APPENDIX D – STORMWATER POLLUTION PREVENTION PLAN

STORMWATER POLLUTION PREVENTION PLAN

Prepared for

NTE CONNECTICUT, LLC
LAKE ROAD
KILLINGLY CONNECTICUT

August 2016

Prepared for

Proposed Natural Gas Power Plant

Prepared by

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CT License #22834

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1. Site Evaluation, Assessment & Planning

1.1 Project/Site Description

NTE Connecticut, LLC is seeking local and state approvals to develop the Killingly Energy Center (KEC), an approximately 550-MW air-cooled electric generating facility and related electrical interconnection switchyard to be located on an approximately 73-acre site off Lake Road in the Town of Killingly, Connecticut; a natural gas lateral will provide fuel to the Generating Facility. Approximately 63-acre parcel north of Lake Road is the proposed location of the Generating Facility and a 10-acre portion of the property located south of Lake Road is the proposed location of the Switchyard. KEC will be located in an area designated in the Townôs Plan of Conservation and Development for future industrial development in the northern portion of Killingly.

Structural stormwater collection and conveyance systems will be limited to the northern portion of the project with collection from paved surfaces and conveyance to a tiered stormwater detention/infiltration basin. The basin will be comprised of a sediment forebay, wet basin and dry basin with a low level outlet and high level weir overflow. The basin will discharge to a level spreader positioned on flat terrain (3% slope) approximately 60ô from the nearest wetland. The dry basin will also serve to infiltrate treated stormwater into the surrounding soil. The stormwater outlet will be reinforced with riprap outlet protection and the level spreaders outfall will sheet flow overland through natural vegetation. Conveyance of stormwater from the switchyard (southern portion of the site) will be via sheet flow over a crushed stone surface.

Where ever possible, sheet flow and overland discharge from pervious surfaces is incorporated into the design with limited storm drain installation and the construction of shallow depressions within the landscape to encourage infiltration and the preservation of natural terrain and ground cover adjacent to wetland resource areas Also, in accordance with the State of Connecticut 2004 Water Quality Guideline recommendations, stormwater runoff from impervious areas will be treated for water quality prior to discharge to the wetland resource areas.

1.2 Contact Information – Responsible Parties

Operator(s):

NTE Connecticut, LLC
24 Cathedral Place, Suite 300
St. Augustine, Florida

SWPPP Contact(s):

NTE Connecticut, LLC
24 Cathedral Place, Suite 300
St. Augustine, Florida
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SWPPP Preparation
(860) 779-7299

SWPPP Preparation Date:

July 2016

Estimated Project Dates:

Project Start Date: Summer 2017
Project Completion Date: Spring/Summer 2020

Site Center Location:

Lake Road, Killingly, CT

N 875,990 E 1,227,084

1.3 Soils

According to the USDA-NRCS Web Soil Survey, the site consists of the following soils:

- Ridgebury, Leicester and Whitman soils - map unit 3;
- Walpole sandy loam ï map unit 13;
- Ninigret and Tisbury soils ï map unit 21;
- Hinckley loamy sand ï map unit 38;
- Sutton fine sandy loam ï map unit 52;
- Gloucester gravelly sandy loam ï map unit 58;
- Canton & Charlton soils ï map units 31 & 62;
- Charlton-Chatfield complex ï map unit 73;
- Hollis-Chatfield-rock outcrop ï map unit 75;

The presence of these soil series and soil mapping units were verified in the field by the project soil scientist in the course of delineating regulated wetlands and watercourses.

The bulk of the land disturbance and development will be conducted in areas shown as Canton and Charlton soils. These soils are well drained and stony but suitable for land development projects. For specific soil descriptions, please refer to the NRCS Web Soil Survey mapping provided as Attachment 1.

1.4 Existing Conditions

The site consists of approximately 73-acres and is located on the northern and southern sides of Lake Road. The site is divided by Lake Road that runs essentially in a northeast-southwest direction. The eastern 10.099-acre property where the switchyard will be constructed is wooded at the higher elevation on the southwestern end, and drains down gradient to the north and east toward an existing agricultural field and ultimately to a wetland system adjacent to the Connecticut Light and Power right of way. The larger northern portion of the property drains predominantly to the north to a large centrally located wetland system. This system flows off site to the northwest to a small depression shown on FEMA mapping as flood zone ñAò (flood elevation undetermined). This area is more than 40ô lower in elevation than the proposed development.

The existing drainage area to these wetlands is approximately 45 acres. The Quinebaug River is located further to the north and west from the proposed development; the project will not result in any direct stormwater discharge to the Quinnebaug River. A small western and northwestern section of the site separated from the bulk of the site by a prominent ridgeline, drains directly to the Quinebuag River via a seasonal watercourse.

The bulk of the area slated for development has been historically utilized for activities associated with agricultural purposes. Numerous on-site fam dump areas were identified adjacent to wetland resource areas. These on-site disposal areas are not uncommon to the area or with agricultural activities and contain household wastes (bottles & cans), paper and cardboard, appliances, and automobile and farm equipment parts.

The following statements can be made regarding the project:

- The project is not located within the Coastal Boundary and therefore a coastal site plan approval in accordance with Sections 22a-92 and 22a-93(15) of the Connecticut General Statutes is not required.
- The project is not located within an aquifer protection area. Statewide aquifer protection mapping available from the CTDEEP website http://cteco.uconn.edu/map_catalog/maps/state/stateAPA.pdf shows no aquifer protection areas in the area of the development.
- There will not be any direct stormwater discharge to the Quinebaug River. The nearest point of disturbance will be greater than 1000ô from the river and is protected by conservation land and higher terrain.
- Plan review certification will be provided by a qualified professional engineer.
- No direct wetland impacts are proposed on the northern portion of the project.

1.5 Proposed Conditions

Development on the northern side of Lake Road for the generating facility will result in the disturbance of approximately 24 acres of land (including construction laydown) and will require some significant grading to create a usable surface. Slopes throughout the site of the generating facility will be approximately 2% and surfaces will be comprised predominantly of pervious materials. Of the 24-acre disturbance on the north side of Lake Road, only 2.1 acres of paved surfaces are proposed and additional 4.3 acres of building and impervious surface for a fuel containment area; a total of 6.5 acres. The fuel containment area will be a bermed enclosure with an impervious liner. Drainage from this enclosure will be via a drainage structure with a manually gated outlet. No stormwater will be released from this area without a visual inspection after the end of a rain event.

The site does not and will not discharge directly to a perennial surface water body (the Quinebaug River). The single discharge from the proposed detention basin has been designed to drain adjacent to on-site wetlands. The discharge has been designed with the appropriate outlet protection and/or treatment in accordance with the state stormwater quality guidelines. After the discharge point, extended overland sheet flow is incorporated into the design prior to discharge to existing on-site wetlands.

Development on the south side of Lake Road for the switchyard will result in the disturbance of approximately 4 acres of land with a direct wetland impact of approximately 12,500 square feet. Again, this disturbance includes the construction laydown area. Grading at the south-southwest portion of the site will be minimized with the construction of a retaining wall and grades across the switchyard will be less than 3%. Total impervious surface around the perimeter of the switchyard will be 15,600 square feet. The remainder of the switchyard surface will be comprised of a crushed stone surface. In order to offset for the loss of wetlands, the eastern agricultural field adjacent to the switchyard will be mitigated in return at the completion of construction. Wetland replication shall take place within a portion of the agricultural field, adjacent to existing

wetland areas. This shall take place at the completion of construction and staging activities.

The drainage design and water quality mechanisms have been designed in accordance with the State of Connecticut 2004 Stormwater Quality Manual. Construction erosion and sedimentation control mechanisms follow the recommendations of the 2002 Connecticut Guidelines for soil erosion and sediment control.

1.6 Potential Sources of Pollution

Sources of water pollution on construction sites include: diesel and oil; paint, solvents, cleaners and other chemicals; and construction debris and dirt. When land is cleared it creates the potential for soil erosion which may lead to silt-bearing run-off, wind-blown soils and sediment, and sediment erosion into resource areas. Silt and soil that runs into natural waterways may turn them turbid, which ultimately restricts sunlight filtration and may affect aquatic life. The erosion and sedimentation controls during construction and water quality treatments designed for post construction assure that resource areas will not be detrimentally impacted by this project.

1.7 Endangered, Protected or Species of Concern

Reference to the June 2016 Natural Diversity Database Mapping shows the property may be subject to known listed species. The construction activity will not threaten the continued existence of any species listed pursuant to section 26-306 of the Connecticut General Statutes as endangered or threatened and will not result in the destruction or adverse modification of habitat designated as essential to such species (see Appendix A).

1.8 Historic Preservation

Phase I and Phase II Archeological investigations were conducted on site. Any areas of archeological sensitivity or concern as identified by the SHPO will be preserved.

2. Erosion & Sedimentation Control BMP's

Detailed Erosion and Sedimentation control measures have been outlined on the plans and are in accordance with the 2002 Guidelines.

2.1 Minimize Disturbed Areas and Protect Natural Features

The primary function of erosion and sediment controls is to absorb erosional energies and reduce runoff velocities that force the detachment and transport of soil and/or encourage the deposition of eroded soil particles before they reach any sensitive area.

2.1.1 Keep Land Disturbance Minimized

The more land that is in vegetative cover, the more surface water will infiltrate into the soil, thus minimizing stormwater runoff and potential erosion. Keeping land disturbance to a minimum not only involves minimizing the extent of exposure at any one time, but also the duration of exposure. Phasing, sequencing and construction scheduling are interrelated. Phasing divides a large project into distinct sections where construction work over a specific area occurs over distinct periods of time and each phase is not dependent upon a subsequent phase in order to be functional. A sequence is the order in which construction activities are to occur during any particular phase. A sequence should be developed on the premise of "first things first" and "last things last" with proper attention given to the inclusion of adequate erosion and sediment control measures. A construction schedule is a sequence with time lines applied to it and should address the potential overlap of actions in a sequence which may be in conflict with each other.

- Limit areas of clearing and grading. Protect natural vegetation from construction equipment with fencing, tree armoring, and retaining walls or tree wells.
- Route traffic patterns within the site to avoid existing or newly planted vegetation.
- Phase construction so that areas which are actively being developed at any one time are minimized and only that area under construction is exposed. Clear only those areas essential for construction.
- Sequence the construction of storm drainage systems so that they are operational as soon as possible during construction. Ensure outlets are stable before conveying storm drainage flow into them.
- Schedule construction so that final grading and stabilization is completed as soon as possible.

2.2 Phase Construction Activities

The project will disturb a total of approximately 25 acres over the duration of the construction (generation facility and switchyard). This disturbance consists of grading to create minimally sloped areas for site facilities and buildings, access roadway, facilities building, support buildings and parking. The clearing and grading activities will commence prior to any buildings or infrastructure with all required tree removal conducted as a single phase. Site work will be done per the sequence outlined on the design plans and as listed below. All construction will be conducted in accordance with the 2002 CTDEEP Guidelines for Soil Erosion and Sediment Control (the Guidelinesò). The construction will generally proceed as follows:

1. Flag the limits of construction disturbance necessary to facilitate the pre-construction meeting.
2. Contact Call Before You Dig at 1-800-922-4455 to mark out existing utilities.
3. Hold the pre-construction meeting.

4. Install the anti-tracking construction entrance.
5. Cut trees within the defined clearing limits and remove cut wood. Chip brush, branches and small trees and stockpile chips for use on site for erosion and sedimentation control.
6. Install perimeter erosion and sedimentation controls.
7. Remove stumps and transport off site. No stumps shall be buried on site.
8. Remove topsoil and grade construction staging and laydown area. Install crushed stone or rolled gravel surface and grade to provide positive drainage to perimeter of laydown area. Construct temporary sediment basin and install perimeter erosion controls in accordance with plans.
9. Strip and stockpile topsoil within the footprint of the construction phase area. Install perimeter erosion and sedimentation controls around stockpiles.
10. Make required cuts and fills and construct proposed retaining walls as fills are being placed adjacent to wetlands area and as cuts are made for the switchyard. Required rock blasting shall be conducted in accordance with Section 3.6 of this Plan and with applicable state and local regulations.
11. Establish the subgrade for topsoil areas, buildings, perimeter roadway and parking areas. Bench buildings to a subgrade and allow for sufficient area around building footprints for construction activities.
12. Begin building and equipment construction.
13. Install surface water controls such as temporary sedimentation basins, diversions, and stone or wood chip dikes and insure that discharge locations are stable. Engineer shall evaluate unstable conditions for recommended alternatives prior to installing surface controls.
14. Construct Stormwater basin, outlet and outlet protection and utilize basin as a temporary sedimentation basin during construction. Plug low level outlet until all areas on site have been stabilized and basin vegetation is established.
15. Install all utilities and drainage systems to within 5ôof the buildings and facilities or as modified by the site engineer for specific site conditions.
16. Prepare sub-base, slopes, parking areas, shoulder areas, access roads and any additional areas of disturbance for final grading.
17. Install topsoil on fill and cut slopes, seed disturbed areas and install erosion control fabric to protect against runoff erosion or raindrop impact.
18. Install and compact processed aggregate for pavement areas.
19. Install crushed stone surfaces where call for on the design plans.
20. Place remaining topsoil where required and complete perimeter landscaping. Fine grade, rake, seed and mulch to within 2ôof curbs or paved areas.
21. Upon substantial completion of the building(s) and plant equipment areas, complete the balance of the site work and stabilization of remaining disturbed areas. Install first course of paving.
22. When all other work has been completed, repair and sweep all paved areas for final course of paving. Inspect drainage system and stormwater basin and remove accumulated sediment.
23. Install final course of pavement and unplug low level outlet from stormwater basin.

24. After site is stabilized, remove all erosion and sedimentation controls such as geotextile silt fence. Stone or wood chip berms may be left in place upon the completion of construction.
25. With the exception of blasting, sequence is essentially repeated for both sides of Lake Road.

2.3 Control Stormwater Flowing onto and Through the Project

2.3 .1 Slow the Flow

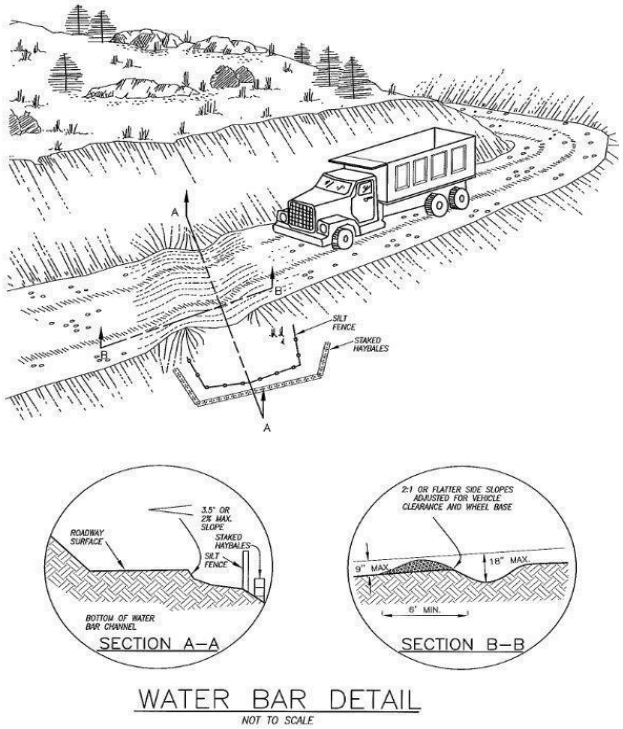
Detachment and transport of eroded soil must be kept to a minimum by absorbing and reducing the erosive energy of water. The erosive energy of water increases as the volume and velocity of runoff increases. The volume and velocity of runoff increases during development as a result of reduced infiltration rates caused by the removal of existing vegetation, removal of topsoil, compaction of soil and the construction of impervious surfaces.

- Use diversions, stone dikes, silt fences and similar measures to break flow lines and dissipate storm water energy.
- Avoid diverting one drainage system into another without evaluating the potential for downstream flooding or erosion.

2.3.2 Keep Clean Runoff Separated

Clean runoff should be kept separated from sediment laden water and should not be directed over disturbed areas without additional controls. Additionally, prevent the mixing of clean off-site generated runoff with sediment laden runoff generated on-site until after adequate filtration of on-site waters has occurred.

- Segregate construction waters from clean water.
- Divert site runoff to keep it isolated from wetlands, watercourses and drainage ways that flow through or near the development until the sediment in that runoff is trapped or detained.



2.4 Preserve & Stabilize Soils

The preserved areas of existing vegetation, as identified on the site plans, will be flagged in the field prior to clearing. Vehicles and equipment will be kept away from these areas. Topsoil stripped from the immediate construction area will be stockpiled as identified on the site plans. The stockpiles will be in areas that will not interfere with construction phases and at least 15 feet away from areas of concentrated flows or pavement. The slopes of the stockpiles will not exceed 2:1 to prevent erosion. A silt fence or wood chip berm will be installed around the perimeter of each stockpile immediately upon formation. Stockpiles that will stand for more than 30 days will be stabilized with temporary seeding PER Figure TS-2.

- Topsoiling including the stripping and reapplication of topsoil to promote the growth of vegetation following establishment of final grades. Distribute topsoil evenly to a minimum depth of 4ò.
- Land Grading Restrictions such as minimizing slope lengths, reverse benches for slopes exceeding 15ô in height, and compacting cuts and fills to reduce erosion for establishment of a stable slope.
- Provide Surface Roughening with tracked machinery up and down slopes to create horizontal depressions in the soil.

Figure TS-2 Temporary Seeding Rates and Dates

Species[4]	Seeding Rates (pounds) /Acre	Seeding Rates (pounds) /1000 sq. ft.	Optimum Seed Depth[2] (inches)	Optimum Seeding Dates[1]	Plant Characteristics
Annual ryegrass *Lolium multiflorum*	40	1.0	0.5		May be added in mixes. Will mow out of most stands
Perennial ryegrass *Lolium perenne*	40	1.0	0.5		Use for winter cover. Tolerates cold and low moisture.
Winter Rye *Secale cereale*	120	3.0	1.0		Quick germination and heavy spring growth. Dies back in June with little regrowth.
Oats *Avena sativa*	86	2.0	1.0		In northern CT. will winter kill with the first killing frost and may through-out the state in severe winters.
Winter Wheat *Triticum aestivum*	120	3.0	1.0		Quick germination with moderate growth. Dies back in June with no regrowth.
Millet *Echinochloa crusgalli*	20	0.5	1.0		Warm season small grain. Dies with frost in September.
Sudangrass *Sorghum sudanense*	30	0.7	1.0		Tolerates warm temperatures and droughty conditions.
Buckwheat *Fagopyrum esculentum*	15	0.4	1.0		Hardy plant that will reseed itself and is good as a green manure crop.
Weeping lovegrass *Eragostis curbula*	5	0.2	0.25		Warm-season perennial. May bunch. Tolerates hot, dry slopes, acid infertile soils. Excellent nurse crop. Usually winter kills.
DOT All Purpose Mix[3]	150	3.4	0.5		Suitable for all conditions.

Optimum Seeding Dates[1]: 3/15, 4/15, 5/15, 6/15, 7/15, 8/15, 9/15, 10/15; 3/1, 4/1, 5/1, 6/1, 7/1, 8/1, 9/1, 10/1

[1] May be planted throughout summer if soil moisture is adequate or can be irrigated. Fall seeding may be extended 15 days in the coastal towns.

[2] Seed at twice the indicated depth for sandy soils.

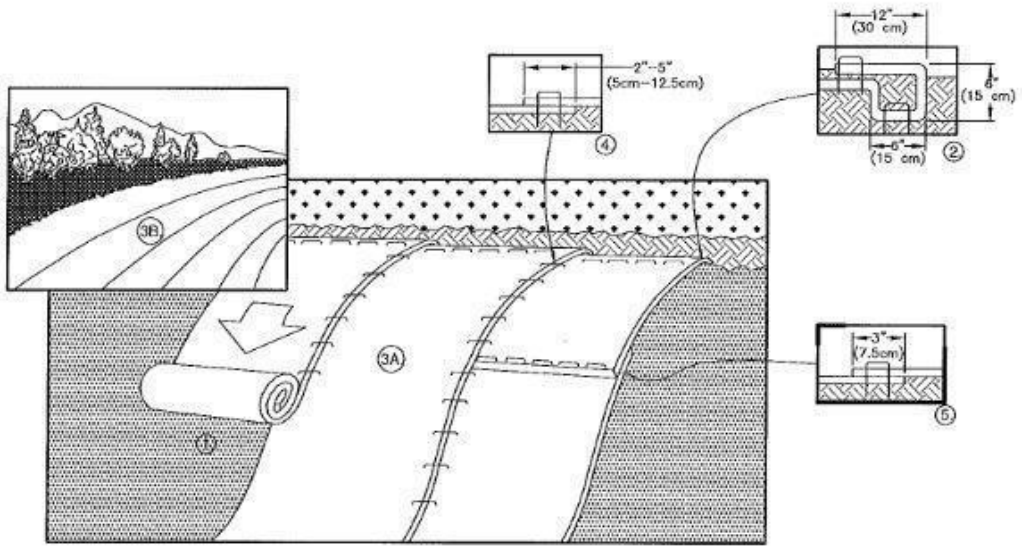
[3] See Permanent Seeding **Figure PS-3** for seeding mixture requirements.

[4] Listed species may be used in combinations to obtain a broader time spectrum. If used in combinations, reduce each species planting rate by 20% of that listed.

2.5 Protect Slopes

Provide erosion control blanketing/turf reinforcement Mats on slopes greater than 3:1.

Geotextile erosion control blankets or jute netting will be used to provide stabilization for slopes. The blanket will cover the entire area of the graded slopes which will be seeded and mulched before the blanket is applied. The blanket will be installed by digging a small trench on the upside of the slope, 12 inches wide by 6 inches deep, and stapling the leading edge of the blanket in the trench. The blanket will be rolled down the slope slowly to maintain soil contact and stapled in 12-inch intervals. If the blanket cannot cover the entire slope, the blankets will be overlapped (minimum of 2 inches) and stapled at the overlapped edge. The erosion control blanket will always be installed according to the manufacturerôs instructions and specifications.



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

NOTES:

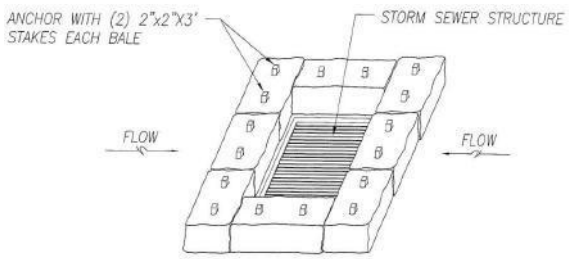
1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. TURF REINFORCEMENT MAT SHALL BE NORTH AMERICAN GREEN P-300® OR APPROVED EQUIVALENT.

TURF REINFORCEMENT MAT INSTALLATION

NOT TO SCALE

2.6 Protect Storm Drain Inlets

Storm drains may be protected from sediment by installation of staked haybales prior to paving. After the first course of pavement has been installed, silt socks or sacks, crushed stone berms or stone filled geotextile may be used.

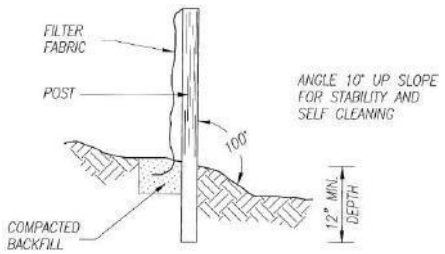


HAYBALE INSTALLATION AT CATCH BASIN

2.7 Establish Perimeter Controls & Sediment Barriers

While it may seem less complicated to collect all waters to one point of discharge for treatment and just install a perimeter control, it can be more effective to apply internal controls to many small sub-drainage basins within the site. By reducing sediment loading from within the site, the chance of perimeter control failure and the potential off-site damage that it can cause is reduced. It is generally more costly to correct off-site damage than it is to install proper internal controls.

