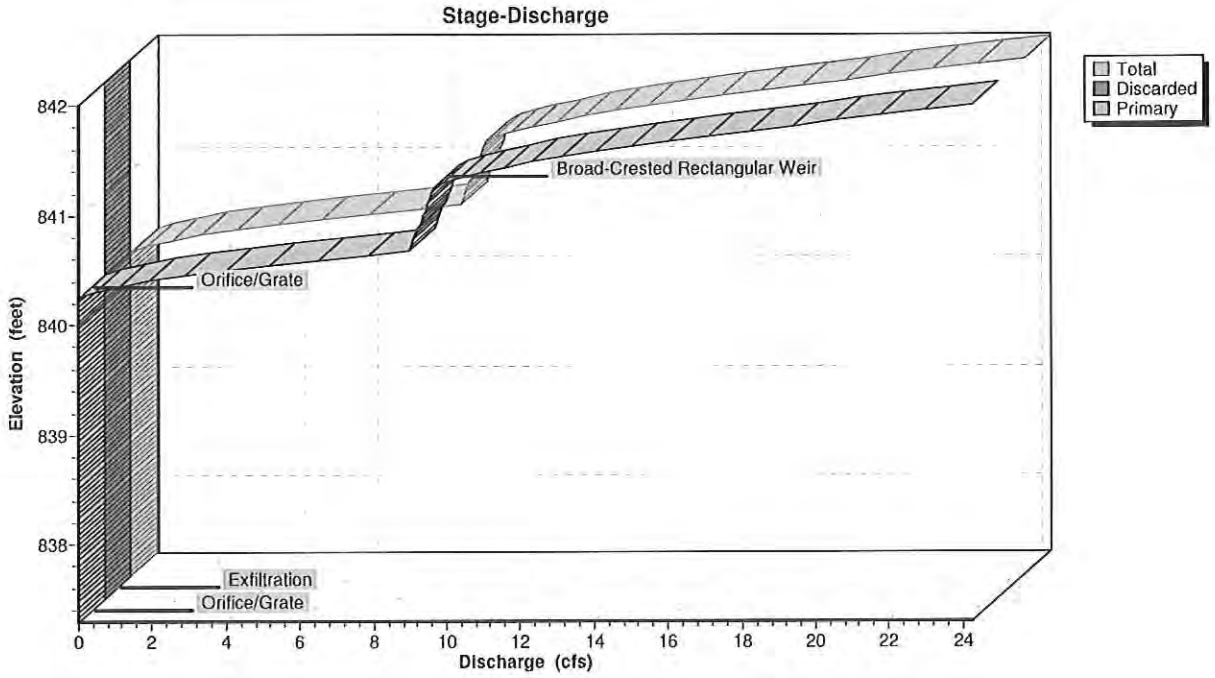
Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 2.50" for 100yr event
Inflow = 22.95 cfs @ 12.37 hrs, Volume= 5.050 af
Primary = 22.95 cfs @ 12.37 hrs, Volume= 5.050 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

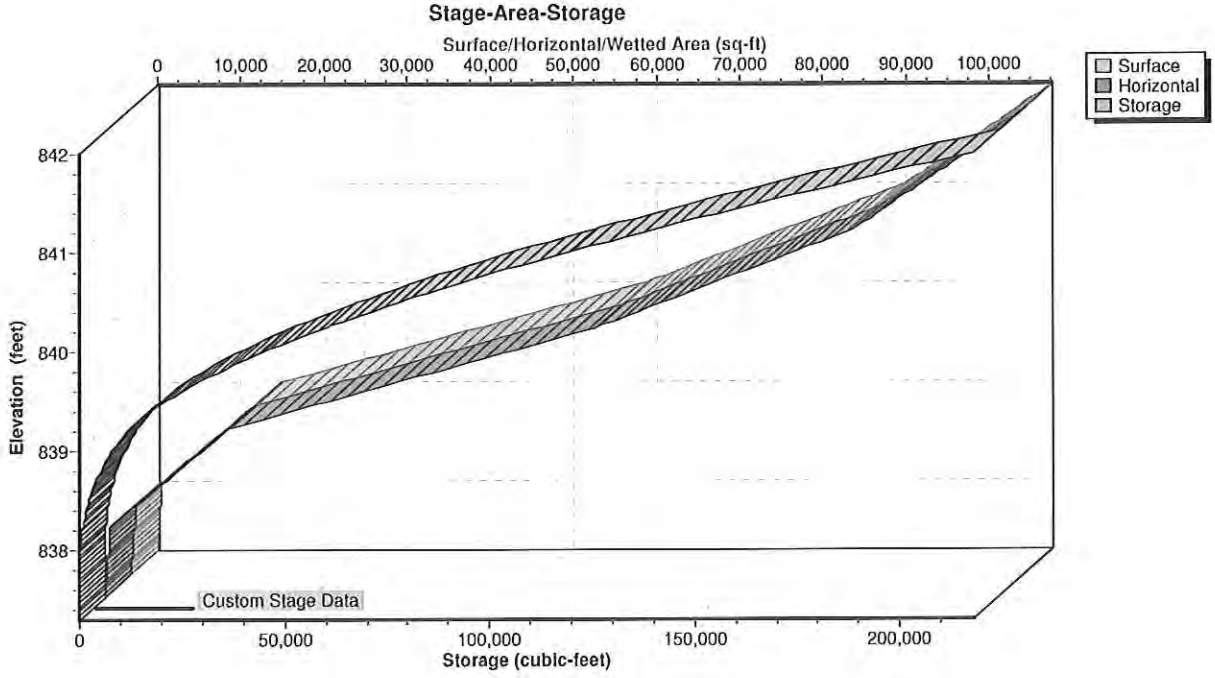
Link 8L: North Discharge



Pond 7P: Infiltration/Detention Basin



Pond 7P: Infiltration/Detention Basin



Stage-Discharge for Pond 7P: Infiltration/Detention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
837.30	0.00	**0.00**	0.00
837.35	0.00	0.00	0.00
837.40	0.00	0.00	0.00
837.45	0.00	0.00	0.00
837.50	0.00	0.00	0.00
837.55	0.00	0.00	0.00
837.60	0.00	0.00	0.00
837.65	0.00	0.00	0.00
837.70	0.00	0.00	0.00
837.75	0.00	0.00	0.00
837.80	0.00	0.00	0.00
837.85	0.00	0.00	0.00
837.90	0.00	0.00	0.00
837.95	0.00	0.00	0.00
838.00	0.00	0.00	0.00
838.05	0.00	0.00	0.00
838.10	0.00	0.00	0.00
838.15	0.00	0.00	0.00
838.20	0.00	0.00	0.00
838.25	0.00	0.00	0.00
838.30	0.00	0.00	0.00
838.35	0.00	0.00	0.00
838.40	0.00	0.00	0.00
838.45	0.00	0.00	0.00
838.50	0.00	0.00	0.00
838.55	0.00	0.00	0.00
838.60	0.00	0.00	0.00
838.65	0.00	0.00	0.00
838.70	0.00	0.00	0.00
838.75	0.00	0.00	0.00
838.80	0.00	0.00	0.00
838.85	0.00	0.00	0.00
838.90	0.00	0.00	0.00
838.95	0.00	0.00	0.00
839.00	0.00	0.00	0.00
839.05	0.00	0.00	0.00
839.10	0.00	0.00	0.00
839.15	0.00	0.00	0.00
839.20	0.00	0.00	0.00
839.25	0.00	0.00	0.00
839.30	0.00	0.00	0.00
839.35	0.00	0.00	0.00
839.40	0.00	0.00	0.00
839.45	0.00	0.00	0.00
839.50	0.00	0.00	0.00
839.55	0.00	0.00	0.00
839.60	0.00	0.00	0.00
839.65	0.00	0.00	0.00
839.70	0.00	0.00	0.00
839.75	0.00	0.00	0.00
839.80	0.00	0.00	0.00
839.85	0.00	0.00	0.00
839.90	0.00	0.00	0.00
839.95	0.00	0.00	0.00
840.00	0.00	0.00	0.00
840.05	0.00	0.00	0.00
840.10	0.00	0.00	0.00
840.15	0.00	0.00	0.00
840.20	0.00	0.00	0.00
840.25	0.00	0.00	0.00
840.30	0.37	0.00	0.37
840.35	1.03	0.00	1.03
840.40	1.90	0.00	1.90
840.45	2.92	0.00	2.92
840.50	4.09	0.00	4.09
840.55	5.37	0.00	5.37
840.60	6.77	0.00	6.77
840.65	8.27	0.00	8.27
840.70	9.01	0.00	9.01
840.75	9.07	0.00	9.07
840.80	9.13	0.00	9.13
840.85	9.19	0.00	9.19
840.90	9.25	0.00	9.25
840.95	9.30	0.00	9.30
841.00	9.36	0.00	9.36
841.05	9.42	0.00	9.42
841.10	9.48	0.00	9.48
841.15	9.54	0.00	9.54
841.20	9.59	0.00	9.59
841.25	9.65	0.00	9.65
841.30	9.95	0.00	9.95
841.35	10.44	0.00	10.44
841.40	11.07	0.00	11.07
841.45	11.79	0.00	11.79
841.50	12.62	0.00	12.62
841.55	13.52	0.00	13.52
841.60	14.50	0.00	14.50
841.65	15.56	0.00	15.56
841.70	16.67	0.00	16.67
841.75	17.84	0.00	17.84
841.80	19.07	0.00	19.07
841.85	20.35	0.00	20.35
841.90	21.62	0.00	21.62
841.95	22.93	0.00	22.93
842.00	**24.26**	0.00	**24.26**

Stage-Area-Storage for Pond 7P: Infiltration/Detention Basin

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
837.30	0	0	0
837.35	39	39	1
837.40	78	78	4
837.45	117	117	9
837.50	156	156	16
837.55	195	195	24
837.60	234	234	35
837.65	273	273	48
837.70	312	312	62
837.75	351	351	79
837.80	390	390	98
837.85	429	429	118
837.90	468	468	140
837.95	507	507	165
838.00	546	546	191
838.05	1,270	1,270	237
838.10	1,994	1,994	318
838.15	2,719	2,719	436
838.20	3,443	3,443	590
838.25	4,167	4,167	780
838.30	4,891	4,891	1,007
838.35	5,615	5,615	1,269
838.40	6,340	6,340	1,568
838.45	7,064	7,064	1,903
838.50	7,788	7,788	2,275
838.55	8,512	8,512	2,682
838.60	9,236	9,236	3,126
838.65	9,961	9,961	3,606
838.70	10,685	10,685	4,122
838.75	11,409	11,409	4,674
838.80	12,133	12,133	5,263
838.85	12,857	12,857	5,888
838.90	13,582	13,582	6,549
838.95	14,306	14,306	7,246
839.00	15,030	15,030	7,979
839.05	17,222	17,222	8,785
839.10	19,414	19,414	9,701
839.15	21,606	21,606	10,727
839.20	23,798	23,798	11,862
839.25	25,990	25,990	13,107
839.30	28,182	28,182	14,461
839.35	30,374	30,374	15,925
839.40	32,566	32,566	17,498
839.45	34,758	34,758	19,181
839.50	36,950	36,950	20,974
839.55	39,142	39,142	22,876
839.60	41,334	41,334	24,888
839.65	43,526	43,526	27,010
839.70	45,718	45,718	29,241
839.75	47,910	47,910	31,582
839.80	50,102	50,102	34,032

Stage-Area-Storage for Pond 7P: Infiltration/Detention Basin (continued)

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
839.85	52,294	52,294	36,592
839.90	54,486	54,486	39,261
839.95	56,678	56,678	42,040
840.00	58,870	58,870	44,929
840.05	60,432	60,432	47,912
840.10	61,994	61,994	50,972
840.15	63,556	63,556	54,111
840.20	65,117	65,117	57,328
840.25	66,679	66,679	60,623
840.30	68,241	68,241	63,996
840.35	69,803	69,803	67,447
840.40	71,365	71,365	70,976
840.45	72,927	72,927	74,583
840.50	74,489	74,489	78,269
840.55	76,050	76,050	82,032
840.60	77,612	77,612	85,874
840.65	79,174	79,174	89,793
840.70	80,736	80,736	93,791
840.75	82,298	82,298	97,867
840.80	83,860	83,860	102,021
840.85	85,421	85,421	106,253
840.90	86,983	86,983	110,563
840.95	88,545	88,545	114,951
841.00	90,107	90,107	119,418
841.05	90,980	90,980	123,945
841.10	91,853	91,853	128,516
841.15	92,726	92,726	133,130
841.20	93,600	93,600	137,788
841.25	94,473	94,473	142,490
841.30	95,346	95,346	147,236
841.35	96,219	96,219	152,025
841.40	97,092	97,092	156,857
841.45	97,965	97,965	161,734
841.50	98,839	98,839	166,654
841.55	99,712	99,712	171,618
841.60	100,585	100,585	176,625
841.65	101,458	101,458	181,676
841.70	102,331	102,331	186,771
841.75	103,204	103,204	191,909
841.80	104,077	104,077	197,091
841.85	104,951	104,951	202,317
841.90	105,824	105,824	207,586
841.95	106,697	106,697	212,899
842.00	**107,570**	**107,570**	**218,256**

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.43" for 1yr event
Inflow = 2.01 cfs @ 12.38 hrs, Volume= 0.871 af
Primary = 2.01 cfs @ 12.38 hrs, Volume= 0.871 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.52" for 2yr event
Inflow = 3.18 cfs @ 12.35 hrs, Volume= 1.056 af
Primary = 3.18 cfs @ 12.35 hrs, Volume= 1.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 0.96" for 10yr event
Inflow = 7.07 cfs @ 12.33 hrs, Volume= 1.930 af
Primary = 7.07 cfs @ 12.33 hrs, Volume= 1.930 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 1.51" for 25yr event
Inflow = 10.00 cfs @ 12.32 hrs, Volume= 3.045 af
Primary = 10.00 cfs @ 12.32 hrs, Volume= 3.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 2.00" for 50yr event
Inflow = 14.36 cfs @ 12.41 hrs, Volume= 4.037 af
Primary = 14.36 cfs @ 12.41 hrs, Volume= 4.037 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link 8L: North Discharge

Inflow Area = 24.230 ac, 0.00% Impervious, Inflow Depth > 2.54" for 100yr event
Inflow = 21.06 cfs @ 12.41 hrs, Volume= 5.132 af
Primary = 21.06 cfs @ 12.41 hrs, Volume= 5.132 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 3.42" for 100yr event
Inflow = 56.05 cfs @ 11.97 hrs, Volume= 5.033 af
Outflow = 2.24 cfs @ 15.92 hrs, Volume= 1.455 af, Atten= 96%, Lag= 237.3 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 2.24 cfs @ 15.92 hrs, Volume= 1.455 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 841.47' @ 15.92 hrs Surf.Area= 98,336 sf Storage= 163,816 cf

Plug-Flow detention time= 439.5 min calculated for 1.455 af (29% of inflow)
Center-of-Mass det. time= 283.9 min (1,099.6 - 815.8)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert X 0.00** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration X 0.00 over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**4=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=2.23 cfs @ 15.92 hrs HW=841.47' (Free Discharge)
├**1=Culvert** (Controls 0.00 cfs)
│ └**2=Orifice/Grate** (Passes 0.00 cfs of 31.93 cfs potential flow)
│ └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 2.23 cfs @ 1.26 fps)

Summary for Pond 7P: Infiltration/Detention Basin

Inflow Area = 17.670 ac, 0.00% Impervious, Inflow Depth > 0.96" for 2yr event
Inflow = 20.47 cfs @ 11.97 hrs, Volume= 1.410 af
Outflow = 2.17 cfs @ 13.10 hrs, Volume= 1.329 af, Atten= 89%, Lag= 67.9 min
Discarded = 2.17 cfs @ 13.10 hrs, Volume= 1.329 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 839.60' @ 13.10 hrs Surf.Area= 41,423 sf Storage= 24,972 cf

Plug-Flow detention time= 158.8 min calculated for 1.329 af (94% of inflow)
Center-of-Mass det. time= 127.2 min (963.1 - 835.9)

Volume	Invert	Avail.Storage	Storage Description
#1	837.30'	218,256 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

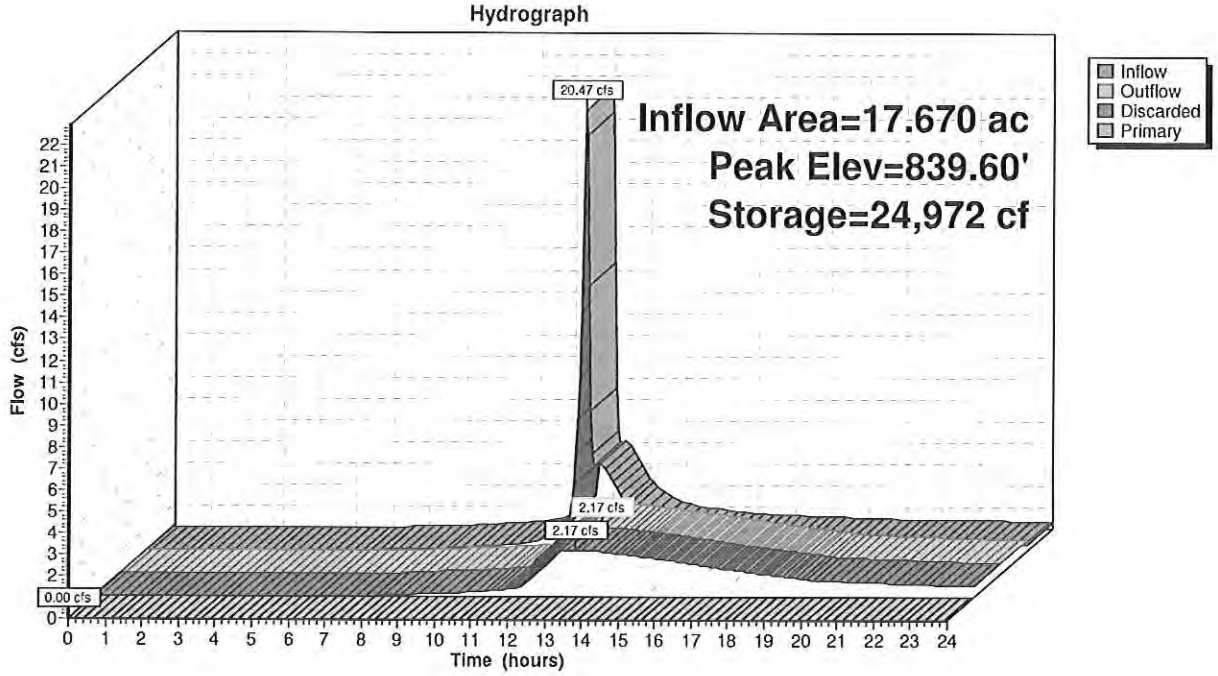
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
837.30	0	0	0
838.00	546	191	191
839.00	15,030	7,788	7,979
840.00	58,870	36,950	44,929
841.00	90,107	74,489	119,418
842.00	107,570	98,839	218,256

Device	Routing	Invert	Outlet Devices
#1	Primary	837.00'	**15.0" Round Culvert** L= 212.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 835.75' S= 0.0059 '/' Cc= 0.900 n= 0.010
#2	Device 1	840.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	837.30'	**4.0" Vert. Orifice/Grate X 0.00** C= 0.600
#4	Discarded	837.30'	**2.260 in/hr Exfiltration over Horizontal area above 837.30'** Excluded Horizontal area = 0 sf
#5	Primary	841.25'	**8.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