- Control erosion and sedimentation in the smallest drainage area possible. It is easier to control erosion than to contend with sediment after it has been carried downstream and deposited in unwanted areas.
- Direct runoff from small disturbed areas to adjoining undisturbed vegetated areas to reduce the potential for concentrated flows and increase settlement and filtering of sediments.
- Concentrated runoff from development should be safely conveyed to stable outlets using rip rapped channels, waterways, diversions, storm drains or similar measures.
- Determine the need for sediment basins. Sediment basins are required on larger developments where major grading is planned and where it is impossible or impractical to control erosion at the source. Sediment basins are needed on large and small sites when sensitive areas such as wetlands, watercourses, and streets would be impacted by off-site sediment deposition. Do not locate sediment basins in wetlands or permanent or intermittent watercourses. Sediment basins should be located to intercept runoff prior to its entry into the wetland or watercourse.

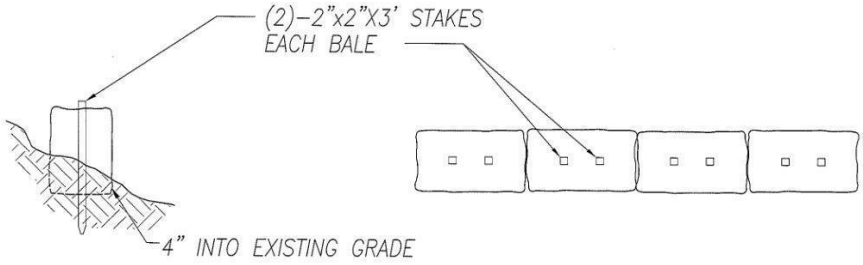


SILT FENCE

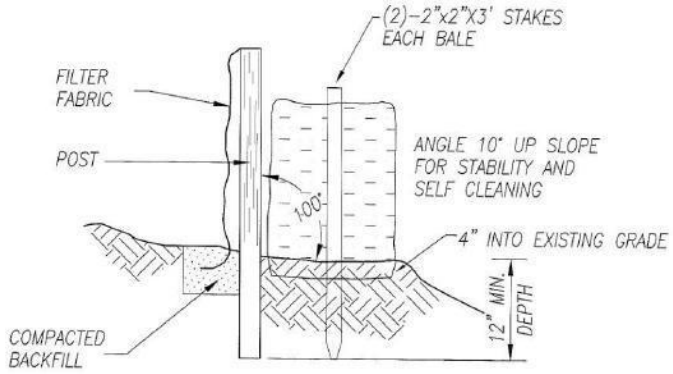
NOT TO SCALE

The silt fence barrier will be installed by excavating a 6-inch-deep trench. Wooden posts supporting the silt fence will be spaced 2 to 3 feet apart and driven securely into the ground; a minimum of 18 to 20 inches deep. The bottom edge of the silt fence will extend across the bottom of the trench and the trench will be backfilled and compacted to prevent stormwater and sediment from discharging underneath the silt fence.

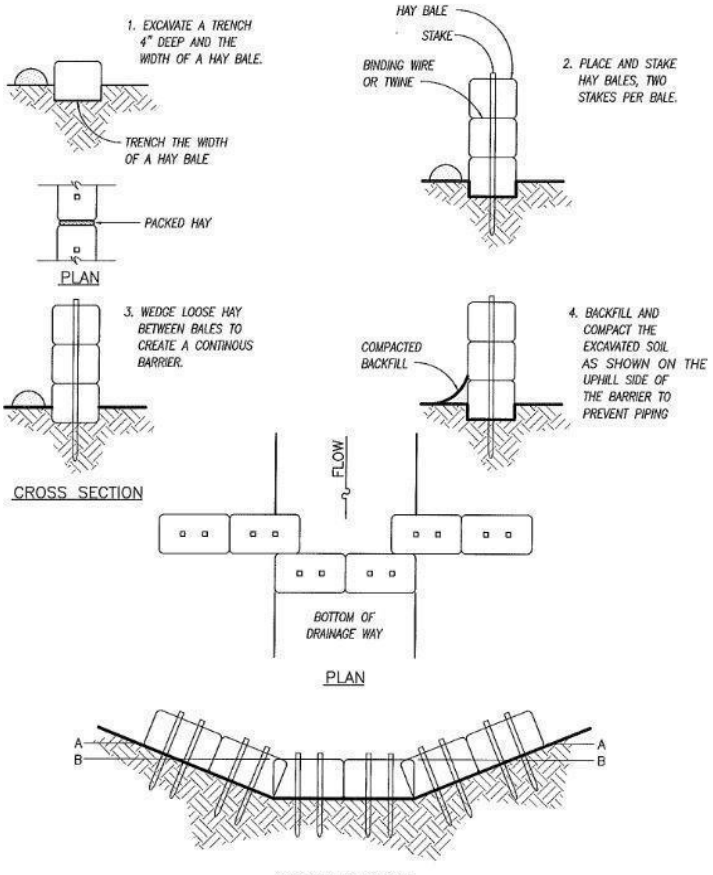
Hay bales may be utilized in lieu of silt fencing or as backing for silt fence in areas of excessive or problematic erosion. Bales may also be utilized as check dams in temporary swales or as protection around catch basins prior to paving.



HAYBALE BARRIER



SILT FENCE – BACKED WITH HAYBALES



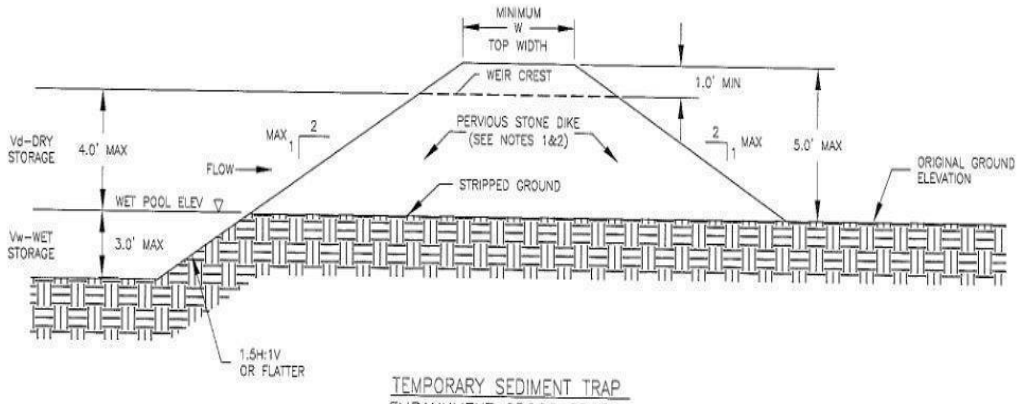
HAYBALE CHECK DAM

NOT TO SCALE

2.8 Construct Temporary Sediment Basins & Diversion Channels

Temporary Sediment Basins are designed and installed to intercept and retain sediment during construction. They prevent erosion and sediment near the source and reduce and/or abate water body impacts, prevent deposition of sediment into undeveloped or undisturbed areas. Basins should be constructed with controlled outlets and designed to have wet and dry storage capacities. Basins may be created by constructing a dam to trap and impound surface water (an embankment basin) or by excavation (an excavated sediment basin), or a combination of both. Method of construction shall be as shown in the detail below and in the locations shown on the design plans.

Diversion channels are constructed with a berm of tamped or compacted soil placed in a manner to divert runoff flows. They are typically constructed to divert sediment laden soils from disturbed areas to temporary sediment basins or to divert clean runoff away from disturbed areas of 25 acres or less. Refer to Figure TD-1 from the 2002 Guidelines. For diversions with slopes of greater than 2%, the necessity for stabilization of the channel should be evaluated (e.g. temporary seeding, riprap, erosion control blankets). For these channels, stone or wood chip check dams should be installed at every 2ô of grade change to slow and filter sediment laden stormwater.



TEMPORARY SEDIMENT TRAP
EMBANKMENT CROSS SECTION
NOT TO SCALE

TOP WIDTH VS. HEIGHT

H = HEIGHT OF EMBANKMENT
W= TOP WIDTH OF EMBANKMENT

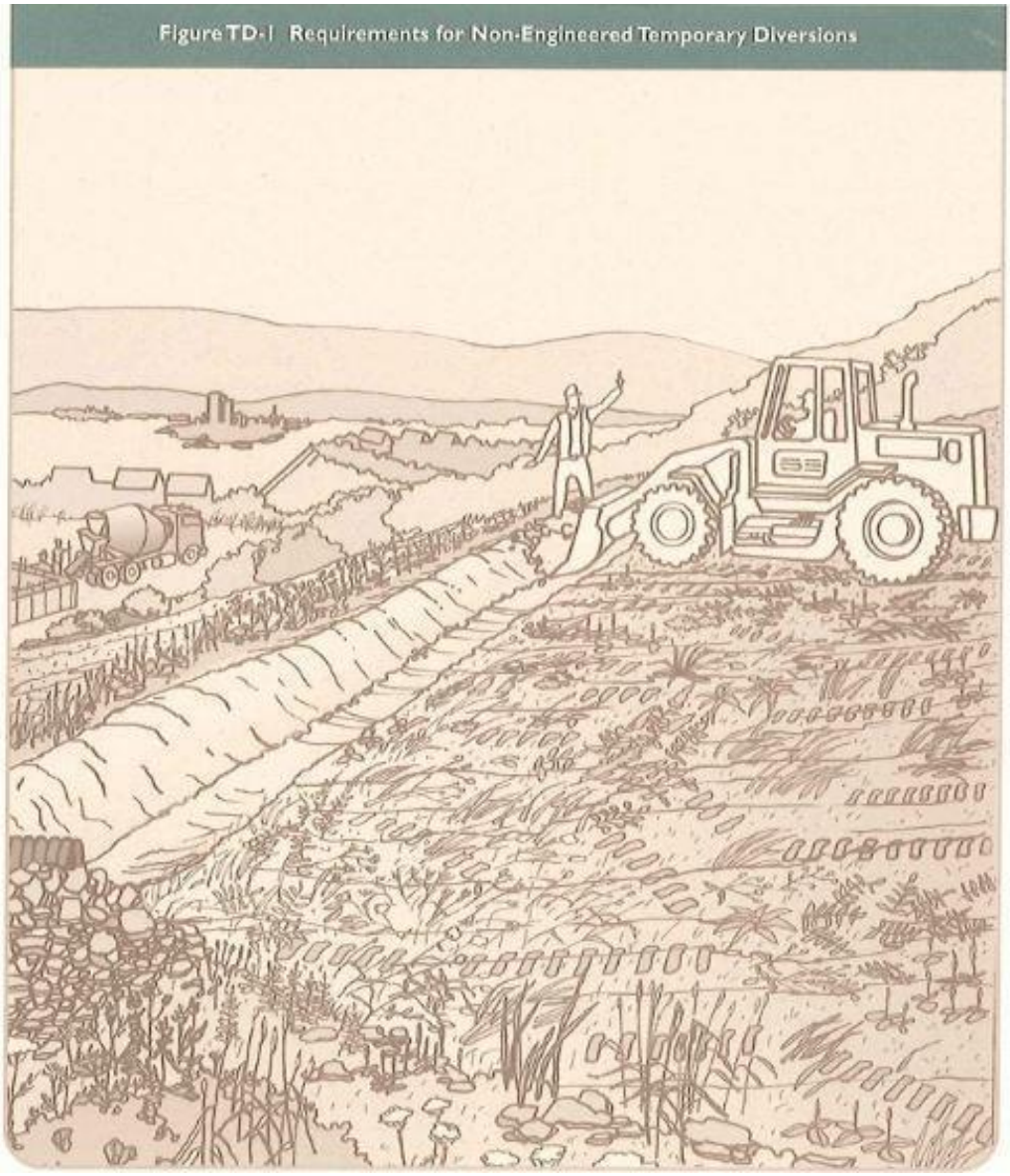
H(ft)	W(ft)
1.5	2.0
2.0	2.0
2.5	2.5
3.0	2.5
3.5	3.0
4.0	3.0
4.5	4.0
5.0	4.5

NOTES:

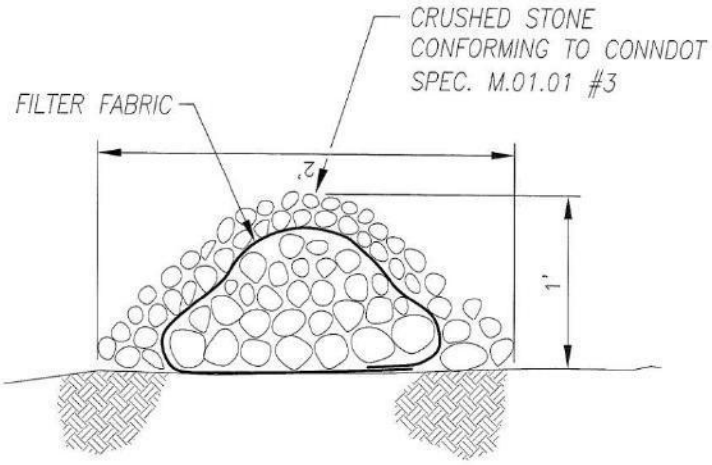
1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL AND EROSION CONTROL, SECTIONS 5-11-25 THRU 5-11-29.
2. PERVIOUS STONE DIKE SHALL BE CONSTRUCTED OF MODIFIED RIPRAP (CTDOT M.12.02) WITH #3 STONE ON FACE (CTDOT M.01.01).
3. NON-OVERFLOW PORTIONS AND ABUTMENTS OF TEMPORARY SEDIMENT TRAPS MAY BE CONSTRUCTED OF ENGINEER APPROVED BACKFILL COMPACTED IN 9" LAYERS. USE ONLY MATERIAL FOR THE EMBANKMENT THAT IS FREE FROM EXCESSIVE ORGANICS, DEBRIS, ROCKS OVER 6" IN DIAMETER OR OTHER UNSUITABLE MATERIALS.
4. IF, IN THE JUDGEMENT OF THE ENGINEER, MATERIALS FROM ON-SITE EXCAVATION ACTIVITIES ARE NOT SUITABLE FOR CONSTRUCTION OF SEDIMENT TRAP EMBANKMENTS, MATERIALS SHALL BE IMPORTED TO THE SITE.
5. EARTHEN EMBANKMENTS SHALL BE STABILIZED WITH TEMPORARY SEEDING, PERMENANT SEEDING OR STONE SLOPE PROTECTION IMMEDIATELY AFTER INSTALLATION.
6. TEMPORARY SEDIMENT TRAP(S) SHALL BE INSPECTED AT LEAST ONCE PER WEEK AND WITHIN 24 HOURS OF THE END OF A STORM OF 0.5 INCHES OF RAINFALL OR GREATER. REMOVE ACCUMULATED SEDIMENT WHEN ONE HALF OF THE MINIMUM WET STORAGE VOLUME HAS BEEN FILLED. DISPOSE OF REMOVED SEDIMENT IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.

The erosion and sedimentation control design calls for temporary diversion channels during construction per figure TD-1 above to convey overland runoff from and around disturbed areas to temporary sediment basins. Temporary diversions are typically constructed with a berm of tamped or compacted soil placed in a manner to divert flows. Their purpose is to:

- Divert sediment-laden runoff from a disturbed area to a sediment-trapping facility such as a temporary sediment trap, sediment basin r vegetative filter.
- Divert water originating from undisturbed areas away from where construction activities are taking place.
- Fragment disturbed areas which thereby reduce the velocity and concentration of runoff.



Stone check dams placed at 50ô intervals within the temporary diversions will assist in reducing velocities and providing a filtering mechanism for removal of sediment.

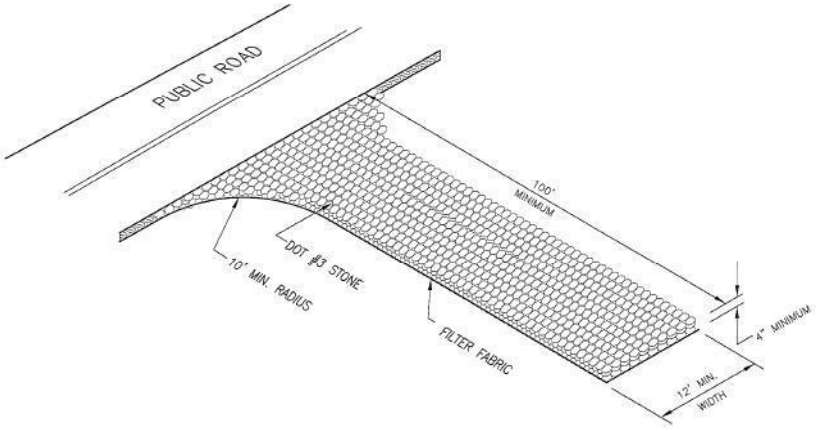


STONE CHECK DAM

NOT TO SCALE

2.9 Establish Stabilized Construction Entrances

Install stabilized construction entrances/anti tracking pads at any and all access/egress points to the site to prevent tire tracked soils and sediment onto paved surfaces.



CONSTRUCTION ENTRANCE

NOT TO SCALE

Construction shall be in accordance with 5-12-2 of the 2002 guidelines. These pads shall be maintained by the addition of stone or lengthening of the entrances as necessary to alleviate sediment transport.

2.10 Additional BMP's

2.10.1 Dust Control

Dust control measures should be taken when it has been determined that other measures for stabilization cannot be practically applied.

- Mechanical Sweeping shall be used on paved areas where dust and fine materials accumulate as a result of truck traffic or wind and water deposits from adjacent areas. Sweep daily in heavily trafficked areas.
- Apply water to exposed soil surfaces and unpaved travel ways.
- Non-asphaltic soil tackifiers may be use consisting of an emulsified liquid soil stabilizer of organic, inorganic or mineral origin. The solutions shall be non-toxic to human, animal or plant life, non-corrosive and nonflammable. Materials shall meet local, state nd federal guidelines for intended use and shall be applied per the manufacturerôs recommendations.

2.10.2 Wood Chips

Clearing of brush and woody vegetation for the purposes of construction will generate wood chips when unmarketable wood is chipped and slashed on site. These chips may be utilized as berms around the perimeter of site disturbances, check dams in swales where slopes are 3% or less, reinforcement behind silt fencing in areas of persistent problematic erosion. They may also be utilized as mulch and spread over exposed surfaces to prevent erosion from rain drop impact; an approved per EPA National Pollutant Discharge Elimination System (NPDES). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=41

Chips may also be combined with compost to create filter berms to prevent sediment transport. In a combined effort, the Connecticut Department of Transportation and the CTDEEP collaborated on a 2-year research project to demonstrate the effectiveness of this application.
http://www.ct.gov/deep/cwp/view.asp?A=2718&Q=325354

3 Good Housekeeping BMP's

3.1 Material Handling & Housekeeping

This section sets forth the requirements for handling, storage, and disposal of material. It specifically addresses the requirements for storing material in open areas; stacking bagged material; storing material in bulk; storing lumber; storing bricks and masonry blocks; handling and storing cement and lime; handling and storing reinforcing sheet and structural steel; handling and storing pipe, conduit, and cylindrical material; storing sand, gravel, and crushed stone; handling and storing flammable and combustible liquids; handling asphalt and tar products; handling liquefied petroleum gas & diesel; and housekeeping.

Materials shall be stored in a manner that does not endanger worker safety. Hazardous materials shall be stored in accordance with the individual requirements. Store all materials on pallets and immediately clean up spills and leaks that could create environmental issues.

- Stack lumber on level and solidly supported sills so that the stacks are stable. Do not pile lumber more than 16 feet high.
- Bagged concrete, mortar or lime shall be stacked on pallets and kept covered at all times. Broken or torn bags shall be removed and disposed of offsite.
- Make sure cylindrical materials are stable when storing or handling. Stacking. Place pipe, conduit bar stock, and other cylindrical materials in racks or stack and block them on a firm, level surface to prevent spreading, rolling, or falling. Use either a pyramided or battened stack. Step back battened stacks at least one unit per tier and securely chock them on both sides of the stack.
- Locate stockpiles to provide safe access for withdrawing material. Material or vertical faces must not overhang. Stockpiles shall be surrounded with silt fence, staked haybales or wood chip berms to prevent erosion from the stockpiles or flow of water into them. Topsoil stockpiles left for more than 30 days shall be over seeded in accordance with Table TS-2, Section 2.4.
- Most flammable and combustible liquids are highly toxic. Use them only after determining their toxic characteristics. In handling toxic liquids, follow the appropriate safety and health requirements in the ñOccupational Healthò section.
- Closed tanks and containers for combustibles shall not exceed the requirements as outlined in the following table:

-Maximum allowable size of containers and portable tanks, combustible

	Flammable liquids			Liquids	
Container type	Class IA	Class IB	Class IB	Class II	Class III
Glass	1 pint	1 quart	1 gallon	1 gallon	5 gallons
Metal	1 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Safety cans	2 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Metal drums	60 gallons	60 gallons	60 gallons	60 gallons	60 gallons
Approved portable tanks	660 gallons	660 gallons	660 gallons	660 gallons	660 gallons
Polyethylene	1 gallon	5 gallons	5 gallons	60 gallons	60 gallons

- **Outdoor Housekeeping -** Keep the areas adjacent to facilities free from rubbish, waste, and tall, dry vegetation. Place combustible waste materials stored outdoors to await subsequent disposal at least 20 feet away from facilities.
- **Tools and Equipment** - To prevent tripping or injury, keep areas clear of tools and portable equipment. Adequately secure tools, materials, and equipment where a tripping hazard exists.
- **Wind** - Store loose or light materials on roofs or unenclosed height only if they are safely tied down or secured.
- **Sacks and Bags** - Remove empty bags that contained cement, lime, or other dust-producing material from the work area at least daily.
- **Excavated Materials** - Keep drives and walkways clear of excavated materials wherever possible. Where this is not possible, adequately post or barricade these areas and provide alternative access.

3.2 Construction Staging Areas

Construction staging areas shall be located as shown on the plans or within locations approved by the site inspector or engineer. Designate where vehicles or construction trailers will turn around or park, where excavated soil or building materials will be stockpiled, where excavation equipment will be unloaded and loaded, where job-site waste will be stored for recycling, etc. Setting up and ensuring use of staging areas requires installation of a packed pervious surface, free of organics or erodible soils. In areas of soft soils, installation of a geogrid prior to placement of a packed pervious surface may be necessary to stabilize surfaces for support of construction equipment and

materials. Staging areas will be evaluated prior to the start of construction to assess surface treatment needs.

3.3 Designate Vehicle Fueling and Maintenance Areas

Designated fueling areas shall be designed to prevent stormwater runoff and spills. It is recommended that fuel-dispensing areas be paved with cement, concrete, or an equivalent impervious surface, with a two to four percent slope to prevent ponding, and separated from the rest of the site by a grade break or berm that prevents run-on of stormwater.

Where practical, fuel dispensing areas should be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area. The cover should not drain onto the fuel dispensing area. Use a perimeter drain or slope the surface inward so that runoff drains to a blind sump. It might be necessary to install and maintain an oil control device in catch basins that might receive runoff from the fueling area.