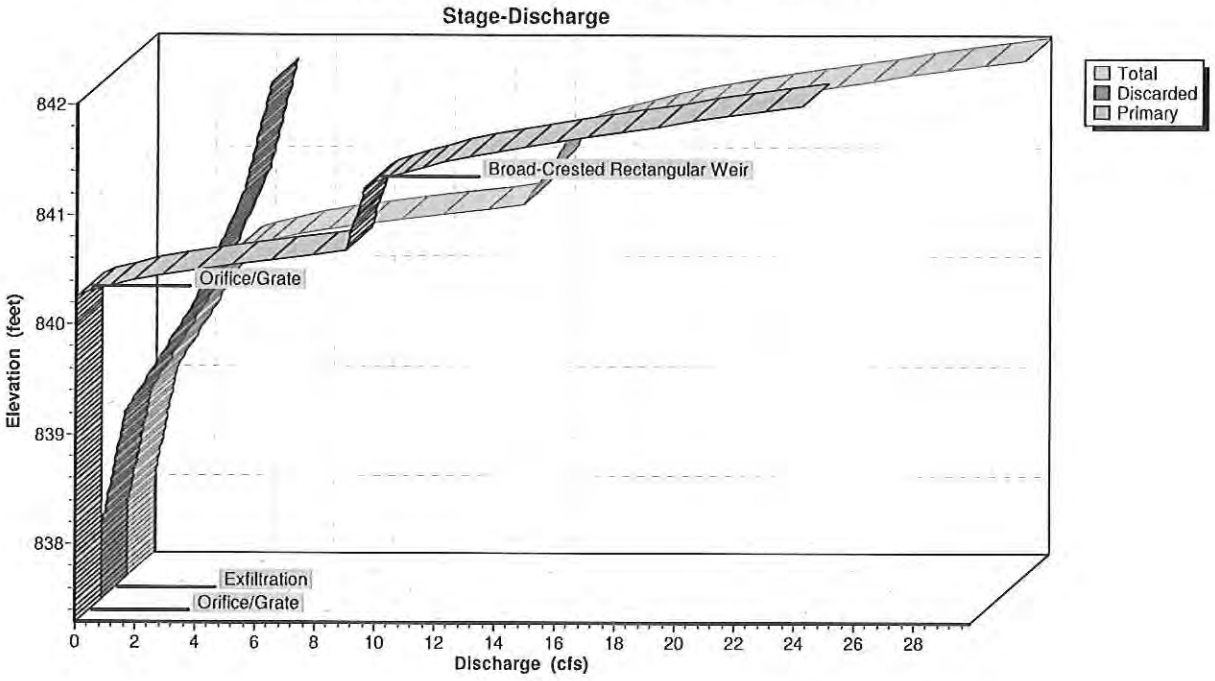
Discarded OutFlow Max=2.17 cfs @ 13.10 hrs HW=839.60' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 2.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=837.30' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 0.42 cfs potential flow)
  └**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Infiltration/Detention Basin



Pond 7P: Infiltration/Detention Basin



Stage-Discharge for Pond 7P: Infiltration/Detention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
837.30	0.00	0.00	0.00
837.35	0.00	0.00	0.00
837.40	0.00	0.00	0.00
837.45	0.01	0.01	0.00
837.50	0.01	0.01	0.00
837.55	0.01	0.01	0.00
837.60	0.01	0.01	0.00
837.65	0.01	0.01	0.00
837.70	0.02	0.02	0.00
837.75	0.02	0.02	0.00
837.80	0.02	0.02	0.00
837.85	0.02	0.02	0.00
837.90	0.02	0.02	0.00
837.95	0.03	0.03	0.00
838.00	0.03	0.03	0.00
838.05	0.07	0.07	0.00
838.10	0.10	0.10	0.00
838.15	0.14	0.14	0.00
838.20	0.18	0.18	0.00
838.25	0.22	0.22	0.00
838.30	0.26	0.26	0.00
838.35	0.29	0.29	0.00
838.40	0.33	0.33	0.00
838.45	0.37	0.37	0.00
838.50	0.41	0.41	0.00
838.55	0.45	0.45	0.00
838.60	0.48	0.48	0.00
838.65	0.52	0.52	0.00
838.70	0.56	0.56	0.00
838.75	0.60	0.60	0.00
838.80	0.63	0.63	0.00
838.85	0.67	0.67	0.00
838.90	0.71	0.71	0.00
838.95	0.75	0.75	0.00
839.00	0.79	0.79	0.00
839.05	0.90	0.90	0.00
839.10	1.02	1.02	0.00
839.15	1.13	1.13	0.00
839.20	1.24	1.24	0.00
839.25	1.36	1.36	0.00
839.30	1.47	1.47	0.00
839.35	1.59	1.59	0.00
839.40	1.70	1.70	0.00
839.45	1.82	1.82	0.00
839.50	1.93	1.93	0.00
839.55	2.05	2.05	0.00
839.60	2.16	2.16	0.00
839.65	2.28	2.28	0.00
839.70	2.39	2.39	0.00
839.75	2.51	2.51	0.00
839.80	2.62	2.62	0.00
839.85	2.74	2.74	0.00
839.90	2.85	2.85	0.00
839.95	2.97	2.97	0.00
840.00	3.08	3.08	0.00
840.05	3.16	3.16	0.00
840.10	3.24	3.24	0.00
840.15	3.32	3.32	0.00
840.20	3.41	3.41	0.00
840.25	3.49	3.49	0.00
840.30	3.94	3.57	0.37
840.35	4.69	3.65	1.03
840.40	5.63	3.73	1.90
840.45	6.74	3.82	2.92
840.50	7.98	3.90	4.09
840.55	9.35	3.98	5.37
840.60	10.83	4.06	6.77
840.65	12.41	4.14	8.27
840.70	13.23	4.22	9.01
840.75	13.37	4.31	9.07
840.80	13.51	4.39	9.13
840.85	13.65	4.47	9.19
840.90	13.80	4.55	9.25
840.95	13.94	4.63	9.30
841.00	14.08	4.71	9.36
841.05	14.18	4.76	9.42
841.10	14.28	4.81	9.48
841.15	14.39	4.85	9.54
841.20	14.49	4.90	9.59
841.25	14.59	4.94	9.65
841.30	14.94	4.99	9.95
841.35	15.48	5.03	10.44
841.40	16.14	5.08	11.07
841.45	16.92	5.13	11.79
841.50	17.79	5.17	12.62
841.55	18.74	5.22	13.52
841.60	19.77	5.26	14.50
841.65	20.87	5.31	15.56
841.70	22.02	5.35	16.67
841.75	23.24	5.40	17.84
841.80	24.51	5.44	19.07
841.85	25.84	5.49	20.35
841.90	27.16	5.54	21.62
841.95	28.51	5.58	22.93
842.00	**29.89**	**5.63**	**24.26**

5.4 Conveyance Facilities

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: ITC LAKE ERIE CONNECTOR, LLC
LOCATION: ERIE CONVERTER STATION, CONNEAUT TWP., ERIE CO.
PREPARED BY: ARH DATE: 6/22/2015
CHECKED BY: SRM DATE: 6/22/2015

CHANNEL OR CHANNEL SECTION		C1	C1			
TEMPORARY OR PERMANENT?	(T OR P)	T	P			
DESIGN STORM	(2, 5, OR 10 YR)	10	10	APPROX. 1/2 OF		
ACRES	(AC)	3.5	3.5	AREA "POST-BASIN"		FOR
MULTIPLIER	(1.6, 2.25, or 2.75)[1]					
Q_f (REQUIRED CAPACITY)	(CFS)	16.1	16.1			
Q (CALCULATED AT FLOW DEPTH d)	(CFS)					
PROTECTIVE LINING[2]		STRAW/NET	VEG. C			
n (MANNING'S COEFFICIENT)[2]		0.025	0.047			
V_a (ALLOWABLE VELOCITY)	(FPS)					
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.95	1.19			
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.45	1.0			
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.26	0.19			
CHANNEL BOTTOM WIDTH	(FT)	4.00	4.00			
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1			
D (TOTAL DEPTH)	(FT)	2.10	2.10			
CHANNEL TOP WIDTH @ D	(FT)	16.60	16.60			
d (CALCULATED FLOW DEPTH)	(FT)	0.84	1.56			
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	9.03	13.35			
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4.8	7.6			
d_{50} STONE SIZE	(IN)					
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	5.47	13.52			
R (HYDRAULIC RADIUS)		0.59	0.98			
S (BED SLOPE)[3]	(FT/FT)	0.005	0.005			
S_c (CRITICAL SLOPE)	(FT/FT)	0.012	0.14			
$.7S_c$	(FT/FT)	0.008	0.097			
$1.3S_c$	(FT/FT)	0.016	0.181			
STABLE FLOW?	(Y/N)	Y	Y			
FREEBOARD BASED ON UNSTABLE FLOW	(FT)					
FREEBOARD BASED ON STABLE FLOW	(FT)	0.21	0.39			
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.50	0.50			
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S			
FREEBOARD PROVIDED	(FT)	1.26	0.54			

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: ITC LAKE ERIE CONNECTOR, LLC
LOCATION: ERIE CONVERTER STATION, CONNEAUT TWP., ERIE CO.
PREPARED BY: ABH DATE: 6/22/2015
CHECKED BY: SRM DATE: 6/22/2015

CHANNEL OR CHANNEL SECTION		C2	C2			
TEMPORARY OR PERMANENT?	(T OR P)	T	P			
DESIGN STORM	(2, 5, OR 10 YR)	10	10			
ACRES	(AC)	7.0	7.0			
MULTIPLIER	(1.6, 2.25, or 2.75)[1]			AREA	"POST - PASING"	
Q_r (REQUIRED CAPACITY)	(CFS)	32.7	32.7			
Q (CALCULATED AT FLOW DEPTH d)	(CFS)					
PROTECTIVE LINING[2]		STRAW/NET	VEG. C			
n (MANNING'S COEFFICIENT)[2]		0.025	0.071			
V_a (ALLOWABLE VELOCITY)	(FPS)					
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.57	1.64			
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.45	1.0			
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.37	0.62			
CHANNEL BOTTOM WIDTH	(FT)	4.0	4.0			
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1			
D (TOTAL DEPTH)	(FT)	2.5	2.5			
CHANNEL TOP WIDTH @ D	(FT)	19.00	19.00			
d (CALCULATED FLOW DEPTH)	(FT)	1.19	1.98			
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	11.15	15.86			
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.4	2.0			
d_{50} STONE SIZE	(IN)					
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	9.03	19.62			
R (HYDRAULIC RADIUS)		0.78	1.19			
S (BED SLOPE)[3]	(FT/FT)	0.005	0.005			
S_c (CRITICAL SLOPE)	(FT/FT)	0.011	0.089			
$.7S_c$	(FT/FT)	0.008	0.061			
$1.3S_c$	(FT/FT)	0.014	0.113			
STABLE FLOW?	(Y/N)	Y	Y			
FREEBOARD BASED ON UNSTABLE FLOW	(FT)					
FREEBOARD BASED ON STABLE FLOW	(FT)	0.30	0.50			
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.50	0.50			
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S			
FREEBOARD PROVIDED	(FT)	1.31	0.52			

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: ITC LAKE ERIE CONNECTOR, LLC
LOCATION: ERIE CONVERTER STATION, CONNEAUT TWP., ERIE CO.
PREPARED BY: ARM DATE: 6/22/2015
CHECKED BY: SRM DATE: 6/22/2015

CHANNEL OR CHANNEL SECTION		D1	D1			
TEMPORARY OR PERMANENT?	(T OR P)	T	P			
DESIGN STORM	(2, 5, OR 10 YR)	10	10			
ACRES	(AC)	20.7	20.7	APPROX. 1/2 OF A and QR FOR AREA "WEST"		
MULTIPLIER	(1.6, 2.25, or 2.75)[1]					
Q_r (REQUIRED CAPACITY)	(CFS)	12.4	12.4			
Q (CALCULATED AT FLOW DEPTH d)	(CFS)					
PROTECTIVE LINING[2]		STRAW/NET	VEG. C			
n (MANNING'S COEFFICIENT)[2]		0.025	0.094			
V_a (ALLOWABLE VELOCITY)	(FPS)					
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.73	1.05			
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.45	1.0			
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.23	0.45			
CHANNEL BOTTOM WIDTH	(FT)	4.0	4.0			
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1			
D (TOTAL DEPTH)	(FT)	2.00	2.00			
CHANNEL TOP WIDTH @ D	(FT)	16.00	16.00			
d (CALCULATED FLOW DEPTH)	(FT)	0.73	1.43			
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	8.38	12.56			
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5.5	2.9			
d_{50} STONE SIZE	(IN)					
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	4.52	11.81			
R (HYDRAULIC RADIUS)		0.52	0.91			
S (BED SLOPE)[3]	(FT/FT)	0.065	0.065			
S_c (CRITICAL SLOPE)	(FT/FT)	0.012	0.175			
$.7S_c$	(FT/FT)	0.008	0.173			
$1.3S_c$	(FT/FT)	0.016	0.228			
STABLE FLOW?	(Y/N)	Y	Y			
FREEBOARD BASED ON UNSTABLE FLOW	(FT)					
FREEBOARD BASED ON STABLE FLOW	(FT)	0.18	0.34			
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.50	0.50			
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S			
FREEBOARD PROVIDED	(FT)	1.27	0.57			

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

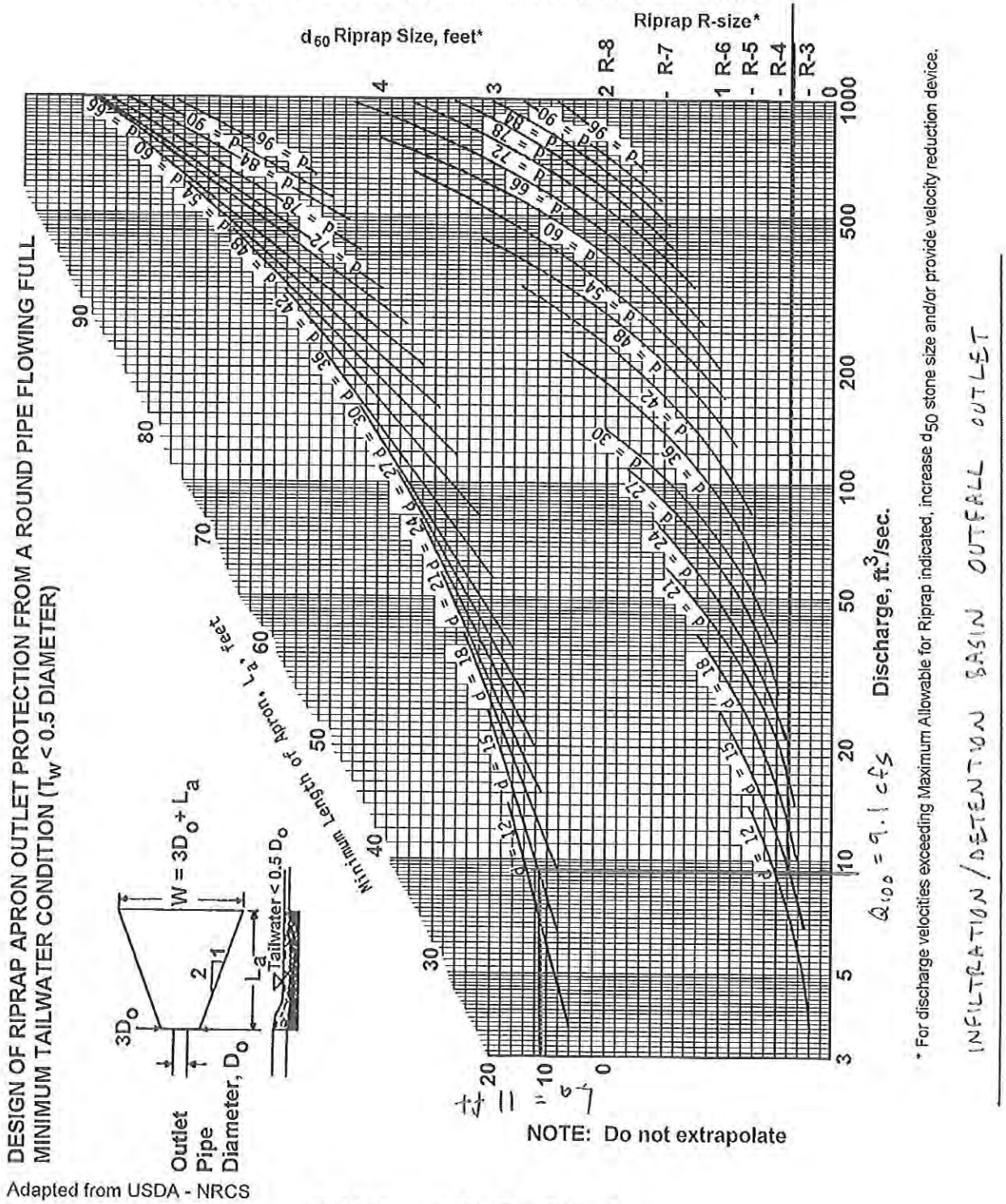
STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: ITC LAKE ERIE CONNECTOR, LLC
LOCATION: ERIE CONVERTER STATION, CONNEAUT TWP., ERIE CO.
PREPARED BY: ARM DATE: 6/22/2015
CHECKED BY: SRM DATE: 6/22/2015

CHANNEL OR CHANNEL SECTION		D2	D2			
TEMPORARY OR PERMANENT?	(T OR P)	T	P			
DESIGN STORM	(2, 5, OR 10 YR)	10	10			
ACRES	(AC)	41.4	41.4			
MULTIPLIER	(1.6, 2.25, or 2.75)[1]			AREA	"WEST"	
Q_r (REQUIRED CAPACITY)	(CFS)	24.7	24.7			
Q (CALCULATED AT FLOW DEPTH d)	(CFS)					
PROTECTIVE LINING[2]		STRAW/DIRT	VEG. C			
n (MANNING'S COEFFICIENT)[2]		0.025	0.078			
V_a (ALLOWABLE VELOCITY)	(FPS)					
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.20	1.41			
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.45	1.0			
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.28	0.50			
CHANNEL BOTTOM WIDTH	(FT)	6.00	6.00			
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1			
D (TOTAL DEPTH)	(FT)	2.20	2.20			
CHANNEL TOP WIDTH @ D	(FT)	19.20	19.20			
d (CALCULATED FLOW DEPTH)	(FT)	0.89	1.61			
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	11.34	15.70			
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	6.7	3.7			
d_{50} STONE SIZE	(IN)					
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	7.7	17.5			
R (HYDRAULIC RADIUS)		0.66	1.08			
S (BED SLOPE)[3]	(FT/FT)	0.005	0.005			
S_c (CRITICAL SLOPE)	(FT/FT)	0.011	0.111			
$.7S_c$	(FT/FT)	0.008	0.078			
$1.3S_c$	(FT/FT)	0.014	0.144			
STABLE FLOW?	(Y/N)	Y	Y			
FREEBOARD BASED ON UNSTABLE FLOW	(FT)					
FREEBOARD BASED ON STABLE FLOW	(FT)	0.22	0.40			
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.50	0.50			
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S			
FREEBOARD PROVIDED (FT)		1.31	0.59			