For fueling with a mobile fuel truck, consider establishing a designated fueling area. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain). A form of secondary containment should be used when transferring fuel from the tank truck to the fuel tank. Storm drains in the vicinity should also be covered. Install vapor recovery nozzles to help control drips as well as reduce air pollution. Fueling areas should have a spill prevention plan and necessary spill kits located nearby.

General Fueling Requirements:

- When fueling must occur onsite, the contractor shall select and designate an area to be used, subject to approval of the Project Engineer or designee of the Town.
- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
- Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 100 feet from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.
- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.
- Fuel tanks shall not be "topped-off."

- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Absorbent spill clean-up materials shall be available in fueling and maintenance areas and used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks.
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.
- Fueling areas and storage tanks shall be inspected regularly.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

3.4 Vehicle Washing & Maintenance

The plans as presented do not consider on-site vehicle washing. Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. However, if these activities must occur onsite, operators should follow appropriate BMPs to prevent untreated nutrient-enriched wastewater or hazardous wastes from being discharged to surface or ground waters. Appropriate BMPs include the following:

- Provide a covered, paved area dedicated to vehicle maintenance and washing;
- Ensure that the areas are properly connected to a liquids collection system;
- Develop a spill prevention and cleanup plan;
- Prevent hazardous chemical leaks by properly maintaining vehicles and equipment;
- Properly cover and provide secondary containment for fuel drums and toxic materials;
- Properly handle and dispose of vehicle wastes and wash water;

Inspect construction vehicles daily, and repair any leaks immediately. Dispose of all used oil, antifreeze, solvents and other automotive-related chemicals according to manufacturer instructions. These wastes require special handling and disposal. Used oil, antifreeze, and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous waste disposal site.

Designate areas for vehicle repair. If cleaning is necessary, use blowers or vacuums instead of water to remove dry materials from vehicles if possible. Water alone can remove most dirt adequately, use high-pressure water spray without detergents at vehicle washing areas. If detergents must be used avoid phosphate- or organic-based cleansers to reduce nutrient enrichment and biological oxygen demand in wastewater. Use only

biodegradable products that are free of halogenated solvents. Clearly mark all washing areas.

3.5 Spill Prevention & Control

Small spills (5 gallons or less) of fuels, oils, chemicals or solvents at the site can be cleaned up in accordance with the following procedure:

1. Have proper protective equipment available for personnel cleaning up the spill.
2. Contain the spill - Oil Absorbent Socks are a containment option for smaller spills. Often used for quick containment around vehicles, valves, small leaks and machines, these absorbents are flexible enough to be quickly molded and curved to fit around a spill area
3. If the spill is from an equipment leak, stop the leak while using the proper protective equipment and ventilation.
4. Clean up small spills and leaks immediately using mops, rags, cloth, sawdust or compatible chemical binders such as bentonite, vermiculite or sawdust. If leak occur on a soil surface, remove the contaminated soil completely as soon as practical.
5. Place solvent-laden materials and/or binders in a covered, solvent-resistant metal container.
6. Arrange for proper waste disposal

For larger spills, contact local and state authorities:

Dayville Fire Department: 911 or 860-774-5525

CTDEEP Emergency Response & Spill Prevention: 866-377-7745

3.6 Rock Blasting

A. Best Management Practices for Blasting.

All activities related to blasting shall follow Best Management Practices (BMPôs) to prevent contamination of ground and surface water including:

- Preparing, reviewing and following an approved blasting plan;
- Proper drilling, explosive handling and loading procedures;
- Evaluating blasting performance;
- Handling and storage of blasted rock.
- Groundwater well monitoring

(1) Loading practices

The following blast hole loading practices to minimize environmental effects shall be followed

(a) Drilling logs shall be maintained by the driller and communicated directly to the blaster. The logs shall indicate depths and lengths of voids, cavities, and fault zones or other weak zones encountered as well as groundwater conditions.

(b) Explosive products shall be managed on-site so that they are either used in the bore hole, returned to the the delivery vehicle, or placed in secure containers for off-site disposal.

(c) Spillage around the borehole shall either be placed in the borehole or cleaned up and returned to an appropriate vehicle for handling or placement in secured containers for off-site disposal.

(d) Loaded explosives shall be detonated as soon as possible and shall not be left in the blastholes overnight, unless weather or other safety concerns reasonably dictate that detonation should be postponed.

(e) Loading equipment shall be cleaned in an area where wastewater can be properly contained and handled in a manner that prevents release of contaminants to the environment.

(f) Explosives shall be loaded to maintain good continuity in the column load to promote complete detonation. Industry accepted loading practices for priming, stemming, decking and column rise shall be attended to.

(2) Explosive Selection.

The following BMPs shall be followed to reduce the potential for ground or surface water contamination when explosives are used:

(a) Explosive products shall be selected that are appropriate for site conditions and safe blast execution.

(b) Explosive products shall be selected that have the appropriate water resistance for the site conditions present to minimize the potential for effect of the product upon ground or surface water.

(3) Prevention of Misfires.

Appropriate practices shall be developed and implemented to prevent misfires.

(4) Muck Pile Management.

Muck piles (the blasted pieces of rock) and rock piles shall be managed in a manner to reduce the potential for contamination by implementing the following measures:

(a) Remove the muck pile from the blast area as soon as reasonably possible.
(b) Manage the interaction of blasted rock piles and stormwater to prevent contamination of surface water.

(5) Groundwater Well Monitoring

A pre-blast survey of existing conditions shall be performed to evaluate structures of concern and all structures located within 250ô of blasting locations, including groundwater wells. Well levels will be monitored throughout the entirety of the blasting process.

4. Post Construction BMP's

For the purposes of this report, post construction BMPôs for impervious surfaces are separated into 3 categories:

1. Overland Flow Erosion Control ï Minimizing the release and suspension of pollutants, particularly erosion of roadway or paved surfaces shoulders by drainage. Erosion control BMPs typically are installed in the form of pervious cover (vegetation, etc.) or energy dissipation devices.
2. Roadway Drainage Conveyance ï Effectively and safely removing water from the roadway or other critical areas of the infrastructure (i.e. steep roadway shoulders or banks). Conveyance BMPs operate as either open (spillway, channel, etc.) or closed (culvert, conduit pipe, etc.) systems.
3. Water Quality and Treatment ï Water quality and treatment BMPs focus on the treatment (pollutant displacement/removal) of stormwater before discharging to and/or beyond the storm drain. Treatment BMPs operate by means of sedimentation, infiltration, filtration, and biological degradation.

The plans, drainage computations and stormwater management methods will need to be reviewed and approved by the CTDEEP in conjunction with a 401 Water Quality Certification and for the General Permit for Discharge of Stormwater Associated with Construction Activities. All proposed discharges and pre-treatment prior to this discharge points were designed to be in accordance with the 2004 Water Quality Guidelines. Where ever possible, non-structural methods of stormwater treatment have been implemented.

- Post construction control measures include promotion of groundwater recharge through pervious surfaces, as well as the construction of stormwater depressions for roof drainage, overland flow and sheet flow from pavement. A large portion of the stormwater from paved surfaces will be collected and treated by a large stormwater basin and discharged to a riprap level spreader constructed on level ground.
- Suspended solid and floatable removal is provided with sumped catch basins with hoods or elbow inserts. The goal of 80% of the annual anticipated sediment load can be achieved with these mechanisms.

- Velocity dissipation is achieved by the design and installation of riprap outlet protection. Flows from these devices discharge to gently sloped vegetated surfaces prior to final discharge to resource areas.
- Runoff reduction is accomplished by encouraging infiltration where practical and extended overland flows.

At the completion of construction, all stormwater collection and treatment devices should be inspected and cleaned in accordance with the plans, including but not limited to the removal of sediment from catch basin sumps & treatment devices, removal of silt fencing adjacent to stabilized areas, inspection of outlets for evidence of erosion or accumulation of sediment, inspection of detention & retention basins and removal of debris and sediment, removal of construction entrances. In addition, paved areas should be thoroughly swept and vegetated surfaces should be inspected to determine whether replacement plantings are necessary.

5. Drainage Summary

The drainage calculations separate drainage analysis for peak overall peak discharges from approximately 45 acres including the developed portion of the site and as well as more than half that will remain in its existing wooded condition.

The calculations utilized HydroCAD® Stormwater Modeling System, a computer model, to analyze pre and post development drainage conditions, and to aid in the design of the stormwater detention/infiltration system. The model used the Soil Conservation Service TR-20 method with a Type III 24-hour rainfall to calculate the runoff. The 2, 10 and 100-year frequency storms were analyzed to evaluate peak runoff flow to the wetlands and perimeter for pre and post construction conditions. All HydroCAD summaries and drainage area maps are included for reference herein as Attachment 3.

5.1 Drainage to Central Wetland

Table 1 summarizes the proposed peak runoff flows to the centrally located wetland (Drainage Area 1S). This drainage area is defined on the enclosed drainage area mapping and has been rounded to the nearest 0.1 CFS

Table 1: Summary of Existing and Proposed Peak Flows from Central Wetlands At Eastern Property Line*

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.2	4.7 CFS	4.8 CFS
10-Year	4.8	24.8 CFS	19.6 CFS
100-Year	6.9	66.0 CFS	48.8 CFS

*All flows are in CFS (cubic feet per second)

As shown in Table 1, the post-construction peak runoff rates are equal to or less than post construction for all design storms. This has been accomplished by re-routing drainage areas to a proposed detention/water quality basin which includes a sediment forebay, a stormwater wetland/bioretention cell and a dry basin for groundwater recharge. Replacement of forested terrain with grassed, gravel and paved areas due to the construction of the proposed facility require this basin.

A small portion of the northern site (the Generating Facility site) discharges east via sheet flow; flow in this direction will continue in the same manner. Table 2 summarizes existing and proposed peak discharge rates at the eastern property boundary (Drainage Area 2S).

Table 2: Summary of Existing and Proposed Peak Flows East

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.2	0.3 CFS	0.4 CFS
10-Year	4.8	1.8 CFS	2.6 CFS
100-Year	6.9	5.0 CFS	6.7 CFS

As the calculations demonstrate, there will be slight increases in peak runoff rates east but these peaks will be metered by construction of small depressions in the landscape to act as retention areas. The increases will be negligible as they are not direct (point) discharges from the property. Portions of the drainage flowing to the east will be intercepted by depressions in the terrain that will infiltrate

The switchyard on the southern side of Lake Road will be comprised substantially of a crushed stone surface that will sheet flow to wetlands located predominantly off site and within the CL&P right of way. The site drains in the same manner presently. Table 3 summarizes existing and proposed peak flows to this wetland area.

Table 3: Summary of Existing and Proposed Peak Flows from Switchyard

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.2	1.8 CFS	2.6 CFS
10-Year	4.8	7.0 CFS	8.8 CFS
100-Year	6.9	16.1 CFS	19.1 CFS

Slight increases in peak runoff rates from the Switchyard will sheet flow overland through the proposed crushed stone surface and ultimately discharge to the wetlands system associated with the existing CL&P right of way.

5.2 Discharge Volume

Although the discharge rate to the central wetlands is significantly reduced for most design storms, it is important to preserve the hydrology of this area. Increased volumes will not adversely affect the wetland or cause erosion of stream banks, on and off the subject site as discharge rates are controlled.

The following table lists pre and post construction discharge volumes to the wetlands for each design storm:

Table 4: Summary of Existing and Proposed Discharge Volume To Central Wetlands in acre-feet

Design Storm	Depth (in)	Existing Volume	Proposed Volume
2-Year	3.2	1.19	1.73
10-Year	4.8	3.72	4.59
100-Year	6.9	8.25	9.37

The central portion wetland on site will continue to discharge off site to the northeast as it does presently. As shown in the computations, this wetland acts as a natural attenuator for existing and proposed flow discharges.

The calculations demonstrate that with construction of the tiered stormwater basin, overland flow and the creation of shallow depressions within the terrain, peak discharge rates to the wetlands will be reduced while the total volume of water to the wetlands will not be. Drainage from impervious areas will be collected, treated and discharged to the basin which ultimately will continue to recharge the wetland.

Drainage from building rooftops will be discharged to the ground or to shallow points in the terrain where ever possible to encourage sheet flow and infiltration. Roof coverings will be comprised of painted standing seam surfaces which are not prone to corrosion or the release of contaminants with rain events.

5.3 Infiltration/Groundwater Recharge

Groundwater recharge volume (GRV) is calculated using the hydrologic soil group approach per the State of CT 2004 Stormwater Quality Manual. For hydrologic soil group ñBò, average annual recharge is 12ò per year and the recharge depth (D) is 0.25ò. The net increase in impervious surface for the runoff to the proposed stormwater basin is 39.3%. Utilizing this information, the required GRV is (D)(A)(I)/12 = (0.25)(16.3)(.39)/12 = 0.132 acre-feet (5,770 cubic feet).

For the Canton and Charlton soils in the area of the proposed basin, the average saturated hydraulic conductivity is 39.6 micrometers per second which converts to 5.6 inches per

hour; the calculations conservatively assume 50% of the average (2.8 inches per hour). The following table summarizes the GRV for each design storm:

Table 5: Summary of Groundwater Recharge Volume

Design Storm	Depth (in)	Volume (ac-ft)
2-Year	3.2	0.29
10-Year	4.8	0.42
100-Year	6.9	0.75

The basin alone as designed exceeds the required GRV. Additional groundwater recharge is accomplished by the construction of small depressions in the terrain throughout the site.

6. Inspections & Reporting

6.1 Inspection Procedure

Within the first 30 days following the commencement of construction activity, the permittee shall contact the Town of Killingly or the project inspecting engineer to review site conditions. The site shall be inspected at least monthly during the first 90 days to insure proper installation of erosion control measures.

The site shall be routinely inspected for compliance with the General Permit and the Plan for the site until a Notice of Termination has been submitted. At least once a week and within 24 hours of a storm that generates a discharge, the qualified inspector shall inspect (at a minimum) the following:

- Disturbed areas of construction activity that have not been stabilized;
- All erosion and sedimentation control measures;
- All structural control measures; soil stockpile areas;
- Washout areas and site entrances;

These areas shall be inspected for evidence of or the potential for off-site impacts and sediment tracking. For storms that fall on a weekend, holiday or after a point where regular working hours will not commence for greater than 24-hours, inspections are required only for storms that equal or exceed 0.5ò.

The qualified inspector shall evaluate the effectiveness of E&S controls, structural controls, stabilization practices, and any other controls implemented to prevent pollution and determine if it is necessary to install, maintain or repair such controls and/or practices to improve the quality of stormwater discharges.

6.2 Reporting

Reports shall be prepared and retained as part of the SWPPP and shall contain the following information:

- Scope of the inspection;
- Name & qualifications of the qualified inspector generating the report;
- Date & weather conditions at the time of the inspection;
- Major observations regarding E&S controls;
- Descriptions of Stormwater Discharges;
- Any stormwater monitoring conducted during the inspection.

A sample report form is enclosed herein as Attachment 7; completed reports may be added to this section as record of inspections. The report should state whether the site is in compliance or out of compliance with the terms of the plans and permit. If the site is out of compliance, the report shall state the remedial actions required to bring the site back into compliance. Non-engineered corrective actions (i.e. silt fence repair, sediment removal, addition of E&S measures) shall be corrected within 24 hours of reporting. Engineered corrective actions (re-design of engineered controls) shall be implemented within 7 days of reporting and shall be incorporated into revised plans within 10 days of reporting.

Inspectors from the DEEP and Town may inspect the site ate any time for compliance with the anticipated General Permit or in terms of approval conditions from state and local authorities. These inspections may take place at any time while construction activities are being conducted or to review post-construction stormwater management measures.

6.3 Keeping Plans Current

The Permittee is responsible for keeping their Plan in compliance with the General Permit at all times, including the following:

A. The Plan shall be amended by the Permittee if the actions required by the plan fail to prevent pollution or fail to otherwise comply with any provisions of the General Permit. The plan shall be immediately amended upon a change in contractor, change in design or construction, operation or maintenance at the site which has the potential for discharge of pollutants to the waters of the state which has not been otherwise addressed in the Plan.

B. The Commissioner of the CTDEEP (the ñDepartmentò) may notify the Permittee at any time that the Plan and/or the site do not meet one or more of the one or more of the minimum requirements of the General Permit. The Permittee shall make any required changes within 7 days upon receipt of such notification and then shall submit certification to the Commissioner within 15 days that the requested changes have been made and implemented.

7. Turbidity Monitoring Requirements

Turbidity monitoring shall be conducted monthly at least monthly with sampling procedure consistent with 40 CFR Part 136.

7.1 Monitoring Frequency

a. Sampling shall be conducted when there is a discharge from the site while construction activity is ongoing, until final stabilization of the drainage areas associated with each outfall is achieved.
b. The Permittee is only required to take samples during regular work hours. If sampling is discontinued at the end of regular working hours, sampling shall resume the next working day as long as the discharge continues.
c. Sampling may be suspended if at any time conditions exist that may reasonably pose a threat to the safety of the person sampling. Such conditions may include high winds, lighting, intense rainfall or other hazardous condition. When the unsafe condition is no longer present, sampling may resume.

7.2 Sample Collection

a. All samples shall be collected from discharges resulting from a storm event that occurs at least 24 hours after any previous storm event that generates a stormwater discharge. Sampling of snow or ice melt without a storm event is not a valid sample.
b. Samples shall be grab samples taken at least three (3) separate times during a storm event and shall be representative of the flow and characteristics of the discharge. Samples may be taken manually or with an in-situ turbidity probe or other automatic sampling device equipped to take turbidity readings. The first sample shall be taken within the first hour of stormwater discharge from the site. If samples are collected manually and the discharge begins outside of normal working hours, the first sample shall be taken at the start of normal working hours and shall be noted.

7.3 Sampling Locations

Sampling is required from point discharges of stormwater from disturbed areas. Sampling points shall be at proposed stormwater outfalls as they are installed throughout the project.

7.4 Monitoring Reports

A. Within thirty (30) days following the end of each month, permittees shall enter the stormwater sampling result(s) on the Stormwater Monitoring Report (SMR) form (available at www.ct.gov/deep/stormwater) and submit it in accordance with the

NetDMR provisions as described below, or, if the permittee has opted out of NetDMR, to the following address:

Bureau of Materials Management and Compliance Assurance
Water Permitting and Enforcement Division (Attn: DMR Processing)
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

If there was no discharge during any given monitoring period, the permittee shall submit the form as required with the words ñno dischargeò entered in place of the monitoring results.

If the permittee monitors any discharge more frequently than required by this general permit, the results of this monitoring shall be included in additional SMRs for the month in which the samples were collected.
If sampling protocols are modified due to the limitations of normal working hours or unsafe conditions in accordance with Section 5(c)(1)(A)(ii) or (iii) above, a description of and reason for the modifications shall be included with the SMR.

If the permittee samples a discharge that is representative of two or more substantially identical discharge points, the permittee shall include the names or locations of the other discharge points.

NetDMR Reporting Requirements

Prior to one-hundred and eighty (180) days after the issuance of a permit, the
Permittee may either submit monitoring data and other reports to the Department in hard copy form or electronically using NetDMR, a web-based tool that allows Permittees to electronically submit stormwater monitoring reports through a secure internet connection. Unless otherwise approved in writing by the commissioner, no later than one-hundred and eighty (180) days after the issuance of the permit the Permittee shall begin reporting electronically using NetDMR. Specific requirements regarding subscription to NetDMR and submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

Submittal of NetDMR Subscriber Agreement

On or before fifteen (15) days after the issuance of a permit, the Permittee and/or the person authorized to sign the Permitteeøs discharge monitoring reports (ñSignatory Authorityò) as described in RCSA Section 22a-430-3(b)(2) shall contact the Department at deep.netdmr@ct.gov and initiate the NetDMR subscription process for electronic submission of Stormwater Monitoring Report information. Information on NetDMR is available on the Departmentøs website at www.ct.gov/deep/netdmr on or before ninety (90) days after issuance of this permit the Permittee shall submit a signed and notarized copy of the Connecticut DEEP NetDMR Subscriber Agreement to the Department

Submittal of Reports Using NetDMR

Unless otherwise approved by the commissioner, on or before one-hundred and eighty (180) days after issuance of this permit, the Permittee and/or the Signatory Authority shall electronically submit SMRs required under the permit to the Department using NetDMR in satisfaction of the SMR submission requirements of Sections 5(c)(2)(A) of this permit.

SMRs shall be submitted electronically to the Department no later than the 30th day of the month following the completed reporting period. Any additional monitoring conducted in accordance with 40 CFR 136 shall be submitted to the Department as an electronic attachment to the SMR in NetDMR. Once a Permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of SMRs to the Department. NetDMR is accessed from: http://www.epa.gov/netdmr

Submittal of NetDMR Opt-Out Requests

If the Permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for electronically submitting SMRs, the commissioner may approve the submission of SMRs in hard copyform (ñopt-out requestò). Opt-out requests must be submitted in writing to the Department for written approval on or before fifteen (15) days prior to the date a Permittee would be required under this permit to begin filing SMRs using NetDMR. This demonstration shall be valid for twelve (12) months from the date of the Departmentôs approval and shall thereupon expire. At such time, SMRs shall be submitted electronically to the Department using NetDMR unless the Permittee submits a renewed opt-out request and such request is approved by the Department.

All opt-out requests and requests for the NetDMR subscriber form should be sent to the following address or by email at deep.netdmr@ct.gov:

Attn: NetDMR Coordinator
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

7.5 Reporting and Record Keeping Requirements

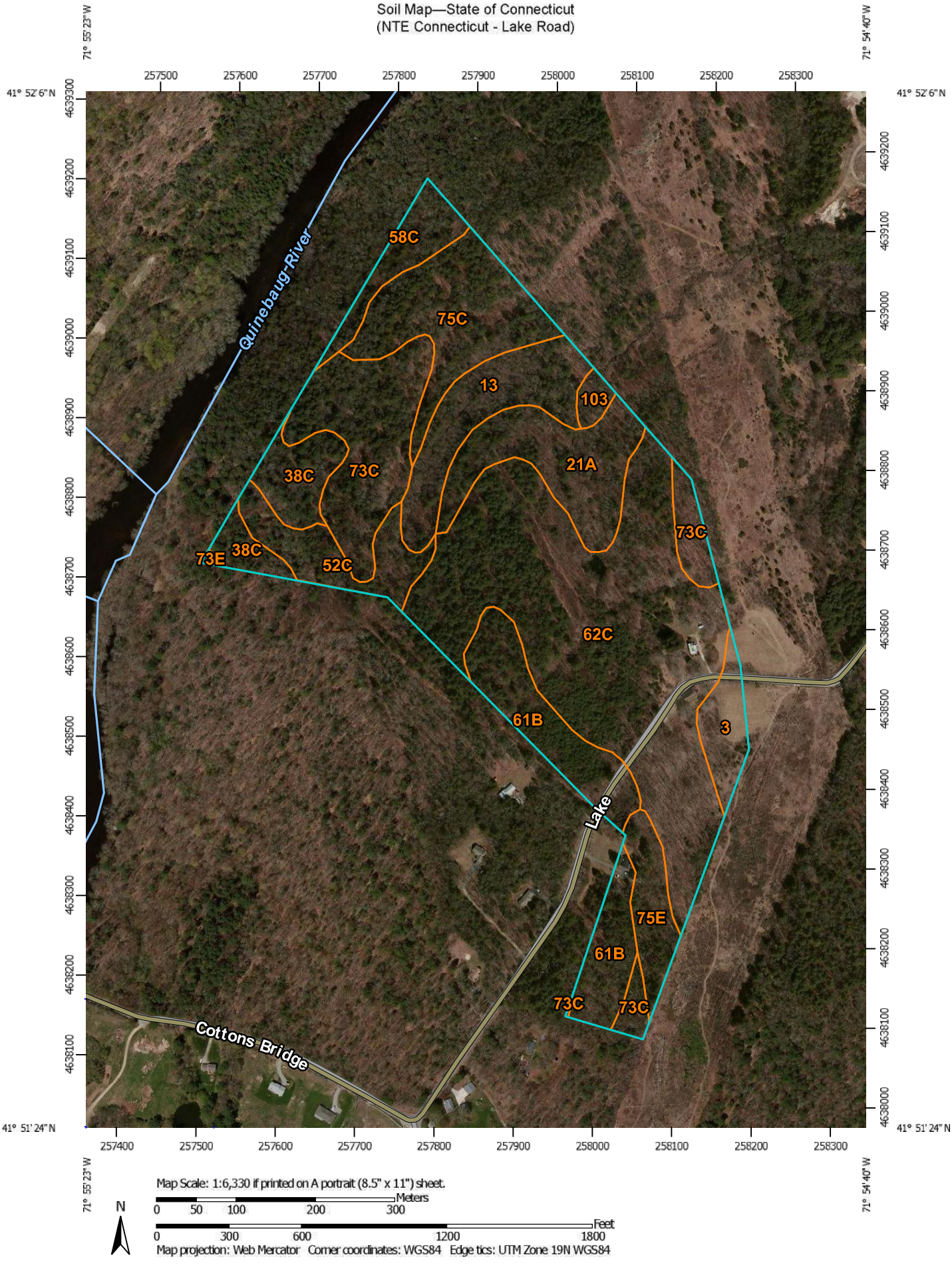
A. For a period of at least five years from the date that construction is complete, the permittee shall retain copies of the Plan and all reports required by the General Permit, and records of all data used to complete the registration for the General Permit, unless the commissioner specifies another time period in writing. Inspection records must be retained as part of the Plan for a period of five (5) years after the date of inspection.