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

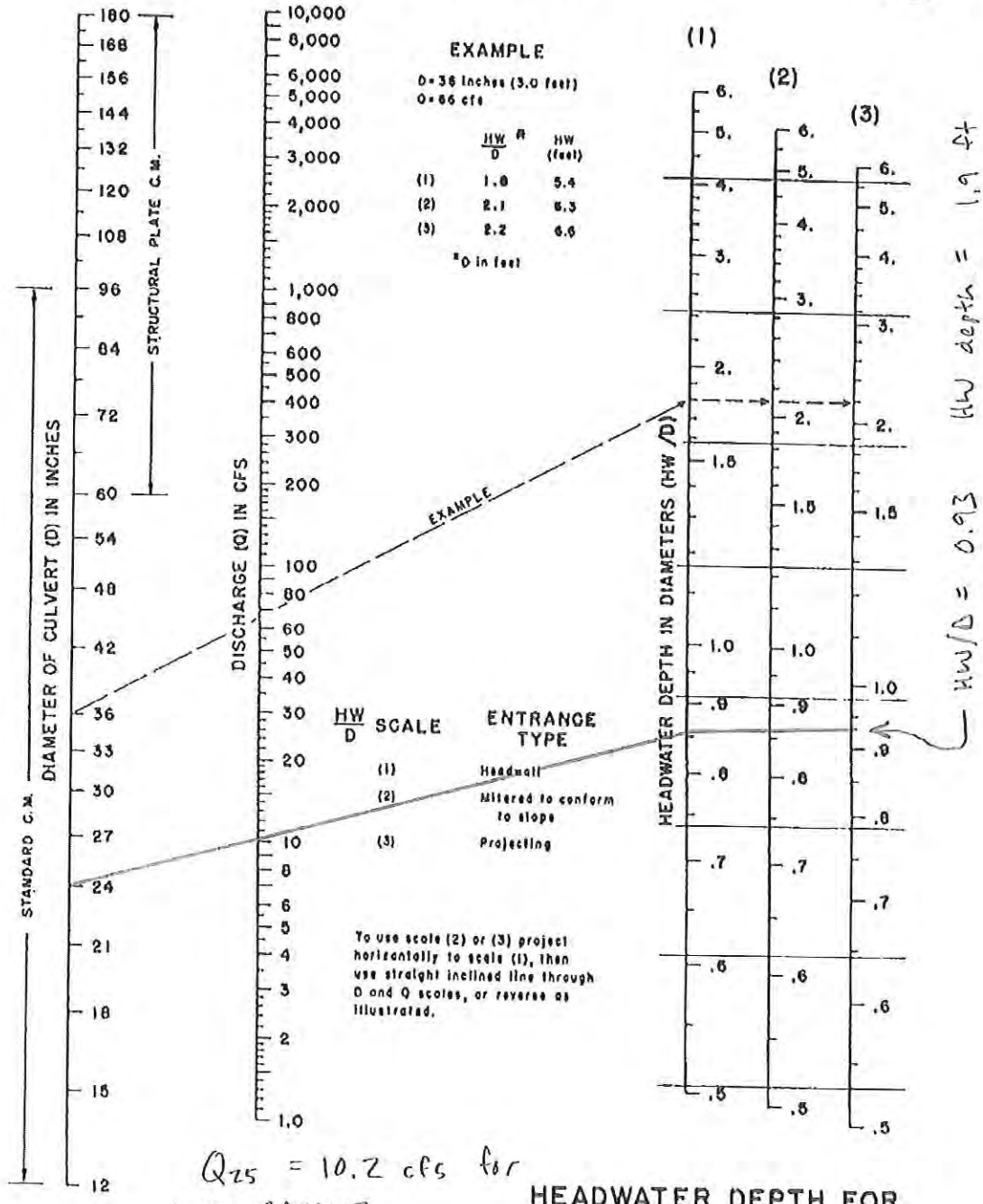


* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Not to be used for Box Culverts

DRIVEWAY CULVERT CAPACITY

CHART 2B



HW/D = 0.93 HW depth = 1.9 ft

HW elev. = 841.95

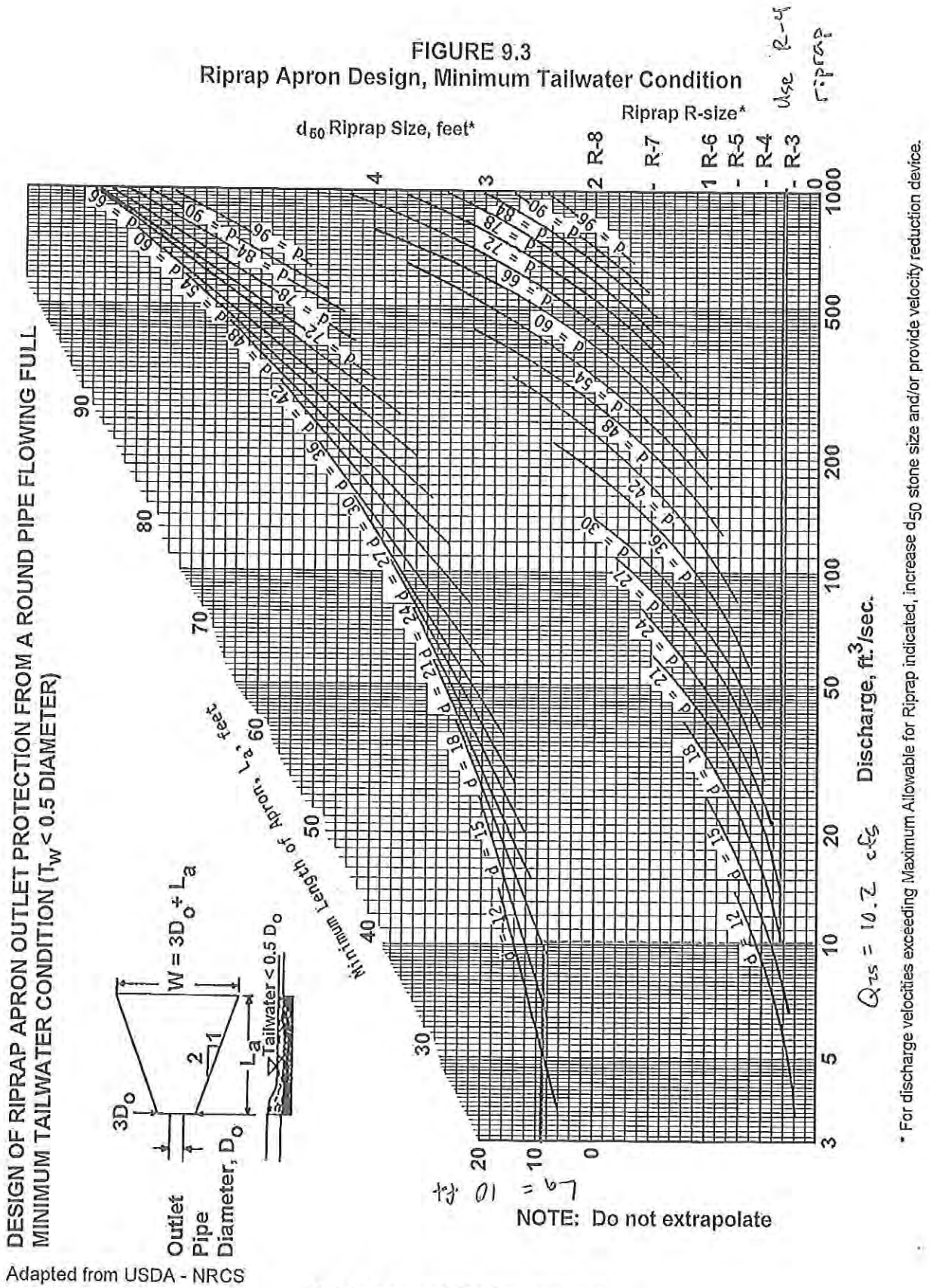
DK State driveway crests at 999 ±

Q_{25} = 10.2 cfs for POST-RAISING

HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Not to be used for Box Culverts

5.5 Riparian Buffer Equivalency Demonstration

Riparian Buffer Equivalency Demonstration
for
ITC Lake Erie Connector LLC
Erie Converter Station

(Supplement to the Post-Construction Stormwater Management Plan)

With limited exceptions, the Project has been located and designed to avoid disturbance within 150 feet of Crooked Creek and tributary streams within the Crooked Creek watershed. One exception occurs at the Erie Converter Station site, where a limited portion within the limit of disturbance (located on the northwestern side of the Converter Station pad) is less than 150 feet from Stream SPA-KAS-029 (See Sheet SW-3). However, in this area none of the disturbed area that is within 150 feet of that stream involves earth disturbance within 100 feet of any stream, wetlands, or other surface water. Thus, for this area, a riparian buffer equivalency demonstration is provided in this supplement, but no offsetting measures are required under Pennsylvania Act 162 of 2014, 35 P.S. §691.402(c)(2).

The earth disturbance that is within 150 feet of Stream SPA-KAS-029 is non-forested, consisting of an existing agricultural field. From upgradient of this buffer, existing runoff flows generally south to north through this riparian buffer. The drainage area upgradient of the portion of the buffer that is within the limit of disturbance is 0.57 acre. Runoff from this disturbed area will be diverted away from Stream SPA-KAS-029 via Conveyance Channel #C1. As such, the proposed disturbed area should not adversely affect the water quality of Stream SPA-KAS-029, despite the disturbed area being within 150 feet of Stream SPA-KAS-029. Furthermore, all of the runoff from the developed area flows into the proposed infiltration/detention basin, and for the 2-year, 24-hour runoff event, there is zero discharge from the infiltration/detention basin (all of the water is infiltrated – refer to the "2-yr infiltration volume calculation" in Section 5.3).

Despite there being zero runoff to the receiving stream for the 2-year, 24-hour event, Worksheets 12, 13, and 14 are provided with this supplement to demonstrate that the pollutant reduction achieved after passing through the proposed vegetated swale and infiltration/detention basin BMPs meets the pollutant reduction required. Thus even if there was a discharge from the developed area for the 2-year, 24-hour event, the water quality requirements are met.

Also attached is the checklist for functional equivalency of riparian buffers. A discussion of each of the checklist items is as follows:

1. Filtration of pollutants in runoff. As documented in the attached Worksheets 12, 13, and 14, the pollutant reduction achieved by the proposed BMPs meets the pollutant reduction required. Filtration of pollutants is therefore adequate.
2. Infiltration and maintenance of streamflow. The 2-year infiltration volume calculation in Section 5.3 demonstrates that the entire volume of the 2-year, 24-hour runoff event will be infiltrated, thus recharging the groundwater which helps to maintain stream baseflow.
3. Water quality maintenance. As documented in the attached Worksheets 12, 13, and 14, the pollutant reduction achieved by the proposed BMPs meets the pollutant reduction required. Water quality is effectively maintained.

4. Habitat for wildlife and vegetation. The existing wooded area within 150 feet of Stream SPA-KAS-029 will be preserved. Other areas within 150 feet of Stream SPA-KAS-029 will be vegetated and allowed to grow as a meadow. The preserved woods and proposed meadow will provide similar habitat for wildlife and vegetation as compared to the existing woods and existing agricultural field.
5. Flood attenuation. The proposed disturbed area within 150 feet of Stream SPA-KAS-029 is not within a floodplain. Therefore flood attenuation will not be affected by the proposed development.
6. Light control and water temperature moderation. The existing wooded area within 150 feet of Stream SPA-KAS-029 will be preserved. Other areas within 150 feet of Stream SPA-KAS-029 will be vegetated and allowed to grow as a meadow. The preserved woods and proposed meadow will provide similar light control and water temperature moderation as compared to the existing woods and existing agricultural field.
7. Travel corridors for migration and dispersal. The existing wooded area within 150 feet of Stream SPA-KAS-029 will be preserved. Other areas within 150 feet of Stream SPA-KAS-029 will be vegetated and allowed to grow as a meadow. The preserved woods and proposed meadow will provide similar travel corridors for migration and dispersal as compared to the existing woods and existing agricultural field.

For the reasons set forth above, the proposed BMPs are functionally equivalent to the existing riparian buffer. Because the disturbed area within 150 feet of Stream SPA-KAS-029 is not within 100 feet of any stream, wetland, or other surface water, no offsetting measures are required under Pennsylvania Act 162 of 2014, 35 P.S. §691.402(c)(2).

Worksheet 14 – Water Quality Analysis of Pollutant Loading from Disturbance in Buffer Area

Total Disturbed Area (AC)	0.57
Disturbed Area Controlled by this BMPs (AC)	0.57

Existing Condition This is the area upgradient of the reduced riparian buffer that is within the limit of disturbance.

	Land Cover Classification	Pollutant TSS EMC (mg/l)	Pollutant TP EMC (mg/l)	Pollutant Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	Pollutant Load TSS** (LBS)	Pollutant Load TP** (LBS)	Pollutant Load NO_3 (LBS)
	Forest	39	0.15	0.17					
	Meadow CN=71, Q=0.52"	47	0.19	0.3	0.57	0.0247	3.13	0.01	0.02
						TOTAL LOAD	3.13	0.01	0.02

Post-Development

	Land Cover Classification	Pollutant TSS EMC (mg/l)	Pollutant TP EMC (mg/l)	Pollutant Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	Pollutant Load TSS** (LBS)	Pollutant Load TP** (LBS)	Pollutant Load NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow CN=71, Q=0.52"	47	0.19	0.3	0.35	0.0152	1.93	0.01	0.01
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot CN=96, Q=2.12"	58	0.15	0.39	0.22	0.0389	6.09	0.02	0.04
						TOTAL LOAD	8.02	0.03	0.05
						Pollutant Load increase (LBS) =	4.89	0.02	0.03

Pollutant Load increase (LBS) = Post development load – Pre-development load

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion

Worksheet 15 – Pollutant Reduction Through BMP Applications*

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

BMP Type: Vegetative Swale

Disturbed Area Controlled by this BMPs:

		Pollutant					Pollutant Load**		
	Land Cover Classification	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	TSS** (LBS)	TP** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
	TOTAL LOAD TO THIS BMP TYPE						8.02	0.03	0.05
	POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%)						50	50	20
	POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)						4.01	0.02	0.01

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION from WS 14 (LBS)			

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

Worksheet 15 – Pollutant Reduction Through BMP Applications*

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

BMP Type: Infiltration Basin

Disturbed Area Controlled by this BMPs:

		Pollutant					Pollutant Load**		
	Land Cover Classification	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	TSS** (LBS)	TP** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
	TOTAL LOAD TO THIS BMP TYPE						4.01	0.01	0.04
	POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%)						85	85	30
	POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)						3.41	0.01	0.01

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION from WS 14 (LBS)			

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

Worksheet 15 – Pollutant Reduction Through BMP Applications*

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

BMP Type: Detention Basin

Disturbed Area Controlled by this BMPs:

		Pollutant					Pollutant Load**		
	Land Cover Classification	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	TSS** (LBS)	TP** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
	TOTAL LOAD TO THIS BMP TYPE						0.60	0.00	0.03
	POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%)						60	40	20
	POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)						0.36	0.00	0.01

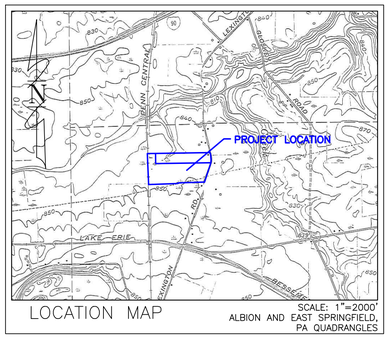
POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)	7.78	0.03	0.03
REQUIRED REDUCTION from WS 14 (LBS)	4.09	0.02	0.03

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

Checklist for Functional Equivalency of Riparian Buffers and Riparian Forest Buffers

	Riparian Buffer	Riparian Forest Buffer
Filtration of pollutants in runoff	☑	☐
Infiltration and maintenance of streamflow	☑	☐
Water quality maintenance	☑	☐
Habitat for wildlife and vegetation	☑	☐
Flood attenuation	☑	☐
Light control and water temperature moderation	☑	☐
Travel corridors for migration and dispersal	☑	☐
Ice damage control		☐
Stream width		☐
Food supply		☐
Wood debris input		☐
Support of aquatic food chains and webs as they relate to terrestrial food webs		☐
Channel and shoreline stability/decrease in erosion		☐
Reduced effects of storm events		☐
Instream pollutant processing		☐

ITC LAKE ERIE CONNECTOR LLC
ERIE CONVERTER STATION
POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
CONNEAUT TOWNSHIP
ERIE COUNTY, PENNSYLVANIA



LOCATION MAP
SCALE: 1"=2000'
ALBION AND EAST SPRINGFIELD, PA QUADRANGLES

SHEET INDEX

SW-1 TITLE SHEET
SW-2 EXISTING SITE PLAN AND NATURAL RESOURCES PLAN
SW-3 GRADING PLAN AND PROPOSED BMPS
SW-4 DETAILS

PROPERTY INFORMATION

TAX I.D. # 04-005-010.0-004.00

OWNER OF RECORD:
ANDREW, JR. AND ALICE HAZER
409 VESTA DRIVE
DAUPHIN, PA 17018

DEED BOOK 0723, PAGE 0075

ACREAGE: 22.84 ACRES

TAX I.D. # 04-005-010.0-003.00

OWNER OF RECORD:
TERRY A. LAVERY
8680 LEXINGTON ROAD
GIRARD, PA 16417

DEED BOOK 2014, PAGE 3507

ACREAGE: 10.11 ACRES

LEGEND

- PROPERTY BOUNDARY
- RIGHT-OF-WAY LINE
- NPDES PERMIT BOUNDARY
- LIMIT OF DISTURBANCE
- SOIL BOUNDARIES
- OHE — OVERHEAD ELECTRIC DISTRIBUTION
- EDGE OF WOODS
- EDGE OF BRUSH
- 1005 — EXISTING CONTOURS
- 1005 — PROPOSED CONTOURS
- WETLANDS
- △ SOIL PROFILE LOCATION
- ○ INFILTRATION TEST LOCATION
- □ ON-LOT SEWAGE SOIL PROFILE LOCATION

NOTES:

1. TOPOGRAPHY PER FIELD SURVEYS BY DEISS & HALMI ENGINEERING, INC. CONDUCTED 11/3/2014 TO 11/11/2014 AND ON 6/4/2015.
2. PROPERTY LINES PLOTTED PER "ALTA/ACSM LAND TITLE SURVEY OF THE HAZER PROPERTY" PREPARED BY DAVID LAIRD ASSOCIATES 12/8/2014 AND "SLTA/ACSM LAND TITLE SURVEY OF THE LAVERY PROPERTY" PREPARED BY DAVID LAIRD ASSOCIATES 10/7/2015.
3. ELEVATION DATUM IS NAVD 88.
4. WETLANDS PLOTTED PER DELINEATION BY HDR ENGINEERING PERFORMED AUGUST 2014 THROUGH DECEMBER 2015.
5. PER FEMA FLOOD INSURANCE RATE MAP NUMBERS 42049C0325D, 42049C0309D, 42049C0336D (ALL HAVING AN EFFECTIVE DATE OF 2/19/2014), THE PROPERTY IS IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN).
6. THE CONTRACTOR SHALL CONTACT PENNSYLVANIA ONE CALL SYSTEM, INC. A MINIMUM OF 3 WORKING DAYS PRIOR TO BEGINNING WORK, TELEPHONE NUMBER 1-800-242-1776. THE SERIAL NUMBER FOR THIS PROJECT IS 20152941661.