B. The permittee shall retain an updated copy of the Plan required by this general permit at the construction site from the date construction is initiated at the site until the date construction at the site is completed.

ATTACHMENT 1

USDA-NRCS WEB SOIL SURVEY MAPPING

Soil Map—State of Connecticut
(NTE Connecticut - Lake Road)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

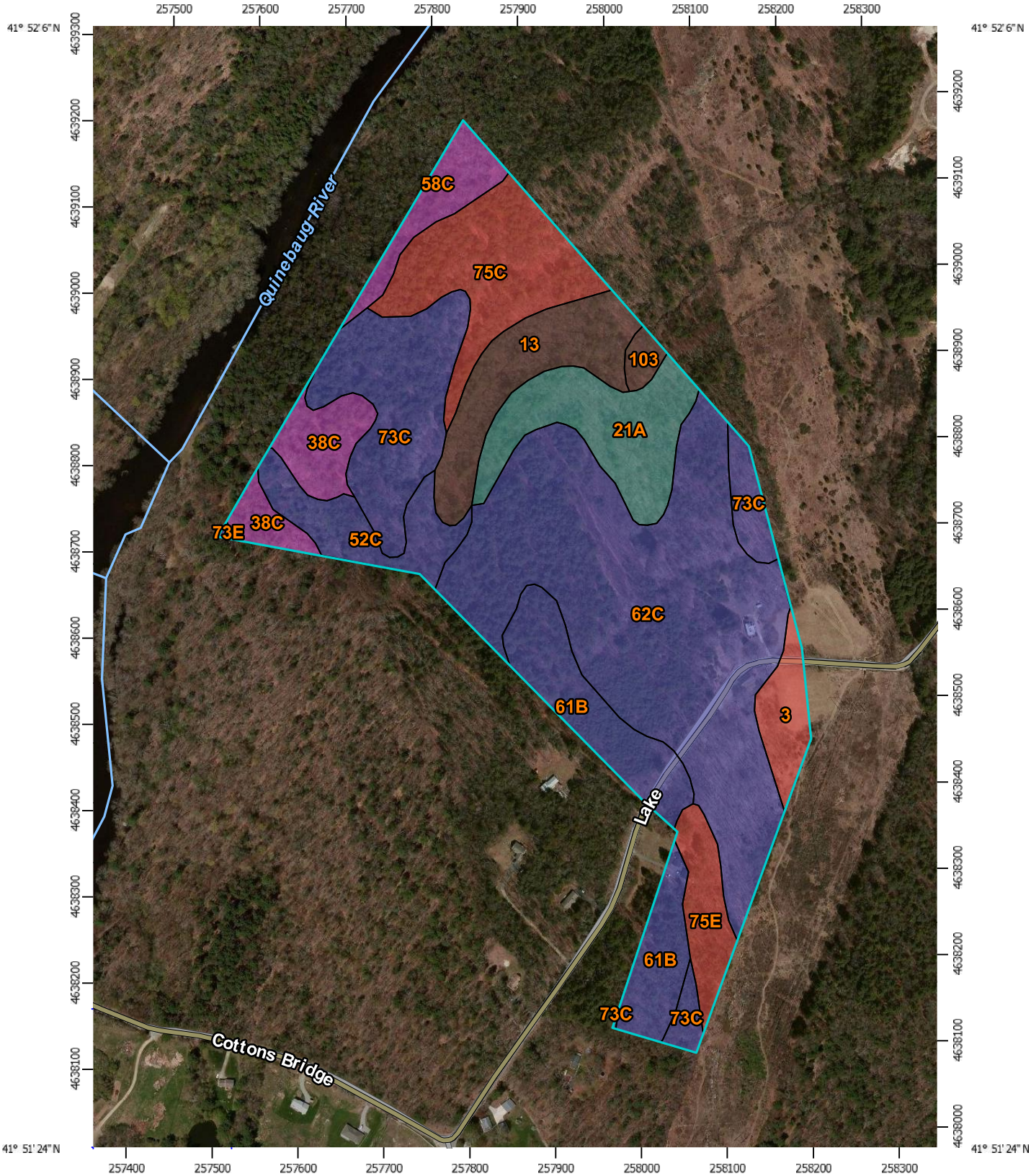
Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	2.0	2.6%
13	Walpole sandy loam, 0 to 3 percent slopes	5.3	7.0%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	6.0	7.9%
38C	Hinckley loamy sand, 3 to 15 percent slopes	3.5	4.6%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	3.5	4.6%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	2.3	3.1%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	7.2	9.5%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	26.6	35.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	9.2	12.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	7.2	9.5%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	2.5	3.2%
103	Rippowam fine sandy loam	0.6	0.8%
Totals for Area of Interest		**75.8**	**100.0%**

Hydrologic Soil Group—State of Connecticut
(NTE Connecticut - Lake Road)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	2.0	2.6%
13	Walpole sandy loam, 0 to 3 percent slopes	B/D	5.3	7.0%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	C	6.0	7.9%
38C	Hinckley loamy sand, 3 to 15 percent slopes	A	3.5	4.6%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	B	3.5	4.6%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	A	2.3	3.1%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	B	7.2	9.5%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	B	26.6	35.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	B	9.2	12.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	7.2	9.5%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	2.5	3.2%
103	Rippowam fine sandy loam	B/D	0.6	0.8%
Totals for Area of Interest			**75.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

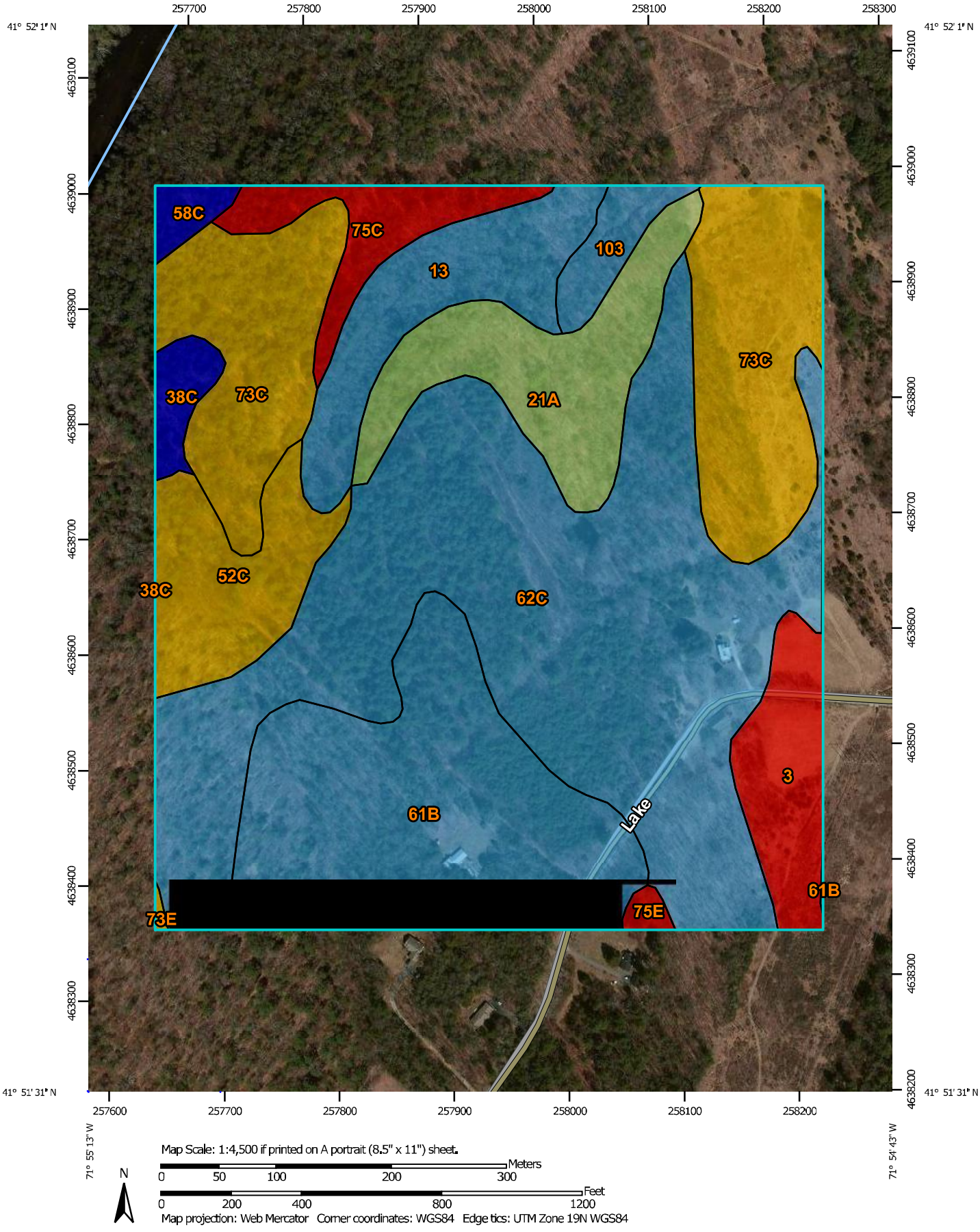
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Saturated Hydraulic Conductivity (Ksat)—State of Connecticut
(NTE Connecticut, Killingly)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Soil Rating Lines
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Soil Rating Points
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Saturated Hydraulic Conductivity (Ksat)

Saturated Hydraulic Conductivity (Ksat)— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	5.1044	3.9	4.2%
13	Walpole sandy loam, 0 to 3 percent slopes	40.6593	5.7	6.1%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	34.7253	7.0	7.6%
38C	Hinckley loamy sand, 3 to 15 percent slopes	100.0000	1.1	1.2%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	24.9231	5.2	5.5%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	93.0769	0.7	0.8%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	39.6703	16.1	17.3%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	39.6703	33.2	35.7%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	21.5714	15.2	16.3%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	21.5714	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	10.0139	3.0	3.2%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	10.0139	0.3	0.3%
103	Rippowam fine sandy loam	44.6703	1.5	1.6%
Totals for Area of Interest			**92.9**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: *None Specified*

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 36

Units of Measure: Inches

ATTACHMENT 2

JUNE 2016

NATURAL DIVERSITY DATABASE MAP

Natural Diversity Data Base Areas

KILLINGLY, CT

June 2016

State and Federal Listed Species & Significant Natural Communities

Town Boundary

NOTE: This map shows general locations of State and Federal Listed Species and Significant Natural Communities. Information on listed species is collected and compiled by the Natural Diversity Data Base (NDDB) from a number of data sources . Exact locations of species have been buffered to produce the general locations. Exact locations of species and communities occur somewhere in the shaded areas, not necessarily in the center. A new mapping format is being employed that more accurately models important riparian and aquatic areas and eliminates the need for the upstream/downstream searches required in previous versions.

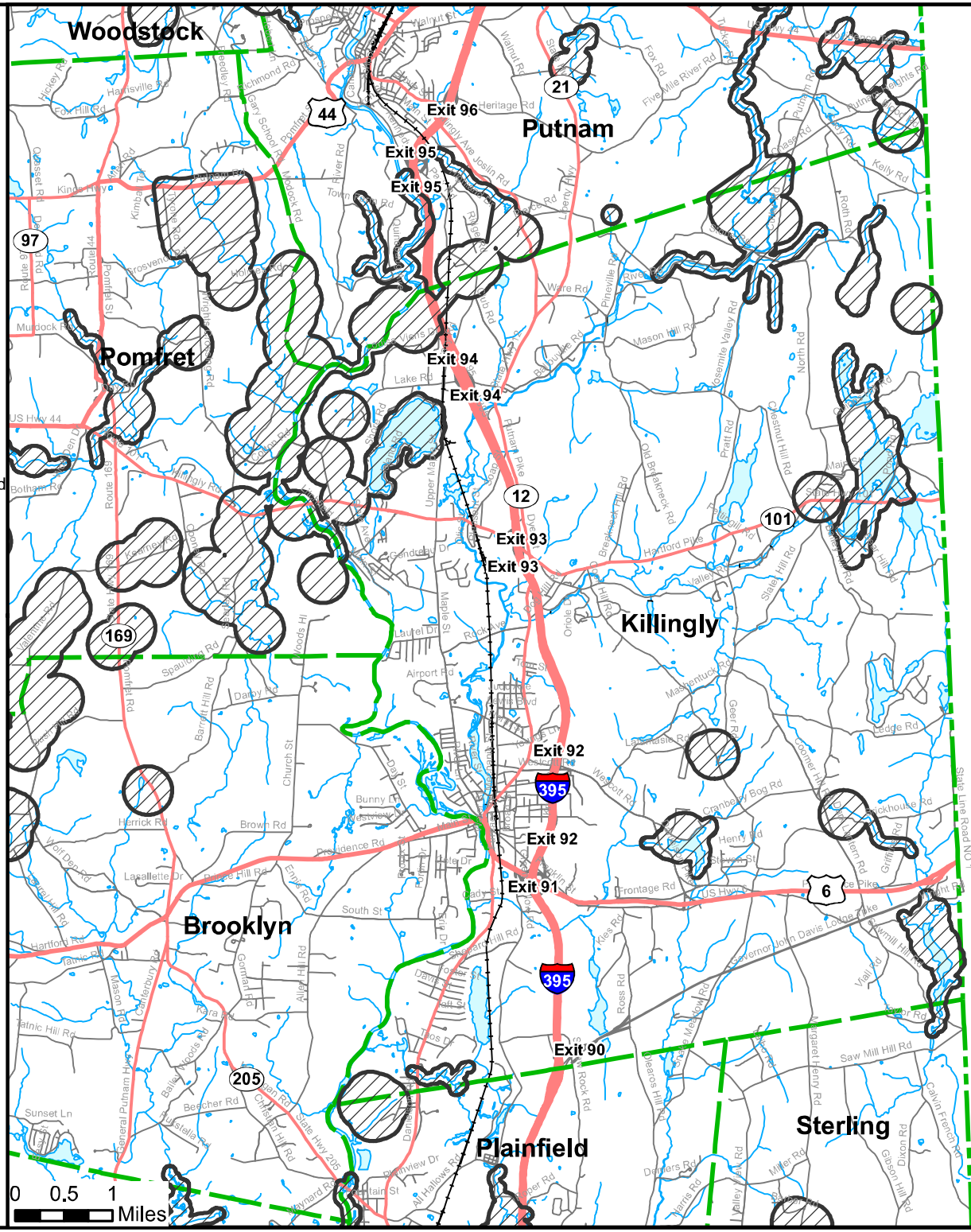
This map is intended for use as a preliminary screening tool for conducting a Natural Diversity Data Base Review Request. To use the map, locate the project boundaries and any additional affected areas. If the project is within a shaded area there may be a potential conflict with a listed species. For more information, complete a Request for Natural Diversity Data Base State Listed Species Review form (DEP-APP-007), and submit it to the NDDB along with the required maps and information. More detailed instructions are provided with the request form on our website.

www.ct.gov/deep/nddbrequest

Use the CTECO Interactive Map Viewers at www.cteco.uconn.edu to more precisely search for and locate a site and to view aerial imagery with NDDB Areas.

QUESTIONS: Department of Energy and Environmental Protection (DEEP)
79 Elm St., Hartford CT 06106
Phone (860) 424-3011

Connecticut Department of Energy & Environmental Protection
Bureau of Natural Resources
Wildlife Division



ATTACHMENT 3

HydroCAD DRAINAGE CALCULATION SUMMARIES

(With drainage area maps)

ANALYSIS POINT

(2S) 25 ACRES

(1S) 44.65 ACRES

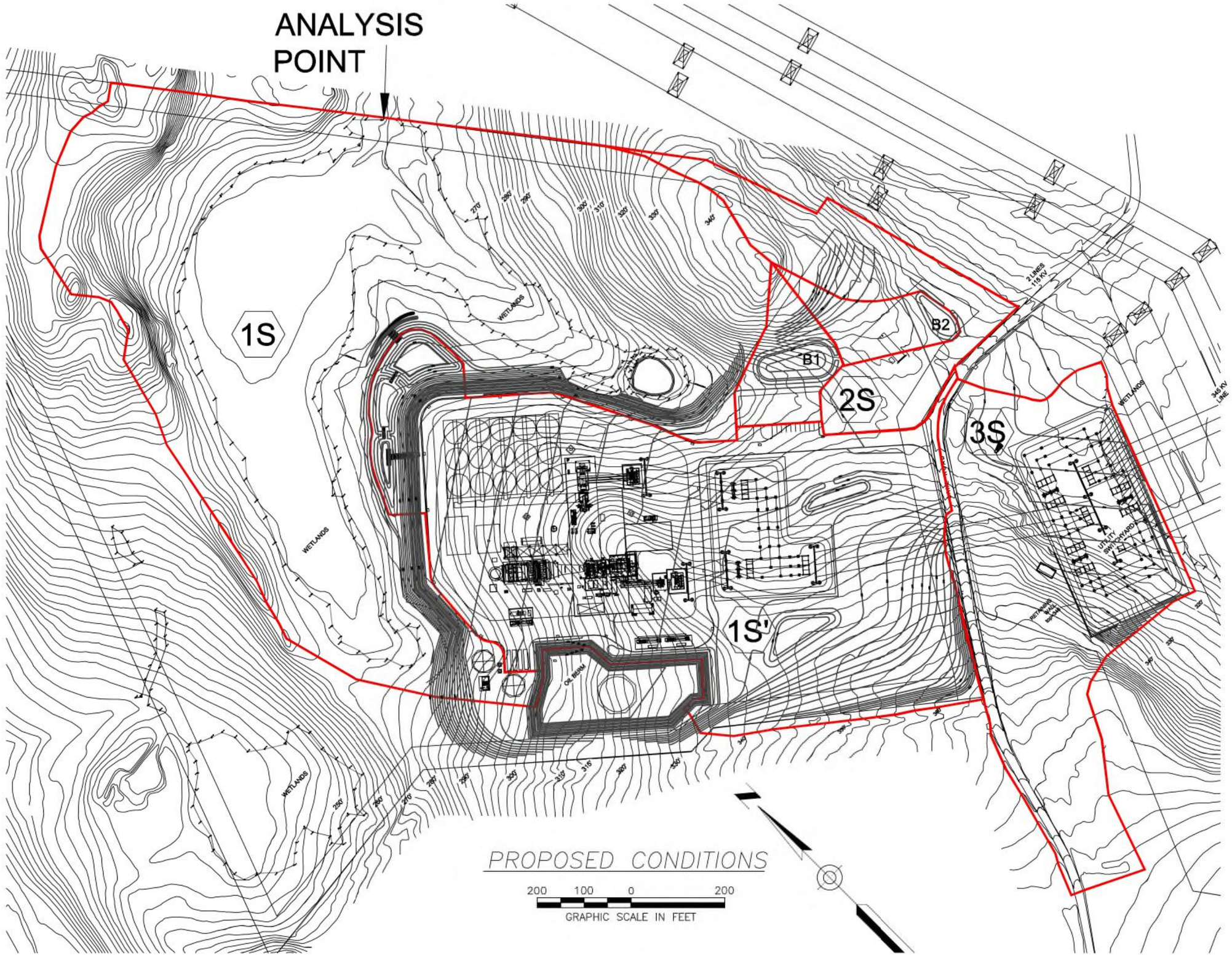
(2S) 7.5 ACRES

RIVER

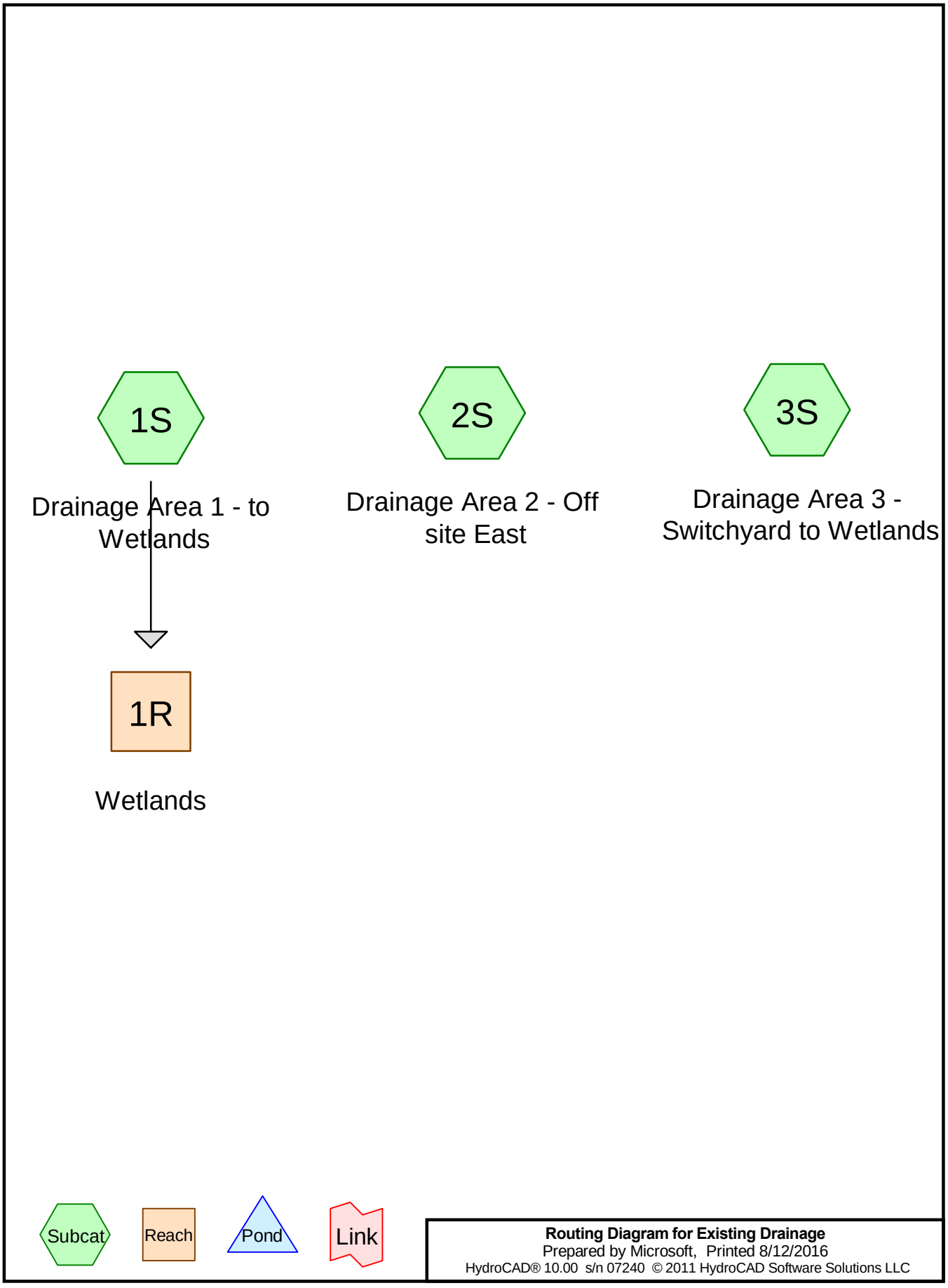
EXISTING CONDITIONS

200 100 0 200

GRAPHIC SCALE IN FEET


ANALYSIS POINT
1S
2S
3S
1S'
B1
B2
WETLANDS
WETLANDS
WETLANDS
WETLANDS
OIL RSVR
2 LINES 115 KV
345 KV LINE
UTILITY SWITCHYARD
PROPOSED CONDITIONS
200 100 0 200
GRAPHIC SCALE IN FEET

EXISTING CONDITIONS DRAINAGE COMPUTATIONS
2, 10 & 100-YEAR STORMS


1S
Drainage Area 1 - to Wetlands
2S
Drainage Area 2 - Off site East
3S
Drainage Area 3 - Switchyard to Wetlands
1R
Wetlands
Subcat
Reach
Pond
Link
Routing Diagram for Existing Drainage
Prepared by Microsoft, Printed 8/12/2016
HydroCAD® 10.00 s/n 07240 © 2011 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: Drainage Area 1 - to Wetlands

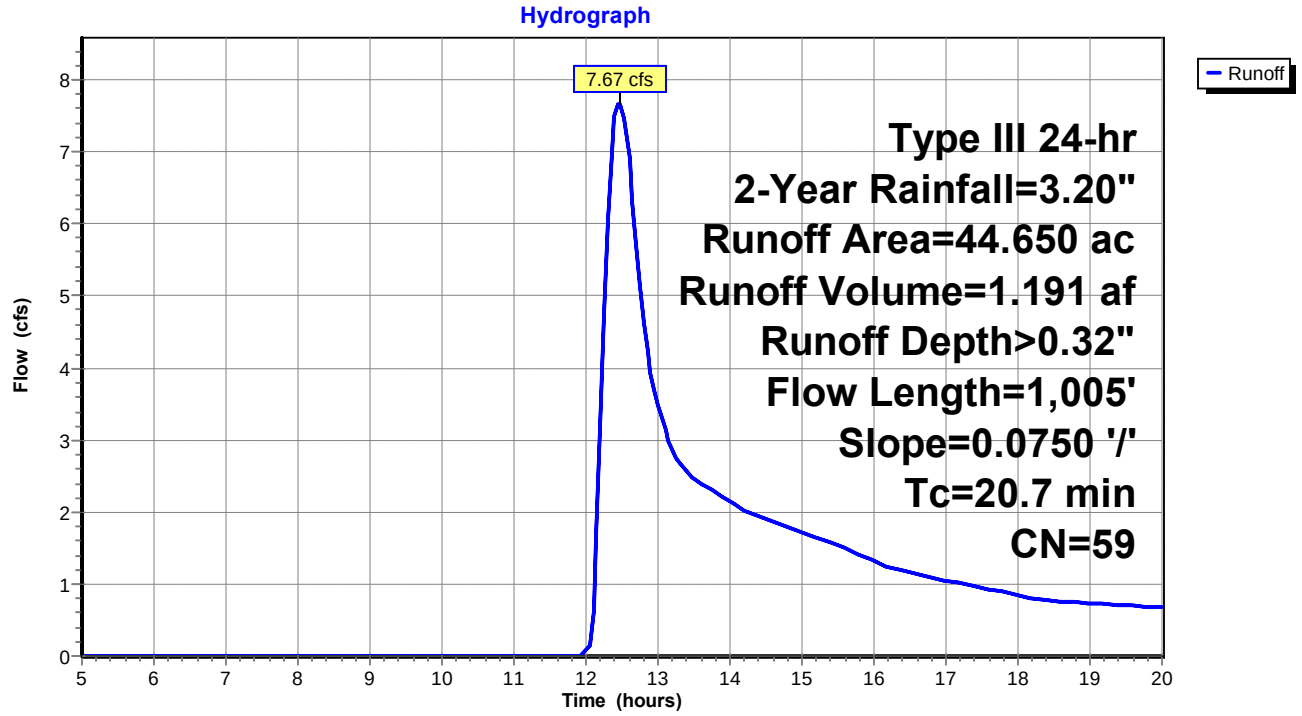
Runoff = 7.67 cfs @ 12.46 hrs, Volume= 1.191 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.750	68	1 acre lots, 20% imp, HSG B
*	8.600	77	Woods, Good, HSG D (Wetlands)
	35.300	55	Woods, Good, HSG B
	44.650	59	Weighted Average
	44.500		99.66% Pervious Area
	0.150		0.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.7	1,005	0.0750	0.81		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Area 1 - to Wetlands



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

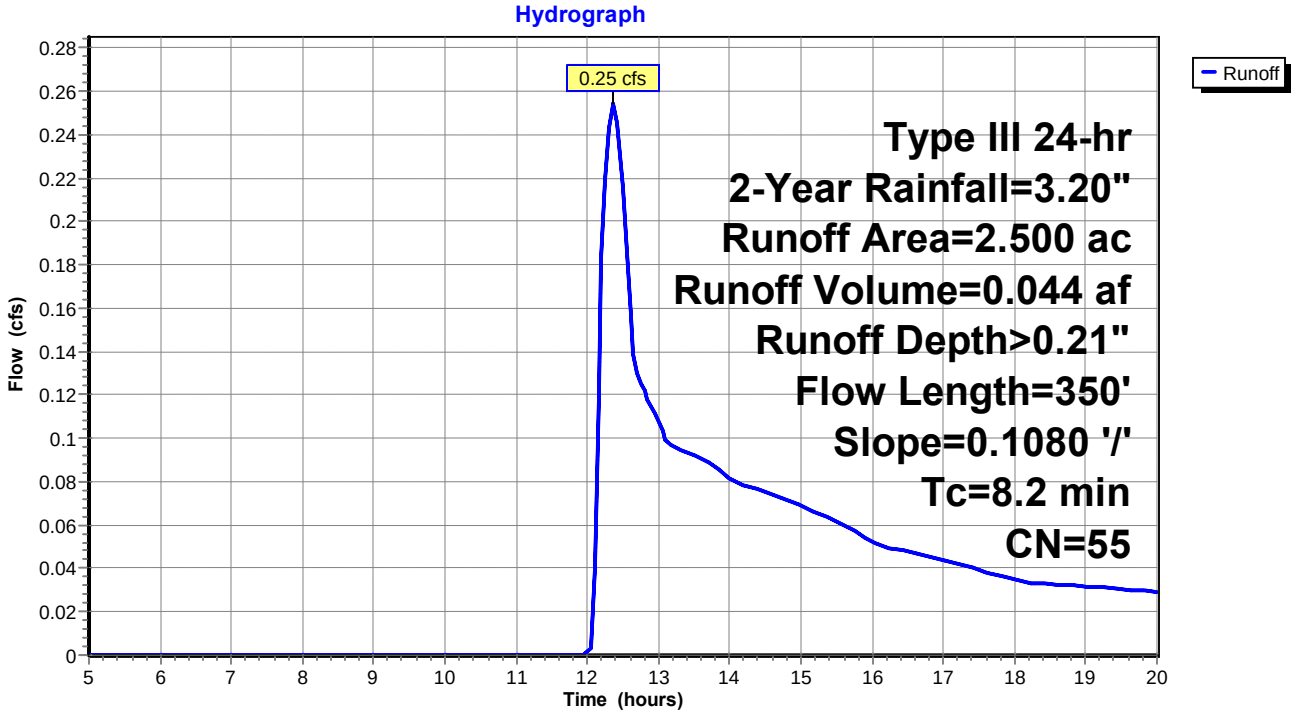
Runoff = 0.25 cfs @ 12.37 hrs, Volume= 0.044 af, Depth> 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
2.500	55	Woods, Good, HSG B
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	350	0.1080	0.71		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

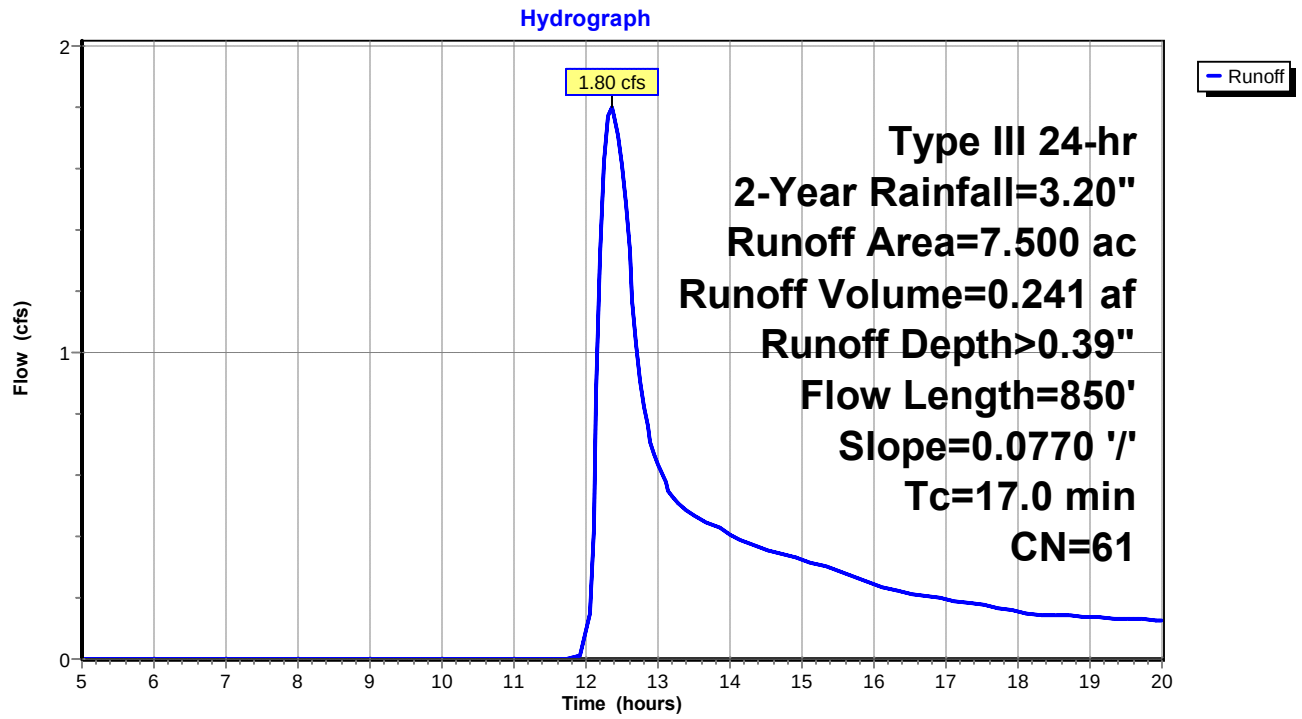
Runoff = 1.80 cfs @ 12.35 hrs, Volume= 0.241 af, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



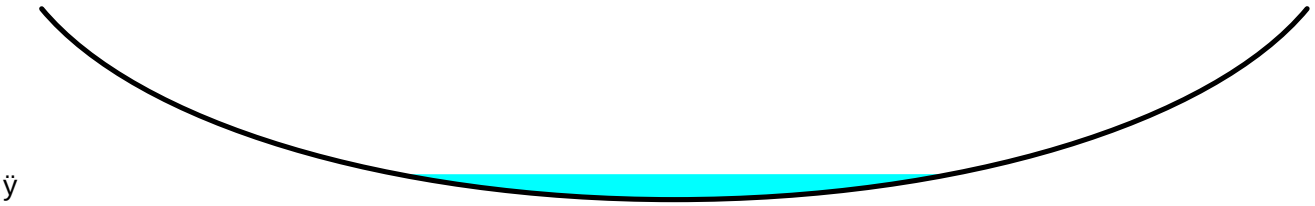
Summary for Reach 1R: Wetlands

Inflow Area = 44.650 ac, 0.34% Impervious, Inflow Depth > 0.32" for 2-Year event
Inflow = 7.67 cfs @ 12.46 hrs, Volume= 1.191 af
Outflow = 4.74 cfs @ 13.28 hrs, Volume= 1.110 af, Atten= 38%, Lag= 49.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.74 fps, Min. Travel Time= 29.3 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 42.0 min

Peak Storage= 8,349 cf @ 12.79 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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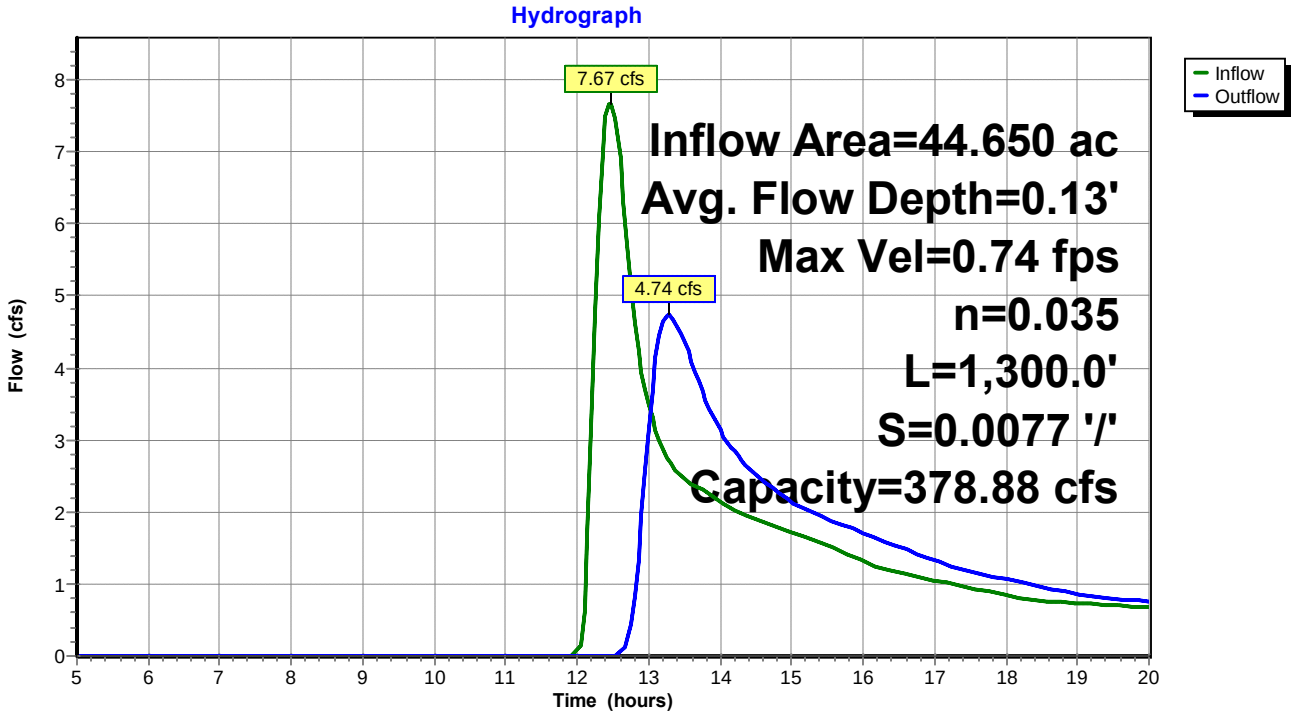
Reach 1R: Wetlands



Summary for Subcatchment 1S: Drainage Area 1 - to Wetlands

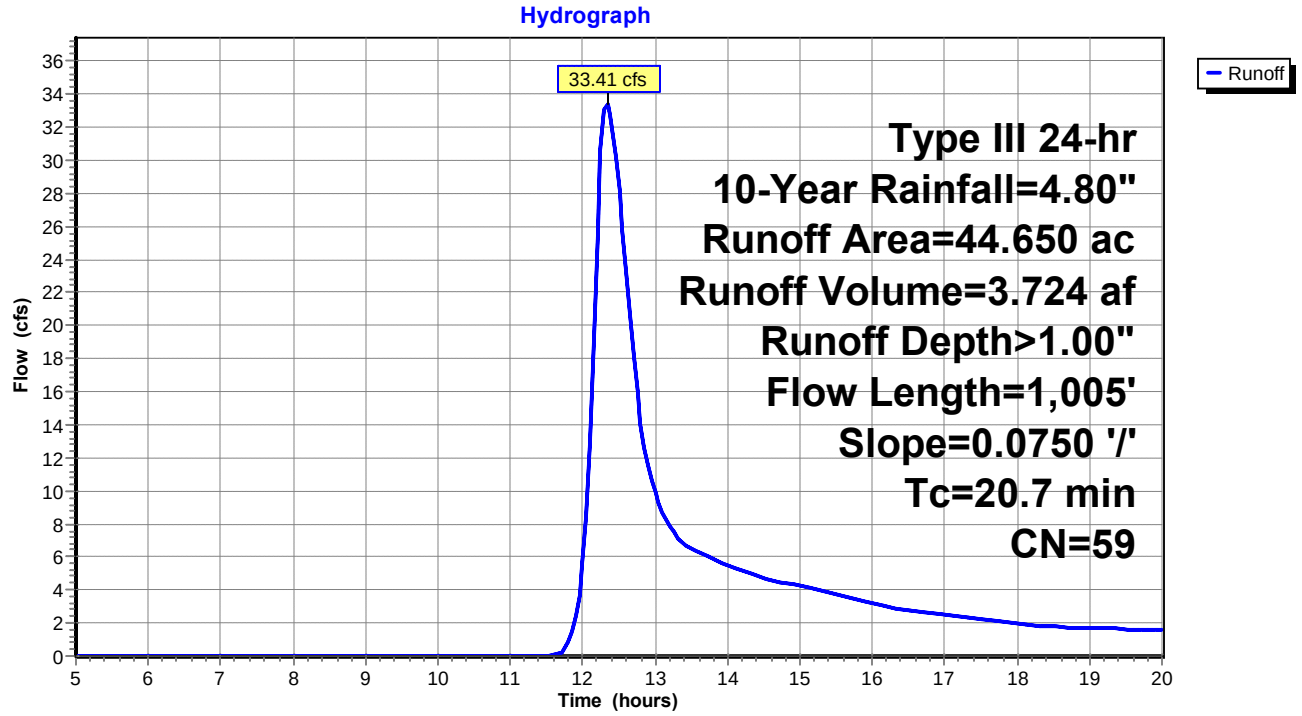
Runoff = 33.41 cfs @ 12.34 hrs, Volume= 3.724 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
	0.750	68	1 acre lots, 20% imp, HSG B
*	8.600	77	Woods, Good, HSG D (Wetlands)
	35.300	55	Woods, Good, HSG B
	44.650	59	Weighted Average
	44.500		99.66% Pervious Area
	0.150		0.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.7	1,005	0.0750	0.81		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Area 1 - to Wetlands



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

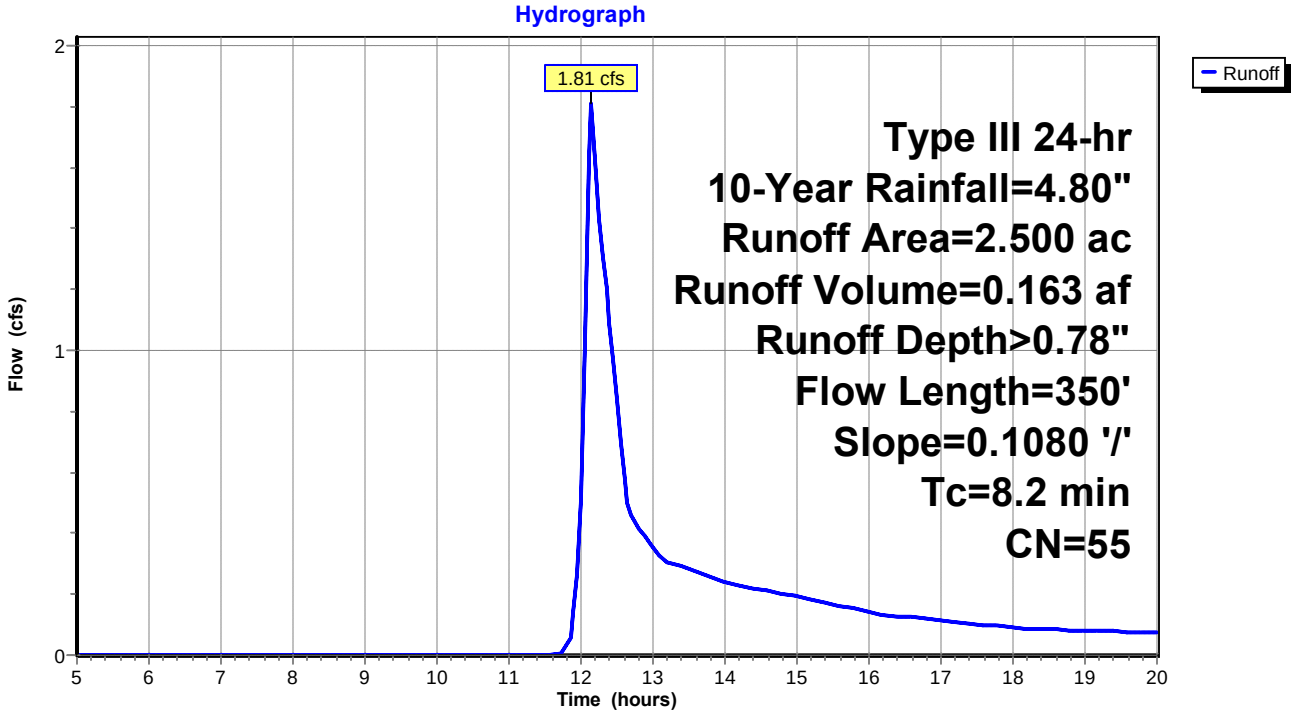
Runoff = 1.81 cfs @ 12.15 hrs, Volume= 0.163 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
2.500	55	Woods, Good, HSG B
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	350	0.1080	0.71		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