APPLICANT HEREBY ACKNOWLEDGES THAT THE STORMWATER BMPS SHOWN ON THIS PLAN ARE FIXTURES THAT CANNOT BE ALTERED OR REMOVED WITHOUT PRIOR APROVAL BY CONNEAUT TOWNSHIP. REFERENCE IS MADE TO THE OPERATION AND MAINTENANCE (O&M) AGREEMENT WHICH SHALL BE CONSIDERED PART OF THIS STORMWATER MANAGEMENT SITE PLAN. RECORD DRAWINGS SHALL BE PROVIDED FOR ALL STORMWATER FACILITIES PRIOR TO OCCUPANCY OR THE RELEASE OF FINANCIAL SECURITY.

_____ _____ _____
APPLICANT SIGNATURE PRINTED NAME AND TITLE DATE

I, STEVEN R. HALMI, P.E. OF DEISS & HALMI ENGINEERING, INC., HEREBY CERTIFY THAT THE STORMWATER MANAGEMENT PLAN MEETS ALL DESIGN STANDARDS AND CRITERIA OF THE CONNEAUT TOWNSHIP STORMWATER MANAGEMENT ORDINANCE.

_____ _____
STEVEN R. HALMI, P.E. DATE

I, _____, HAVE REVIEWED THIS STORMWATER MANAGEMENT PLAN IN ACCORDANCE WITH THE DESIGN STANDARDS AND CRITERIA OF THE CONNEAUT TOWNSHIP STORMWATER MANAGEMENT ORDINANCE.

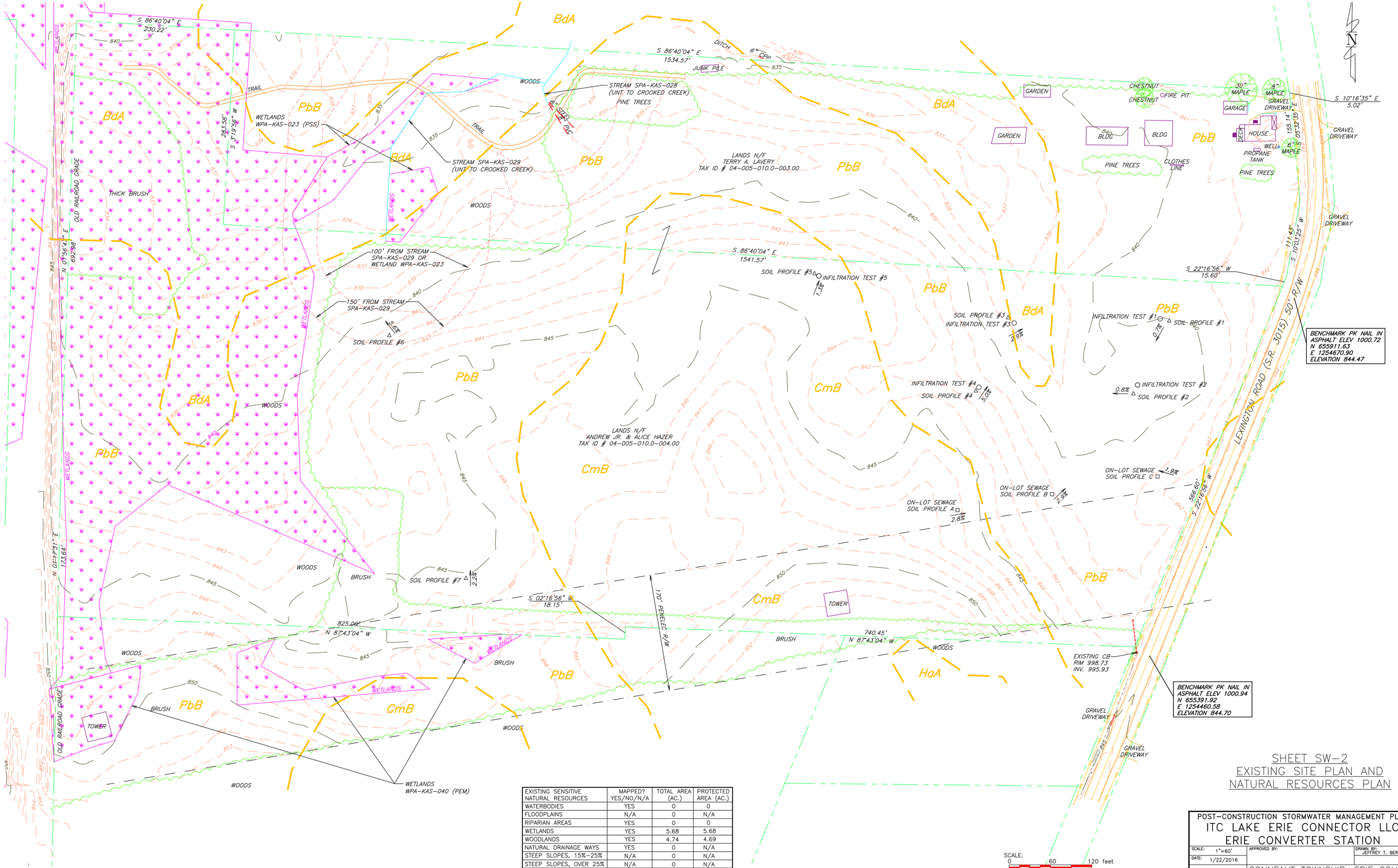
_____ _____ _____
SIGNATURE PRINTED NAME AND TITLE DATE

SOIL CLASSIFICATIONS

SYMBOL	DESCRIPTION	HYDROLOGIC SOIL GROUP
BdA	BIRDSALL SILT LOAM, 0%-2% SLOPES.	D
CmB	CONOTTON GRAVELLY SANDY LOAM, MODERATELY WELL DRAINED VARIANT, 3%-8% SLOPES.	B
HaA	HALSEY LOAM, 0%-3% SLOPES.	C
PbB	PLATEA SILT LOAM, 2%-8% SLOPES.	C

PREPARED BY:
DEISS & HALMI ENGINEERING, INC.
EDINBORO, PENNSYLVANIA

JANUARY 22, 2016



EXISTING SENSITIVE NATURAL RESOURCES	MAPPED? YES/NO/N/A	TOTAL AREA (AC.)	PROTECTED AREA (AC.)
WATERBODIES	YES	0	0
FLOODPLAINS	N/A	0	N/A
RIPARIAN AREAS	YES	0	0
WETLANDS	YES	5.68	5.68
WOODLANDS	YES	4.74	4.69
NATURAL DRAINAGE WAYS	YES	0	N/A
STEEP SLOPES, 15%-25%	N/A	0	N/A
STEEP SLOPES, OVER 25%	N/A	0	N/A
TOTAL EXISTING:		10.51	9.88

SHEET SW-2
EXISTING SITE PLAN AND
NATURAL RESOURCES PLAN

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
ITC LAKE ERIE CONNECTOR LLC
ERIE CONVERTER STATION

SCALE: 1"=60'
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY
DATE: 1/22/2016

CONNEAUT TOWNSHIP, ERIE COUNTY
PENNSYLVANIA

Deiss & Halmi Engineering, Inc.
ENVIRONMENTAL AND CIVIL ENGINEERING
105 Meadville Street, Edinboro PA 16412 PH. 814-734-3640 Fax 814-734-3643

DRAWING NO.: 2080215-2

No.	Date	Revisions	By

CONVERTER HALL BUILDING
(APPROXIMATE LOCATION–NOT ALL STRUCTURES IN CONVERTER STATION FOOTPRINT ARE SHOWN)

CONVERTER STATION FOOTPRINT
(FENCED AREA)

INFILTRATION/DETENTION BASIN
(100–YR WATER SURFACE WITH PRIMARY OUTLET PLUGGED=841.47)
NOTE: BOTTOM (BELOW ELEV. 842.0) TO BE LEFT UNDISTURBED.

SITE ACCESS DRIVEWAY

TEMPORARY ACCESS DRIVEWAY

VEGETATED SWALE #C1

VEGETATED SWALE #C2

VEGETATED SWALE #D1

VEGETATED SWALE #D2

LIMIT OF DISTURBANCE

NPDES PERMIT BOUNDARY

RIPRAP OUTLET PROTECTION (SEE DETAIL)

INV. 835.75
SEE ENDWALL DETAIL

30" CPP CULVERT

OUTLET STRUCTURE (SEE DETAIL)

INV. 837.00

EMERGENCY SPILLWAY, 8 FOOT WIDE, CREST ELEVATION 841.25 (SEE DETAIL)

BERM TOP ELEV. 842.75
TOP WIDTH 8.0'

INV. 839.85
SEE ENDWALL DETAIL

24" CORRUGATED HDPE CULVERT

INV. 840.05
SEE ENDWALL DETAIL

AREA RESERVED FOR ON–LOT SEWAGE DISPOSAL ABSORPTION AREA. AREA SHALL BE PROMINENTLY MARKED TO PREVENT DISTURBANCE.