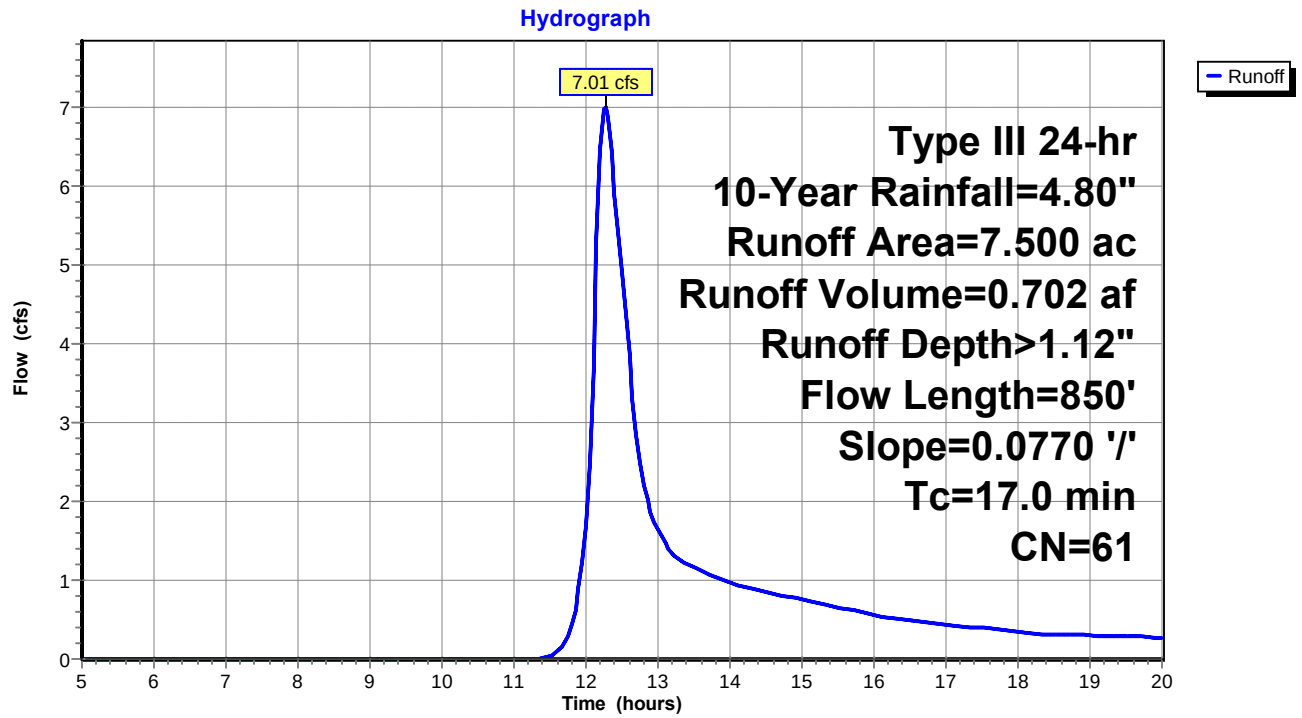
Runoff = 7.01 cfs @ 12.27 hrs, Volume= 0.702 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



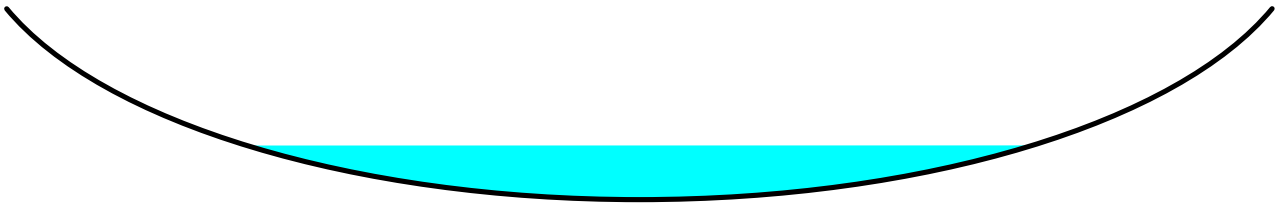
Summary for Reach 1R: Wetlands

Inflow Area = 44.650 ac, 0.34% Impervious, Inflow Depth > 1.00" for 10-Year event
Inflow = 33.41 cfs @ 12.34 hrs, Volume= 3.724 af
Outflow = 24.82 cfs @ 12.87 hrs, Volume= 3.594 af, Atten= 26%, Lag= 31.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.23 fps, Min. Travel Time= 17.6 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 31.5 min

Peak Storage= 26,286 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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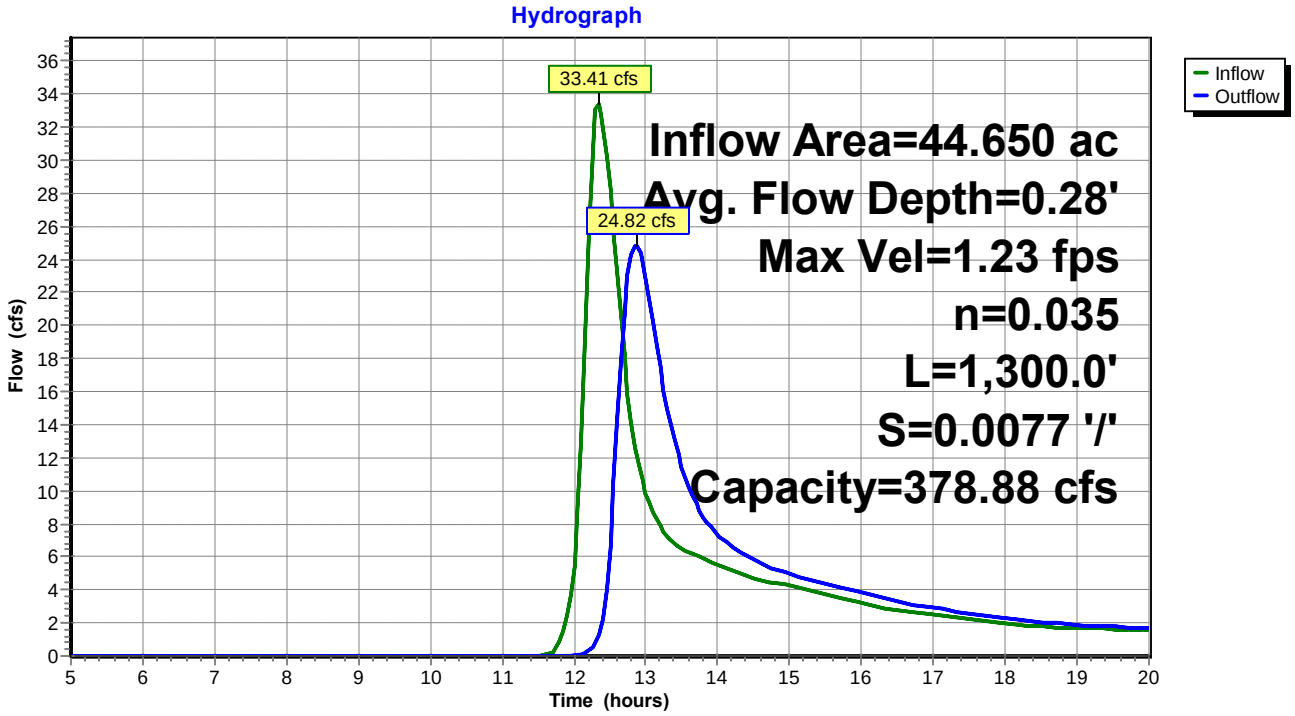
Reach 1R: Wetlands



Summary for Subcatchment 1S: Drainage Area 1 - to Wetlands

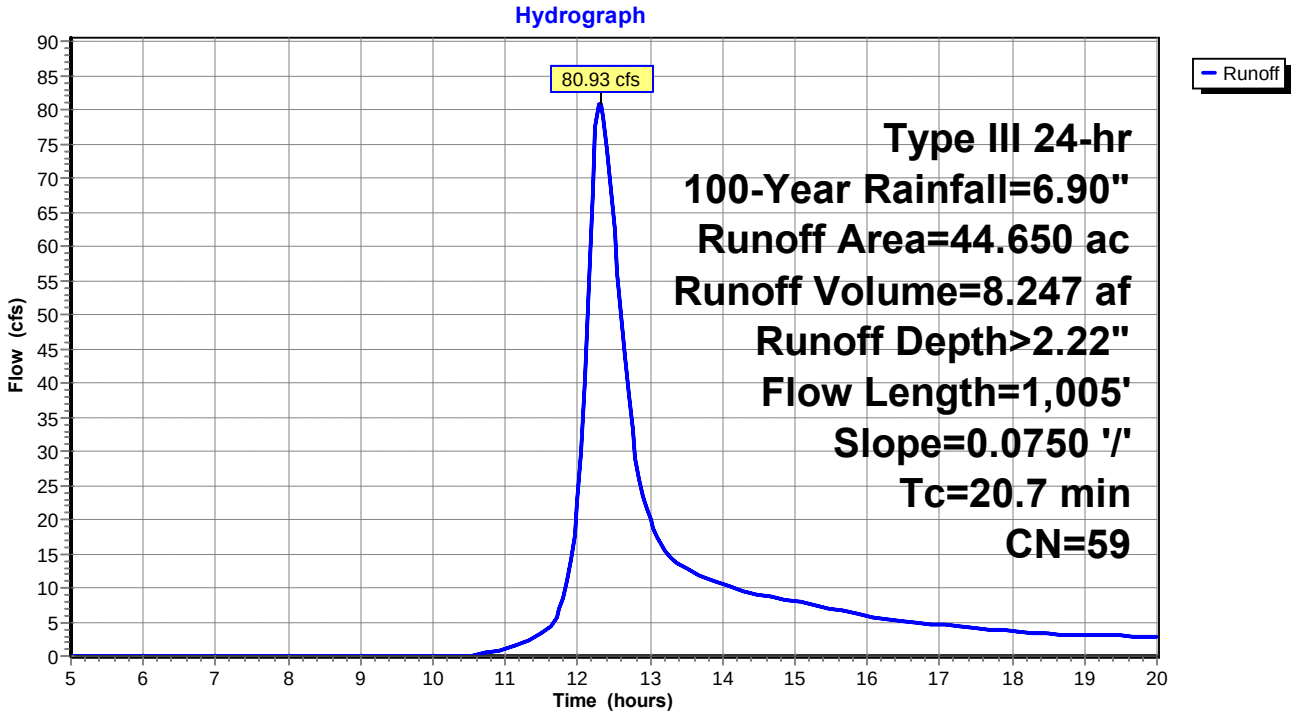
Runoff = 80.93 cfs @ 12.31 hrs, Volume= 8.247 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

	Area (ac)	CN	Description
	0.750	68	1 acre lots, 20% imp, HSG B
*	8.600	77	Woods, Good, HSG D (Wetlands)
	35.300	55	Woods, Good, HSG B
	44.650	59	Weighted Average
	44.500		99.66% Pervious Area
	0.150		0.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.7	1,005	0.0750	0.81		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Area 1 - to Wetlands



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

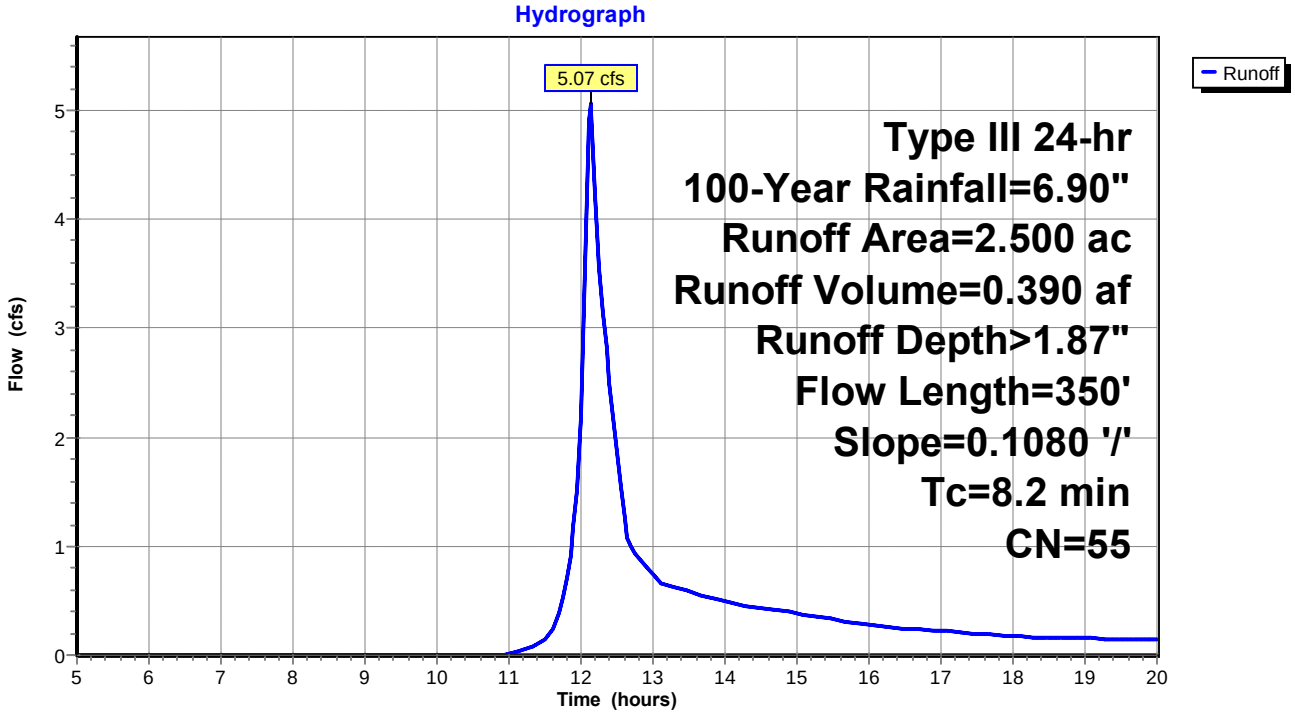
Runoff = 5.07 cfs @ 12.13 hrs, Volume= 0.390 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

Area (ac)	CN	Description
2.500	55	Woods, Good, HSG B
2.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	350	0.1080	0.71		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

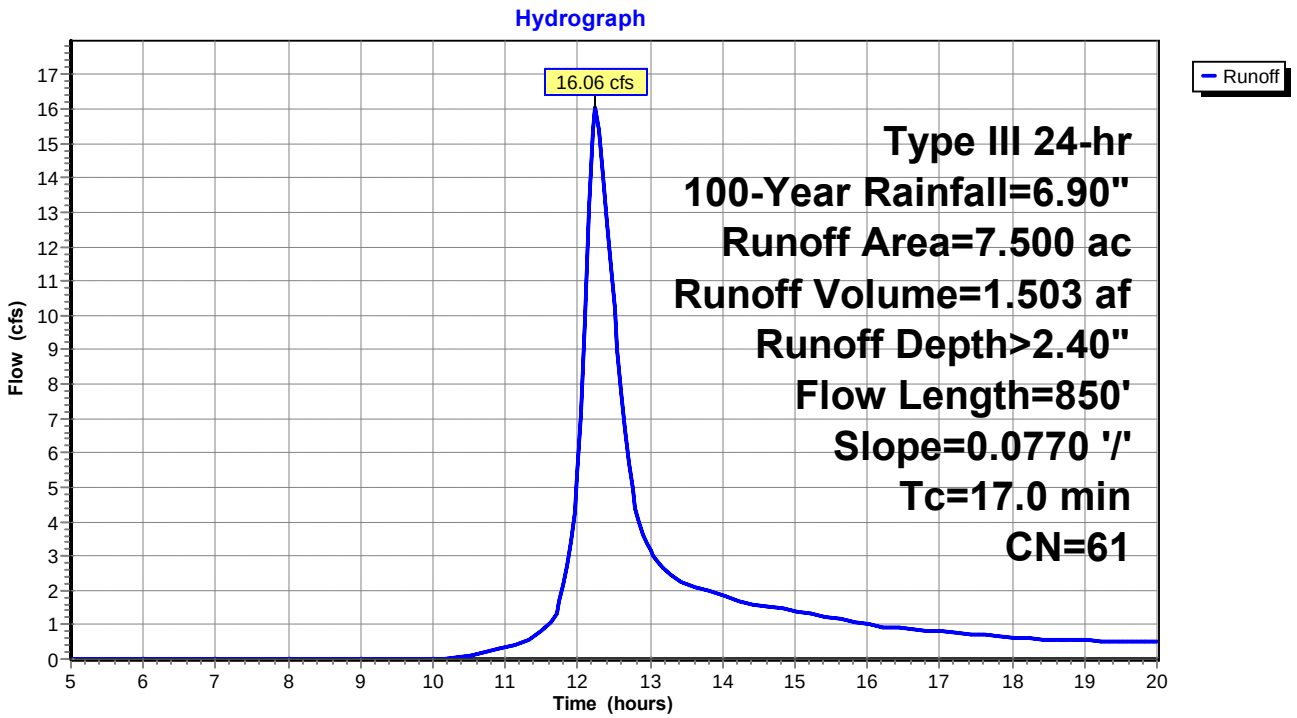
Runoff = 16.06 cfs @ 12.25 hrs, Volume= 1.503 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



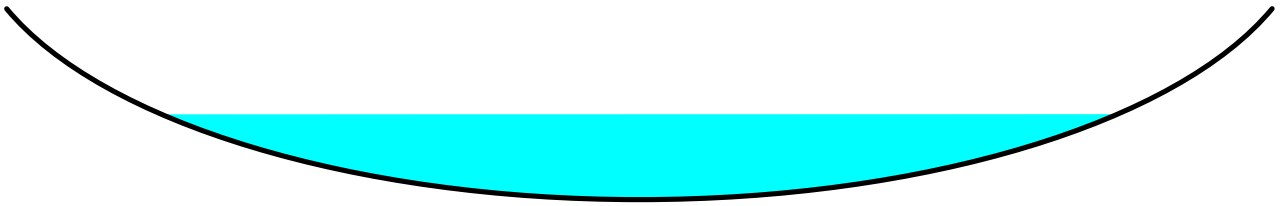
Summary for Reach 1R: Wetlands

Inflow Area = 44.650 ac, 0.34% Impervious, Inflow Depth > 2.22" for 100-Year event
Inflow = 80.93 cfs @ 12.31 hrs, Volume= 8.247 af
Outflow = 65.99 cfs @ 12.69 hrs, Volume= 8.057 af, Atten= 18%, Lag= 23.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.66 fps, Min. Travel Time= 13.0 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 27.0 min

Peak Storage= 51,844 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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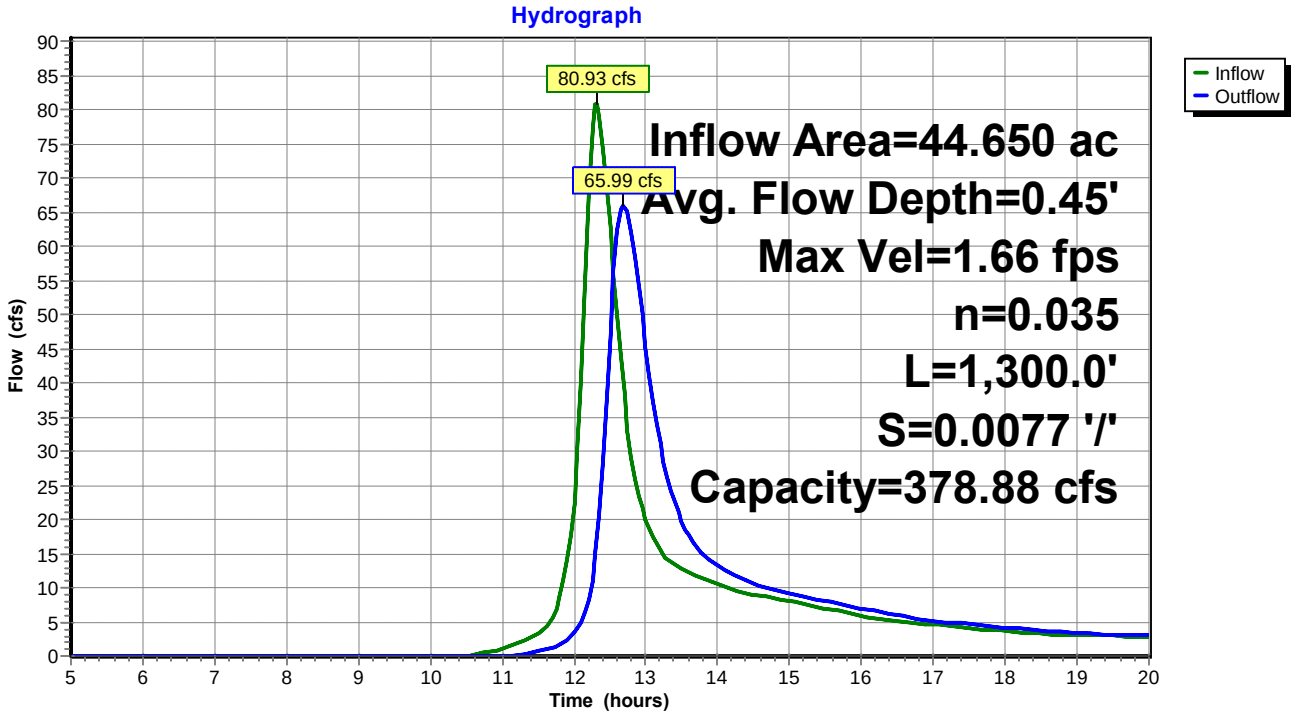
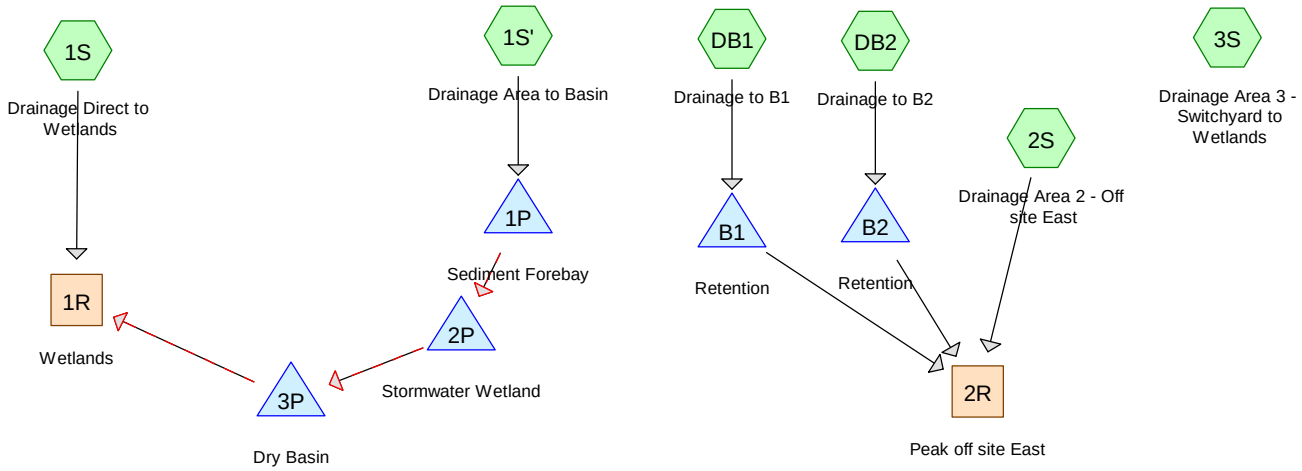
Reach 1R: Wetlands