ON–LOT SEWAGE SOIL PROFILE A

ON–LOT SEWAGE SOIL PROFILE B

ON–LOT SEWAGE SOIL PROFILE C

SOIL PROFILE #1

SOIL PROFILE #2

SOIL PROFILE #3

SOIL PROFILE #4

SOIL PROFILE #5

SOIL PROFILE #6

SOIL PROFILE #7

INFILTRATION TEST #1

INFILTRATION TEST #2

INFILTRATION TEST #3

INFILTRATION TEST #4

INFILTRATION TEST #5

REFER TO SEPARATE SITE RESTORATION PLAN FOR PENNSYLVANIA CABLE ROUTE

EXISTING CB
RIM 998.73
INV. 995.93

BENCHMARK PK NAIL IN ASPHALT ELEV 1000.72
N 655911.63
E 1254670.90
ELEVATION 844.47

BENCHMARK PK NAIL IN ASPHALT ELEV 1000.94
N 655391.92
E 1254460.58
ELEVATION 844.70

LANDSCAPE BERM

LEXINGTON ROAD (S.R. 3015) 50' R/W

OLD RAILROAD GRADE

170' PENELEC R/W

GARAGE

BLDG

HOUSE

DECK

WELL

PROPANE TANK

CLOTHES LINE

GARDEN

JUNK PILE

FIRE PIT

GRAVEL DRIVEWAY

TOWER

STREAM SPA–KAS–029

100' FROM STREAM SPA–KAS–029 OR WETLAND WPA–KAS–023

150' FROM STREAM SPA–KAS–029

WETLANDS

WOODS

BRUSH

THICK BRUSH

TRAIL

DITCH

PINE TREES

CHESTNUT

MAPLE

S 86°40'04" E 230.22'

S 86°40'04" E 1534.57'

S 86°40'04" E 1541.57'

S 3°19'56" W 283.58'

N 01°56'14" E 692.98'

N 01°47'51" E 173.64'

S 02°16'56" W 18.15'

N 87°43'04" W 825.00'

N 87°43'04" W 740.45'

S 22°16'56" W 15.60'

S 10°16'35" E 5.02'

S 05°32'55" E 155.14'

S 17°03'25" W 111.43'

S 22°16'56" W 566.60'

PbB

BdA

CmB

HaA

APPLICANT INFORMATION
ITC LAKE ERIE CONNECTOR LLC
27175 ENERGY WAY
NOVI, MI 48377

PROPERTY INFORMATION
TAX I.D. # 04–005–010.0–004.00

OWNER OF RECORD:
ANDREW, JR. AND ALICE HAZER
409 VESTA DRIVE
DAUPHIN, PA 17018

DEED BOOK 0723, PAGE 0075

ACREAGE: 22.84 ACRES

TAX I.D. # 04–005–010.0–003.00

OWNER OF RECORD:
TERRY A. LAVERY
8680 LEXINGTON ROAD
GIRARD, PA 16417

DEED BOOK 2014, PAGE 3507

ACREAGE: 10.25 ACRES

SHEET SW–3
GRADING PLAN AND PROPOSED BMPS

SCALE: 0 60 120 feet

No.	Date	Revisions	By

POST–CONSTRUCTION STORMWATER MANAGEMENT PLAN
ITC LAKE ERIE CONNECTOR LLC
ERIE CONVERTER STATION

SCALE: 1"=60'
DATE: 1/22/2016
APPROVED BY:
DRAWN BY: JEFFREY T. BERNOSKY

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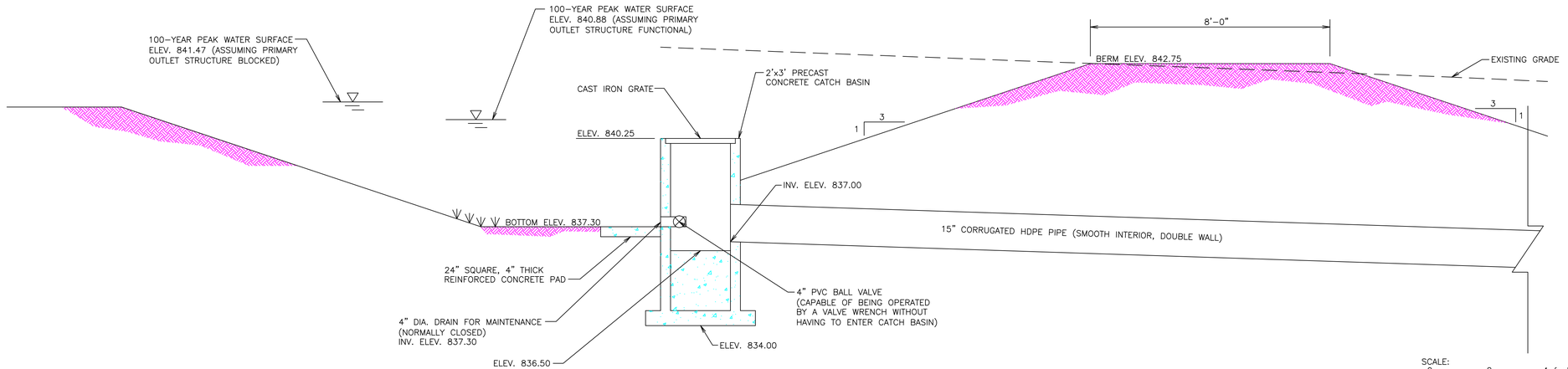
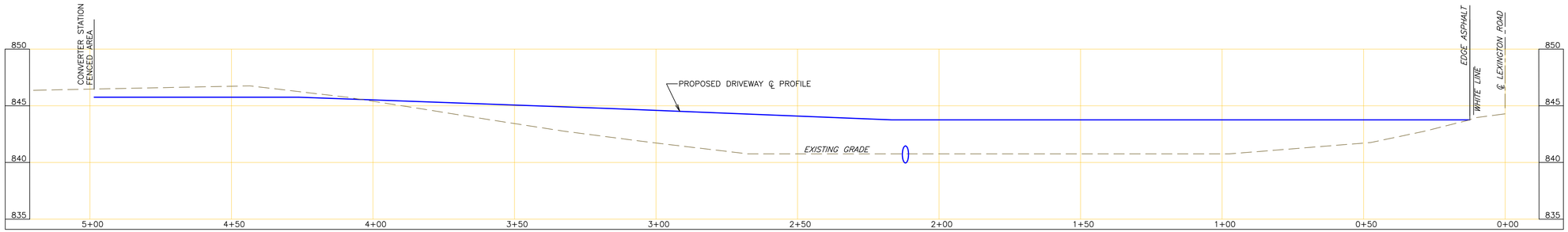
DRAWING NO.: 2080115–3



SECTION THROUGH INFILTRATION/DETENTION BASIN OUTLET

SCALE: 1"=2'

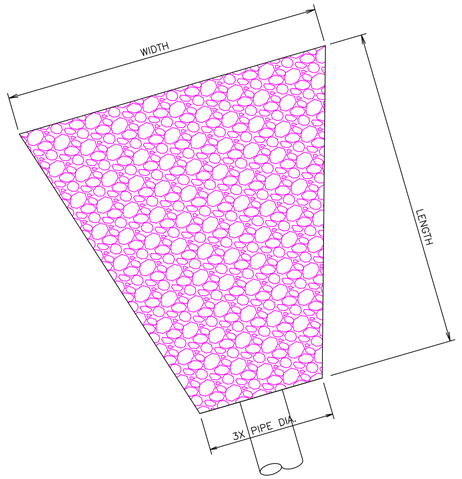


PROPOSED DRIVEWAY PROFILE

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

HORIZONTAL SCALE:
0 20 40 feet

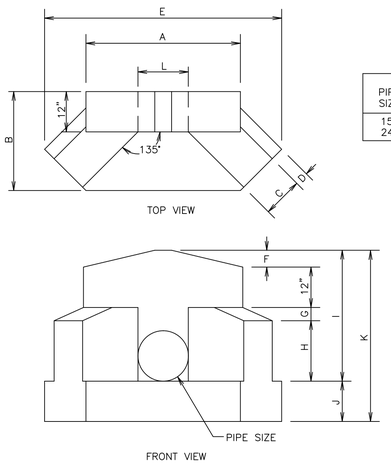
VERTICAL SCALE:
0 5 10 feet



LOCATION	WIDTH	LENGTH	RIPRAP SIZE	PLACEMENT THICKNESS
INFILTRATION/DETENTION BASIN OUTLET	15'	11'	R-4	18"
DRIVEWAY CULVERT OUTLET	16'	10'	R-4	18"

RIPRAP OUTLET PROTECTION

N.T.S.



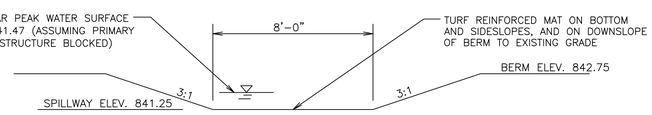
PRECAST CONCRETE ENDWALL DETAIL

N.T.S.

PIPE SIZE	A	B	C	D	E	F	G	H	I	J	K	L
15"	3'-10"	2'-6"	12"	4"	5'-7"	5"	4"	18"	34"	12"	46"	18"
24"	4'-4"	2'-10"	12"	4"	6'-11"	5"	7"	21"	40"	12"	52"	24"

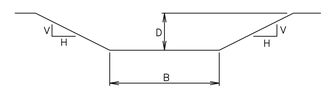
NOTES:

1. REINFORCING 4" x 12" 4/9 GAUGE WIRE CENTERED IN BASE AND WALLS REINFORCEMENT = 0.12 SQ. IN./FT.
2. 3/4" CHAMFER ON ALL EXPOSED EDGES.
3. CONCRETE TO BE 4,000 PSI.
4. AS MANUFACTURED BY MACK INDUSTRIES OF PENNSYLVANIA, INC., OR EQUAL.



EMERGENCY SPILLWAY DETAIL

N.T.S.



CHANNEL NO.	SLOPE	H:V	B (FT)	D (FT)	LINING TYPE
C1	0.005	3:1	4.0	2.1	VEG., RET. CLASS C
C2	0.005	3:1	4.0	2.5	VEG., RET. CLASS C
D1	0.005	3:1	4.0	2.0	VEG., RET. CLASS C
D2	0.005	3:1	6.0	2.2	VEG., RET. CLASS C

NOTE: ALL VEGETATED SWALES TO HAVE TEMPORARY LINING OF STRAW WITH NET, PROPEX LANDLOK S2, OR EQUAL, UNTIL PERMANENT VEGETATED LINING IS ESTABLISHED.

CHANNEL DETAIL

N.T.S.

SHEET SW-4
DETAILS

No.	Date	Revisions	By

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