PROPOSED CONDITIONS DRAINAGE COMPUTATIONS
2, 10 & 100-YEAR STORMS



Subcat Reach Pond Link

Routing Diagram for Proposed Drainage
Prepared by Microsoft, Printed 8/12/2016

Summary for Subcatchment 1S: Drainage Direct to Wetlands

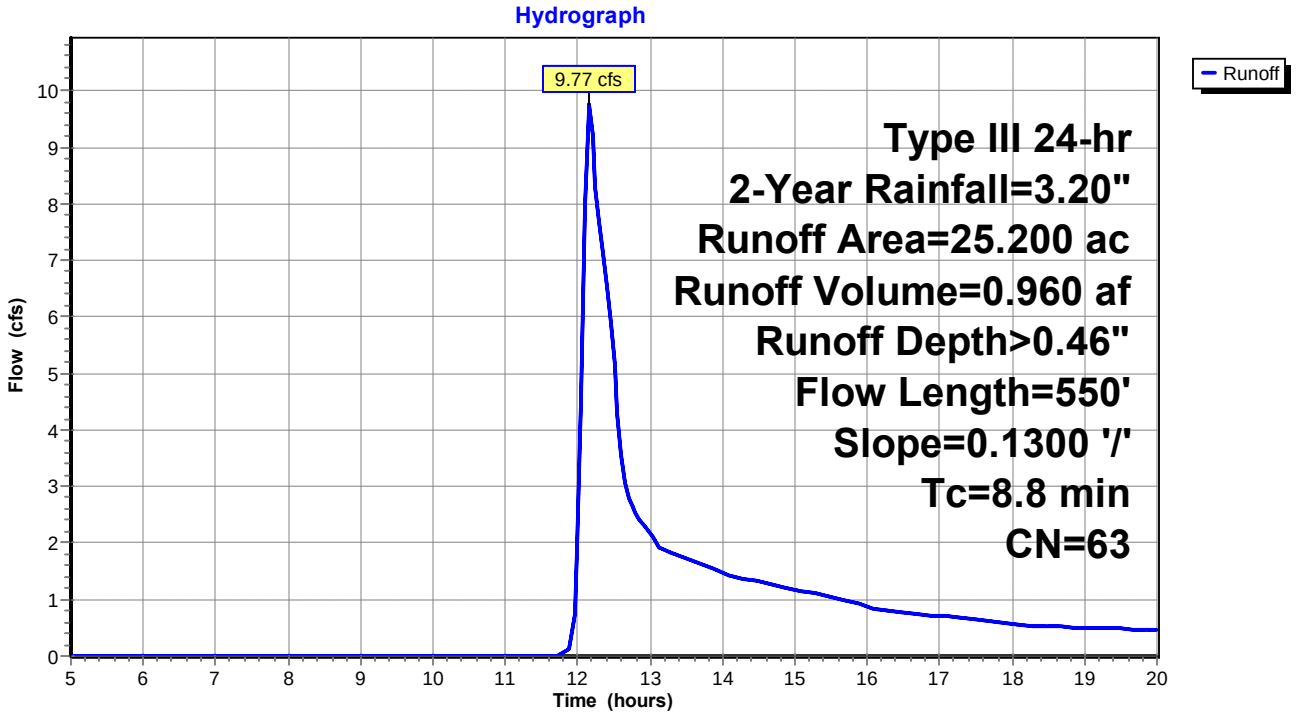
Runoff = 9.77 cfs @ 12.16 hrs, Volume= 0.960 af, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	14.900	55	Woods, Good, HSG B
	8.600	77	Woods, Good, HSG D
	1.350	61	>75% Grass cover, Good, HSG B
*	0.350	72	Crushed Stone Surface, HSG B
	25.200	63	Weighted Average
	25.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	550	0.1300	1.05		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Direct to Wetlands



Summary for Subcatchment 1S': Drainage Area to Basin

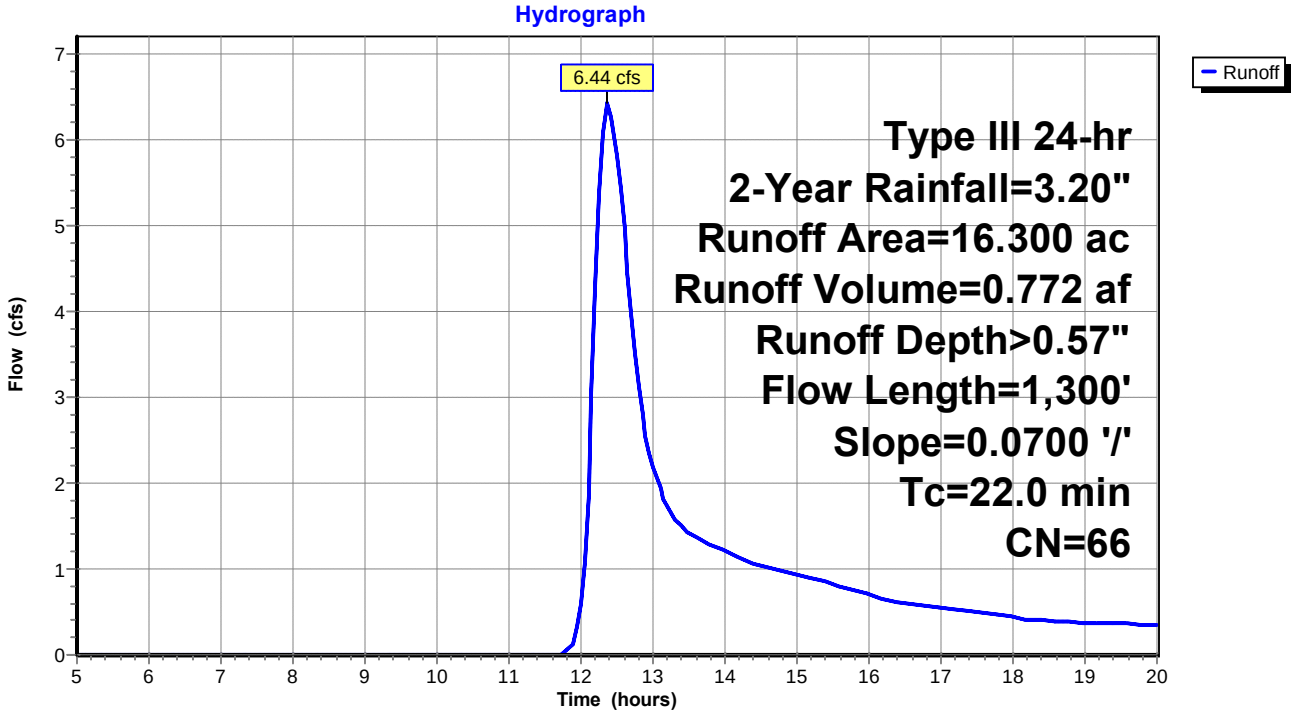
Runoff = 6.44 cfs @ 12.37 hrs, Volume= 0.772 af, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	6.400	65	Impervious roof & pavement
*	4.500	72	Crushed Stone surface, HSG B
	5.400	61	>75% Grass cover, Good, HSG B
	16.300	66	Weighted Average
	16.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	1,300	0.0700	0.99		**Lag/CN Method, Tc-1**

Subcatchment 1S': Drainage Area to Basin



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

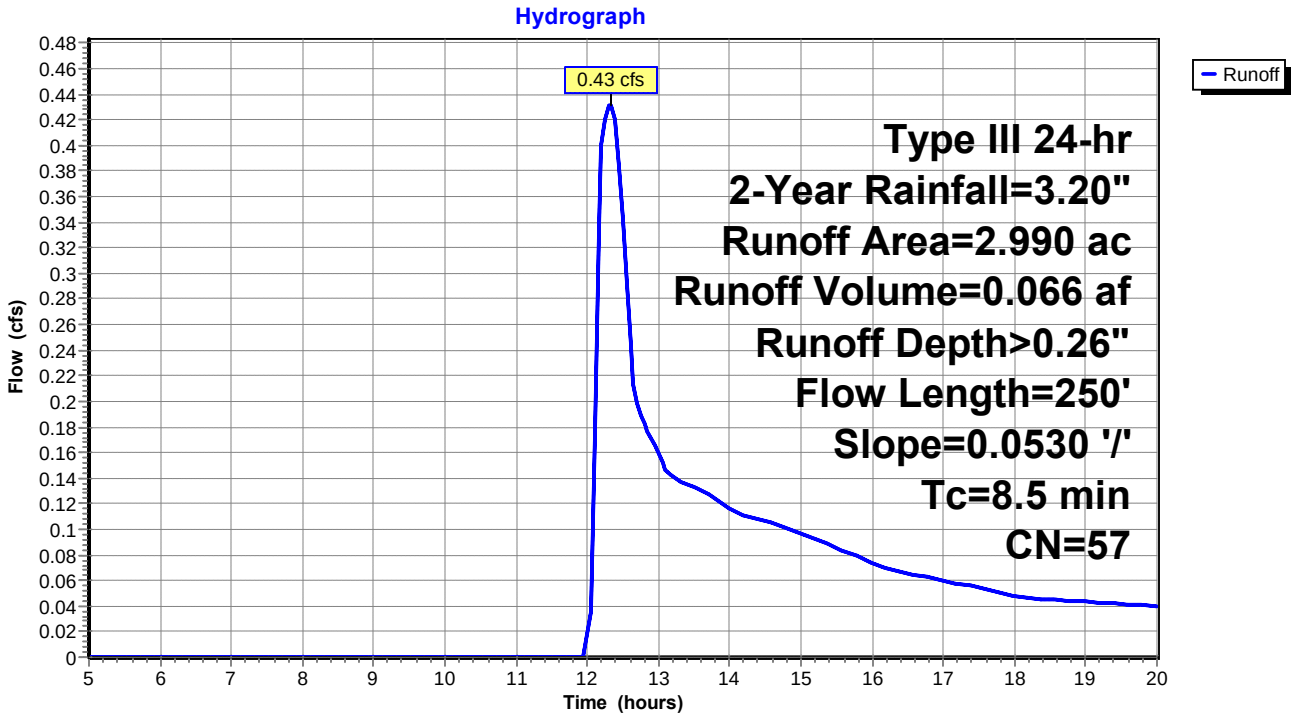
Runoff = 0.43 cfs @ 12.32 hrs, Volume= 0.066 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (ac)	CN	Description
1.760	55	Woods, Good, HSG B
1.230	61	>75% Grass cover, Good, HSG B
2.990	57	Weighted Average
2.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	250	0.0530	0.49		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

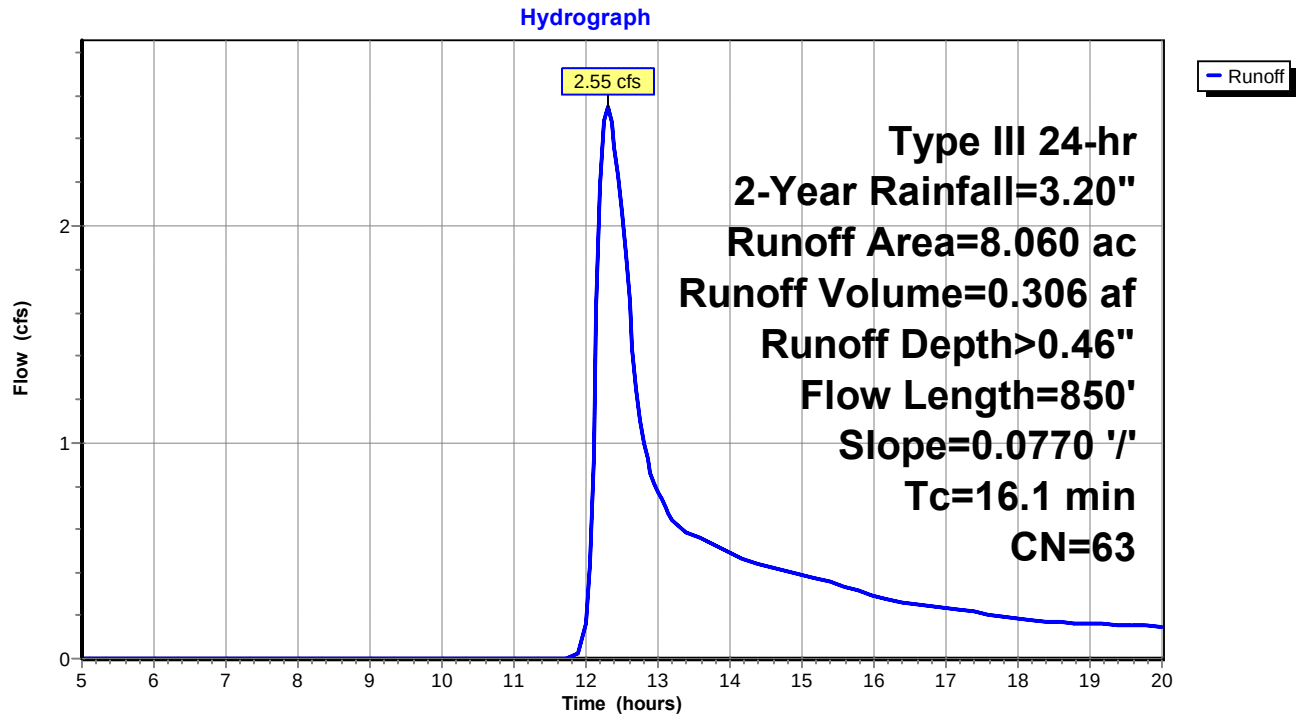
Runoff = 2.55 cfs @ 12.30 hrs, Volume= 0.306 af, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	4.650	55	Woods, Good, HSG B
*	1.600	72	Crushed stone surface
	8.060	63	Weighted Average
	7.250		89.95% Pervious Area
	0.810		10.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	850	0.0770	0.88		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



Summary for Subcatchment DB1: Drainage to B1

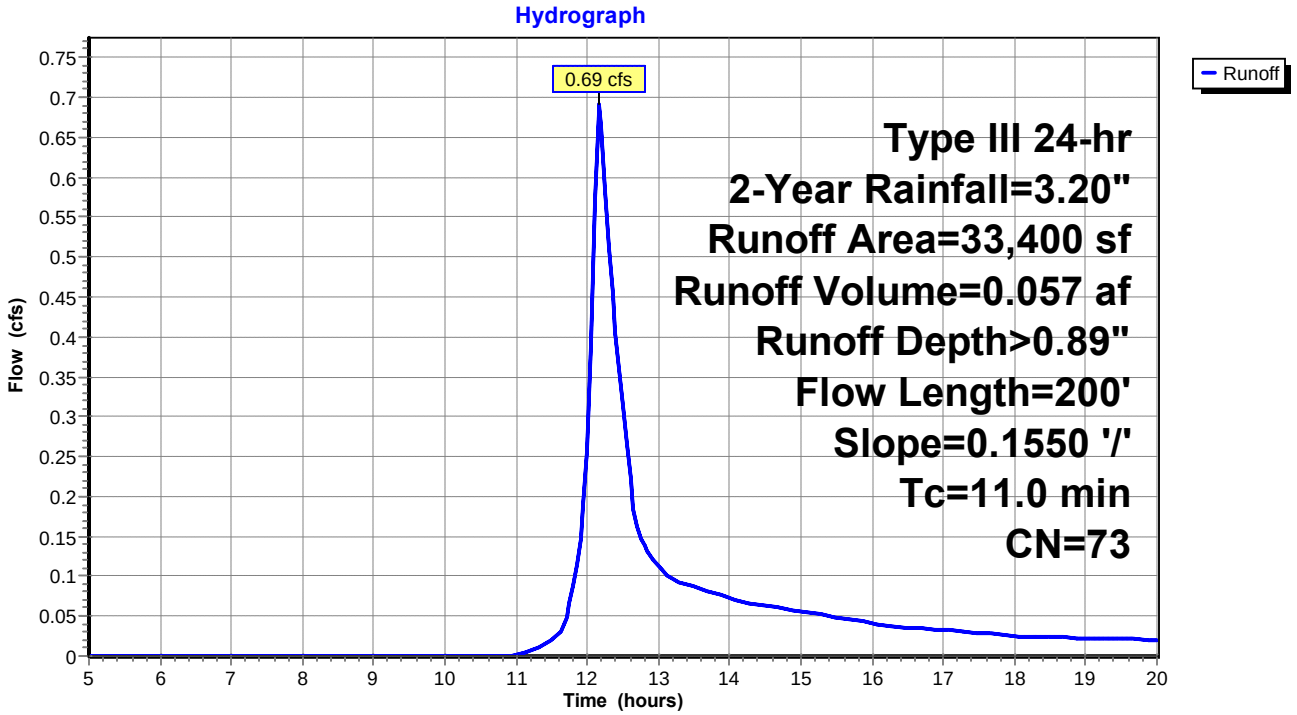
Runoff = 0.69 cfs @ 12.17 hrs, Volume= 0.057 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
22,400	61	>75% Grass cover, Good, HSG B
11,000	98	Roofs, HSG B
33,400	73	Weighted Average
22,400		67.07% Pervious Area
11,000		32.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	200	0.1550	0.30		**Sheet Flow, Tc-DB-1** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB1: Drainage to B1



Summary for Subcatchment DB2: Drainage to B2

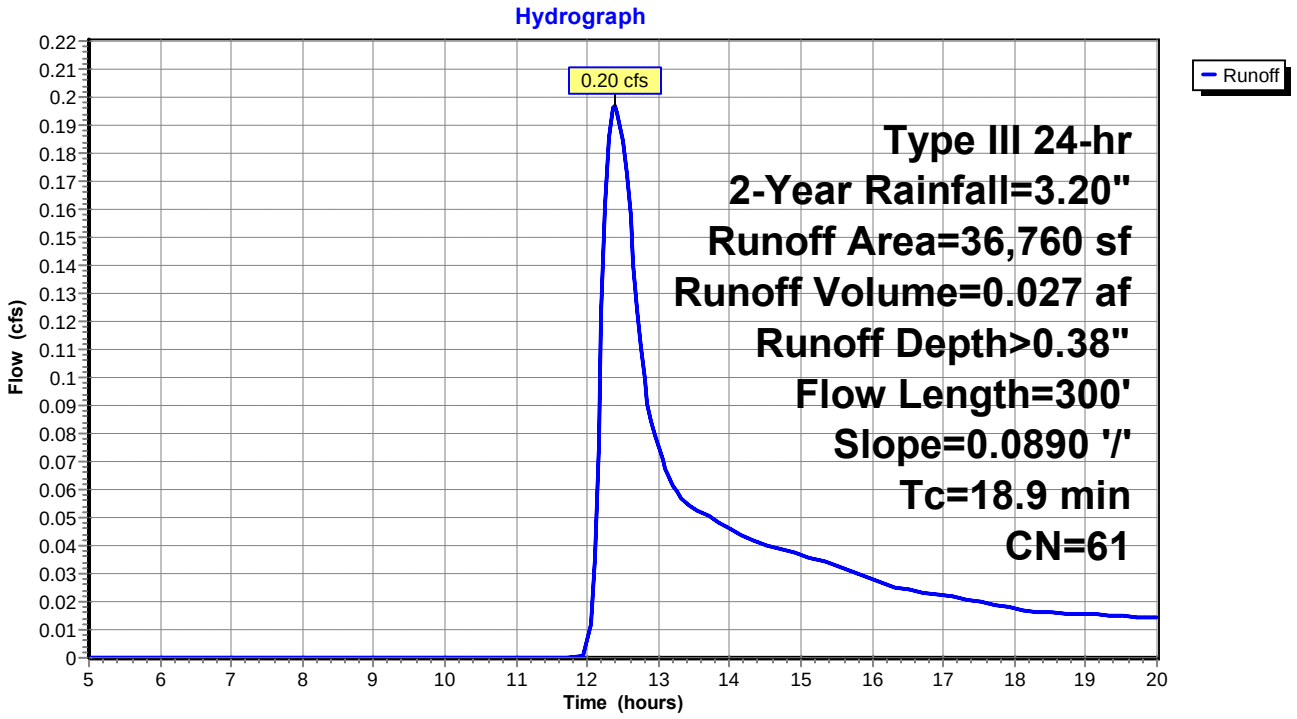
Runoff = 0.20 cfs @ 12.38 hrs, Volume= 0.027 af, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
36,760	61	>75% Grass cover, Good, HSG B
36,760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	300	0.0890	0.26		**Sheet Flow, Tc-DB2** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB2: Drainage to B2



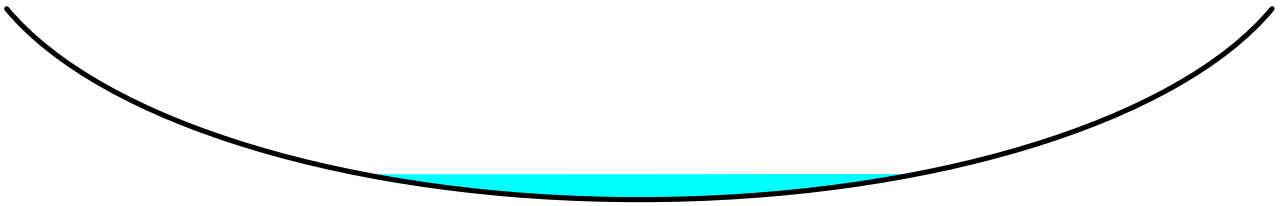
Summary for Reach 1R: Wetlands

Inflow Area = 41.500 ac, 0.00% Impervious, Inflow Depth > 0.28" for 2-Year event
Inflow = 9.77 cfs @ 12.16 hrs, Volume= 0.960 af
Outflow = 4.75 cfs @ 13.01 hrs, Volume= 0.900 af, Atten= 51%, Lag= 51.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.74 fps, Min. Travel Time= 29.3 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 45.7 min

Peak Storage= 8,370 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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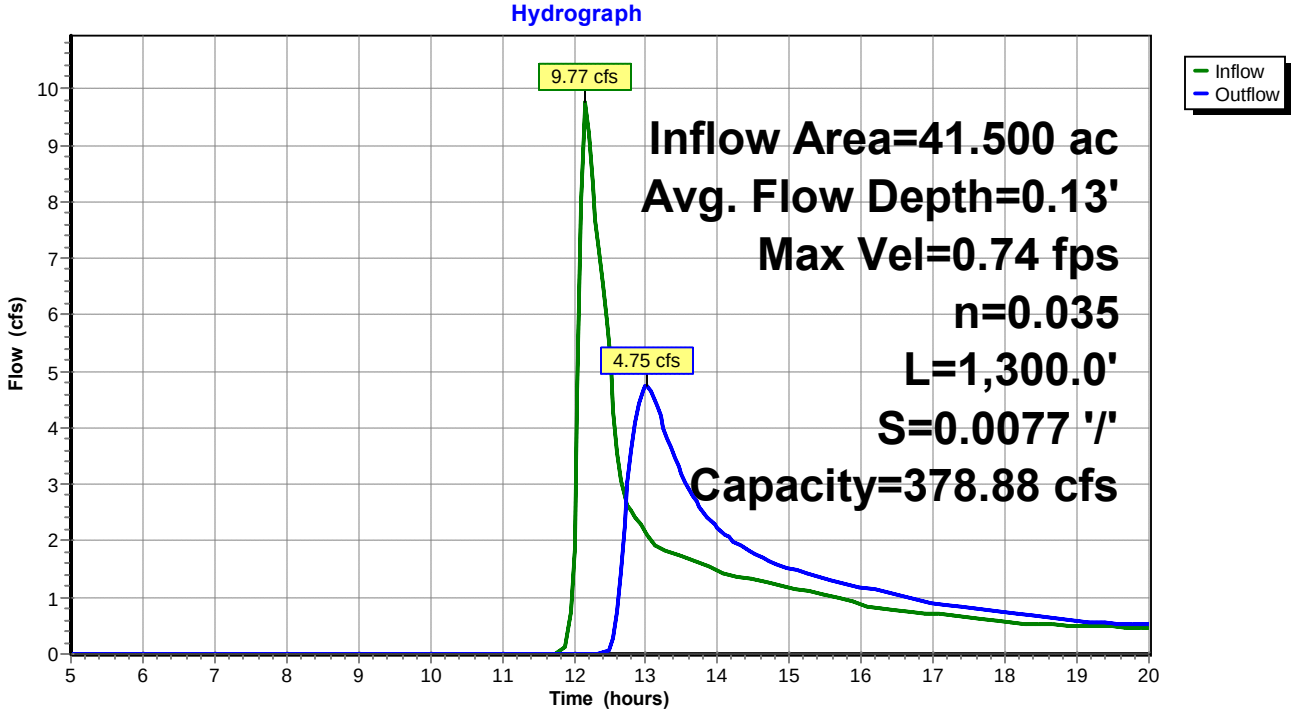
Reach 1R: Wetlands

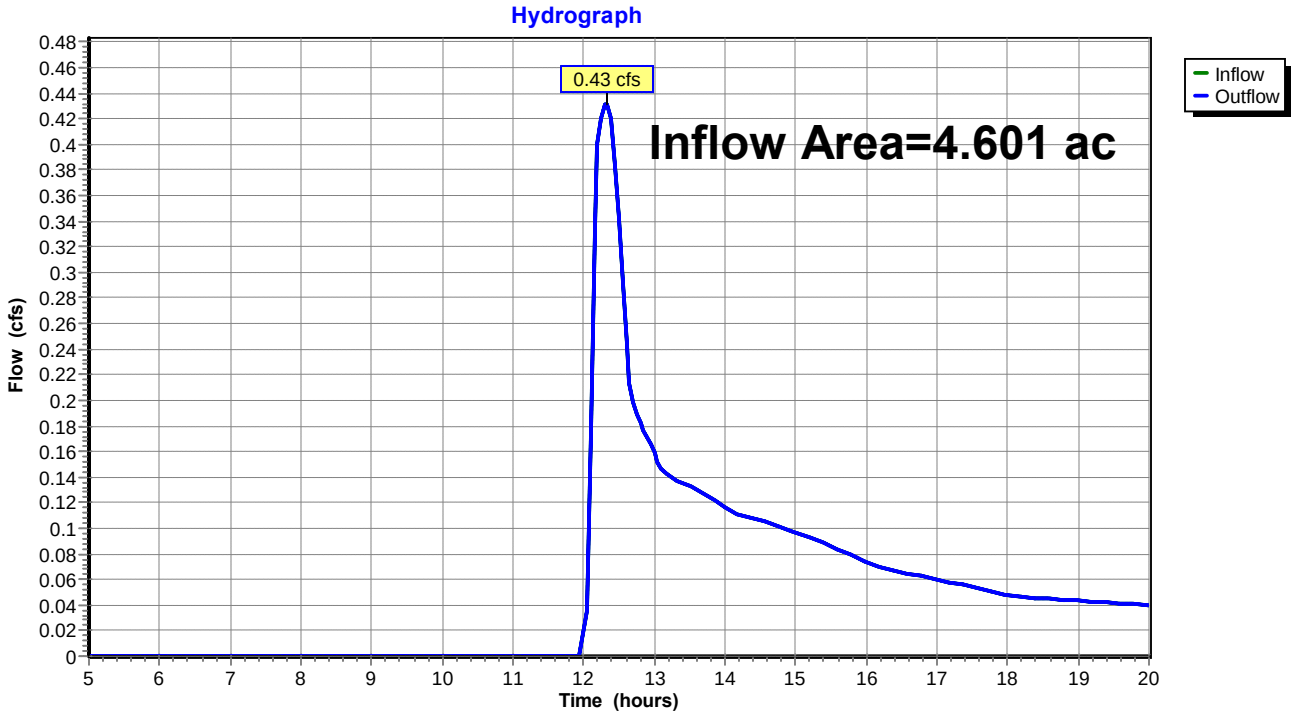


Summary for Reach 2R: Peak off site East

Inflow Area = 4.601 ac, 5.49% Impervious, Inflow Depth > 0.17" for 2-Year event
Inflow = 0.43 cfs @ 12.32 hrs, Volume= 0.066 af
Outflow = 0.43 cfs @ 12.32 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Peak off site East



Summary for Pond 1P: Sediment Forebay

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 0.57" for 2-Year event
Inflow = 6.44 cfs @ 12.37 hrs, Volume= 0.772 af
Outflow = 4.80 cfs @ 12.62 hrs, Volume= 0.621 af, Atten= 25%, Lag= 15.1 min
Primary = 4.80 cfs @ 12.62 hrs, Volume= 0.621 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 278.47' @ 12.62 hrs Surf.Area= 4,103 sf Storage= 8,076 cf

Plug-Flow detention time= 85.4 min calculated for 0.621 af (80% of inflow)
Center-of-Mass det. time= 32.6 min (883.8 - 851.2)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	15,801 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

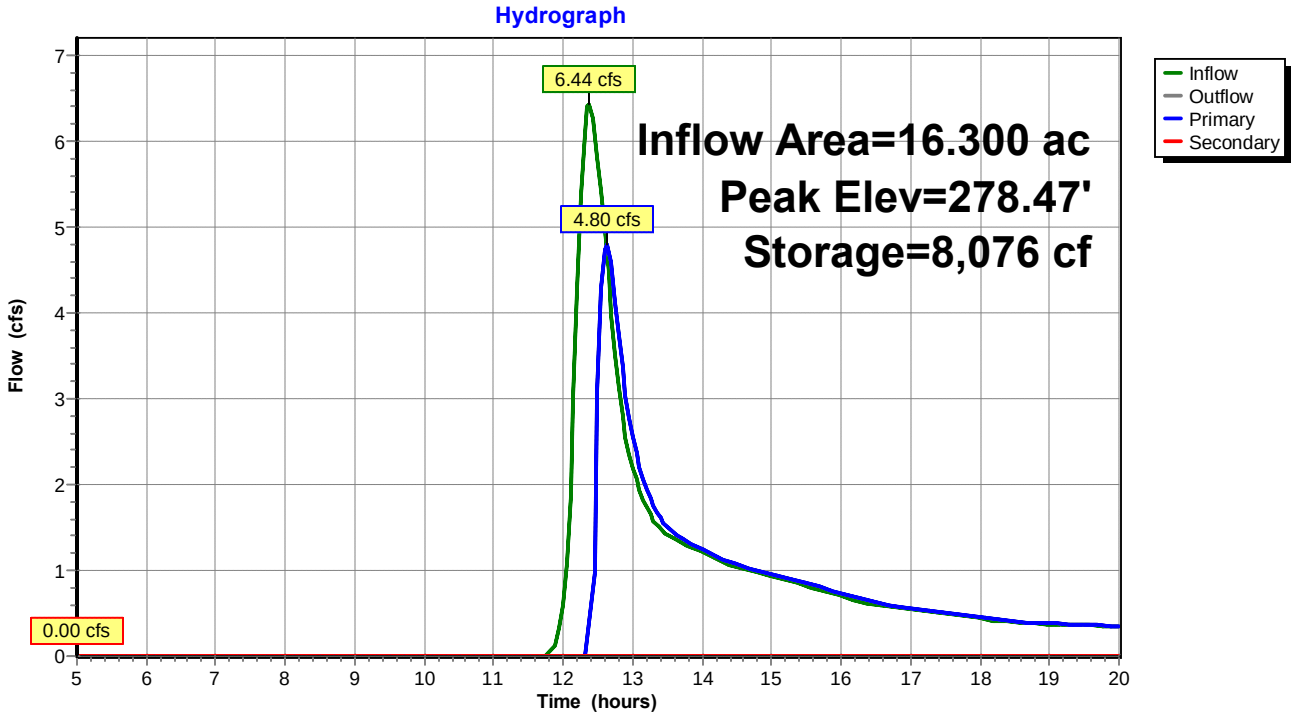
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	925	0	0
276.00	1,532	1,229	1,229
278.00	3,530	5,062	6,291
280.00	5,980	9,510	15,801

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	278.00'	**84.0" W x 18.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=4.74 cfs @ 12.62 hrs HW=278.46' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 4.74 cfs @ 1.46 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=275.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Sediment Forebay



Summary for Pond 2P: Stormwater Wetland

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 0.46" for 2-Year event
Inflow = 4.80 cfs @ 12.62 hrs, Volume= 0.621 af
Outflow = 4.21 cfs @ 12.75 hrs, Volume= 0.587 af, Atten= 12%, Lag= 7.4 min
Primary = 4.21 cfs @ 12.75 hrs, Volume= 0.587 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 276.93' @ 12.75 hrs Surf.Area= 2,906 sf Storage= 2,448 cf

Plug-Flow detention time= 27.3 min calculated for 0.587 af (95% of inflow)
Center-of-Mass det. time= 11.0 min (894.8 - 883.8)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	15,825 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

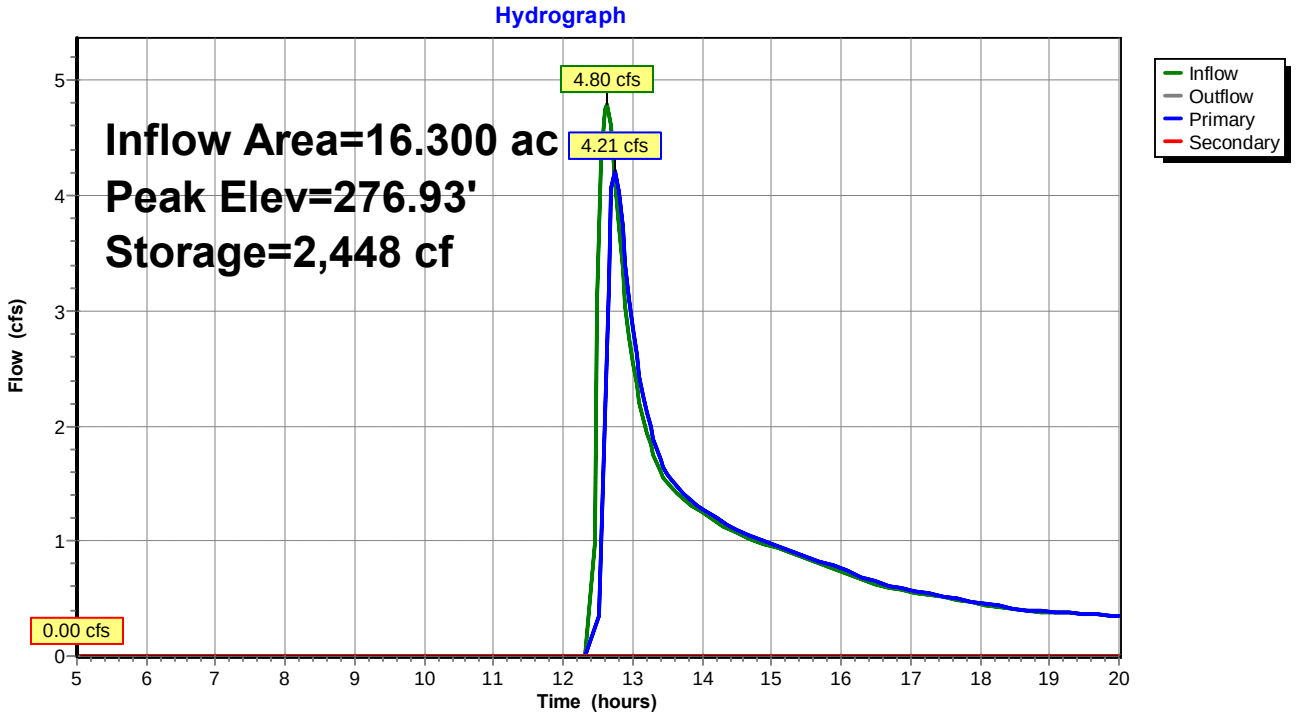
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	2,365	0	0
278.00	3,530	5,895	5,895
280.00	6,400	9,930	15,825

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	276.50'	**84.0" W x 36.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=4.20 cfs @ 12.75 hrs HW=276.93' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 4.20 cfs @ 1.40 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=276.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormwater Wetland



Summary for Pond 3P: Dry Basin

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 0.43" for 2-Year event
Inflow = 4.21 cfs @ 12.75 hrs, Volume= 0.587 af
Outflow = 0.50 cfs @ 17.69 hrs, Volume= 0.289 af, Atten= 88%, Lag= 296.7 min
Discarded = 0.50 cfs @ 17.69 hrs, Volume= 0.289 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 276.80' @ 17.69 hrs Surf.Area= 7,675 sf Storage= 13,748 cf

Plug-Flow detention time= 192.8 min calculated for 0.288 af (49% of inflow)
Center-of-Mass det. time= 92.8 min (987.6 - 894.8)

Volume	Invert	Avail.Storage	Storage Description
#1	274.50'	44,586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	4,780	2,246	2,246
276.00	6,750	5,765	8,011
278.00	9,075	15,825	23,836
280.00	11,675	20,750	44,586

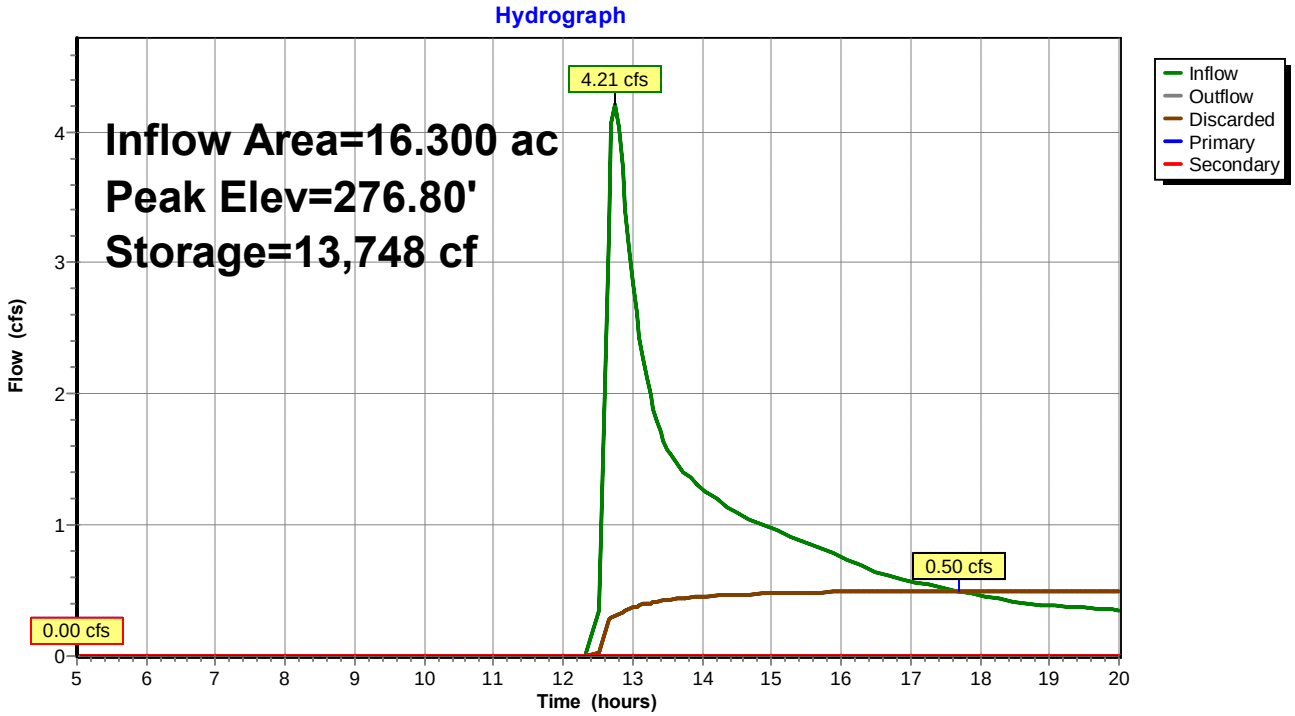
Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.00'	**6.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.00' / 275.00' S= 0.0714 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Discarded	274.50'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.50 cfs @ 17.69 hrs HW=276.80' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=274.50' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=274.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Dry Basin



Summary for Pond B1: Retention

Inflow Area = 0.767 ac, 32.93% Impervious, Inflow Depth > 0.89" for 2-Year event
Inflow = 0.69 cfs @ 12.17 hrs, Volume= 0.057 af
Outflow = 0.29 cfs @ 12.53 hrs, Volume= 0.057 af, Atten= 59%, Lag= 21.7 min
Discarded = 0.29 cfs @ 12.53 hrs, Volume= 0.057 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.12' @ 12.53 hrs Surf.Area= 4,410 sf Storage= 464 cf

Plug-Flow detention time= 12.1 min calculated for 0.057 af (99% of inflow)
Center-of-Mass det. time= 11.1 min (835.7 - 824.6)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

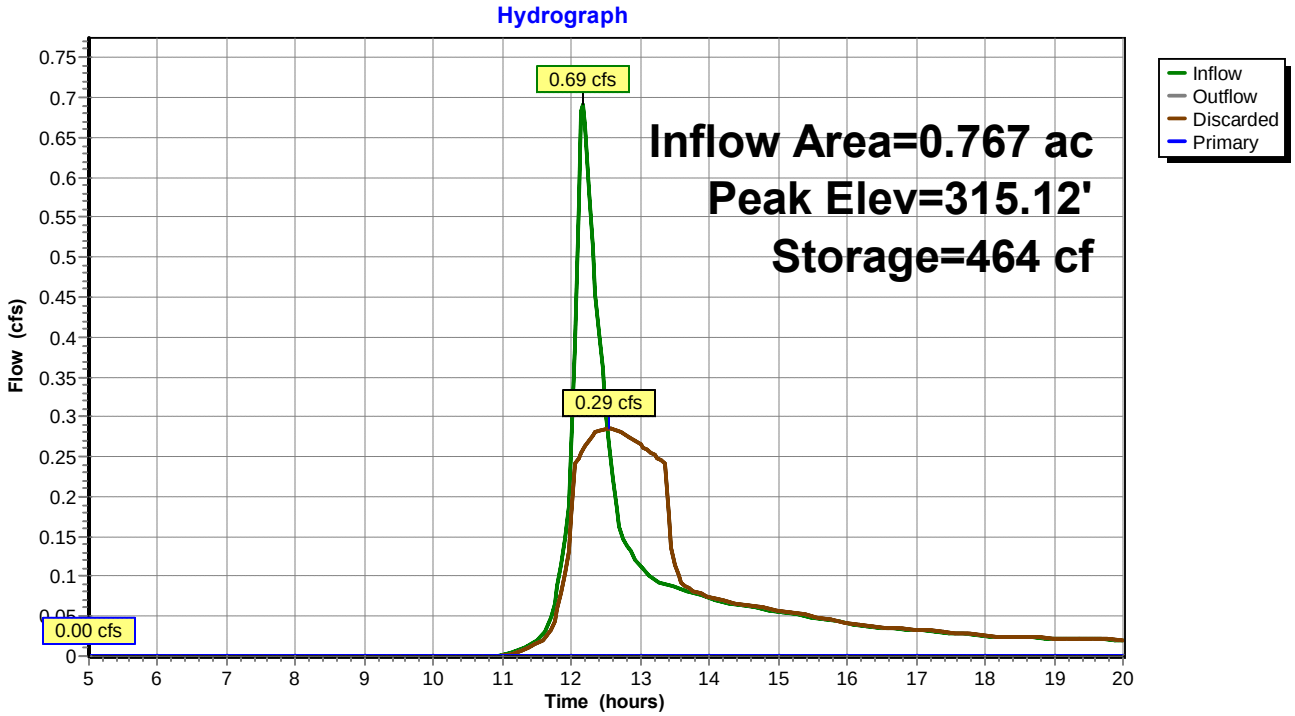
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' 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
#2	Discarded	315.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.29 cfs @ 12.53 hrs HW=315.12' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=315.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: Retention



Summary for Pond B2: Retention

Inflow Area = 0.844 ac, 0.00% Impervious, Inflow Depth > 0.38" for 2-Year event
Inflow = 0.20 cfs @ 12.38 hrs, Volume= 0.027 af
Outflow = 0.19 cfs @ 12.49 hrs, Volume= 0.027 af, Atten= 6%, Lag= 6.7 min
Discarded = 0.19 cfs @ 12.49 hrs, Volume= 0.027 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 312.02' @ 12.49 hrs Surf.Area= 2,992 sf Storage= 57 cf

Plug-Flow detention time= 5.1 min calculated for 0.027 af (100% of inflow)
Center-of-Mass det. time= 3.9 min (869.8 - 865.9)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

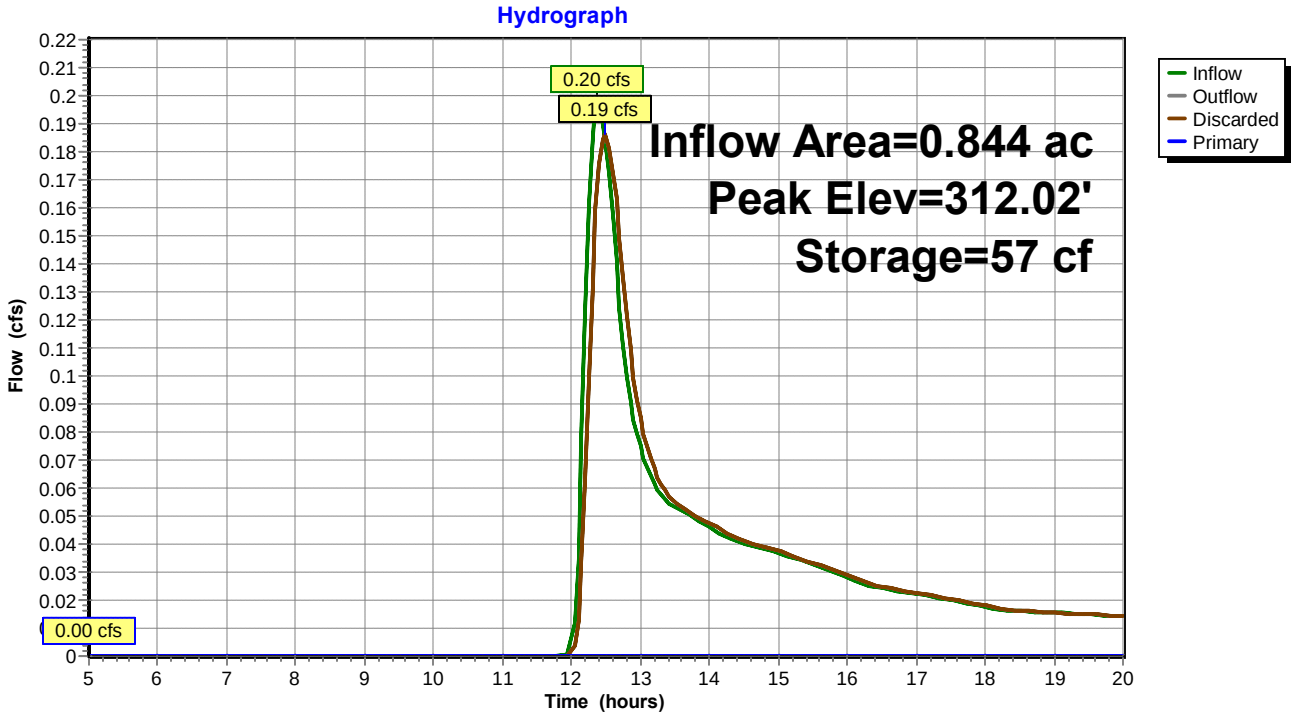
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' 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
#2	Discarded	312.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.19 cfs @ 12.49 hrs HW=312.02' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=312.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond B2: Retention



Summary for Subcatchment 1S: Drainage Direct to Wetlands

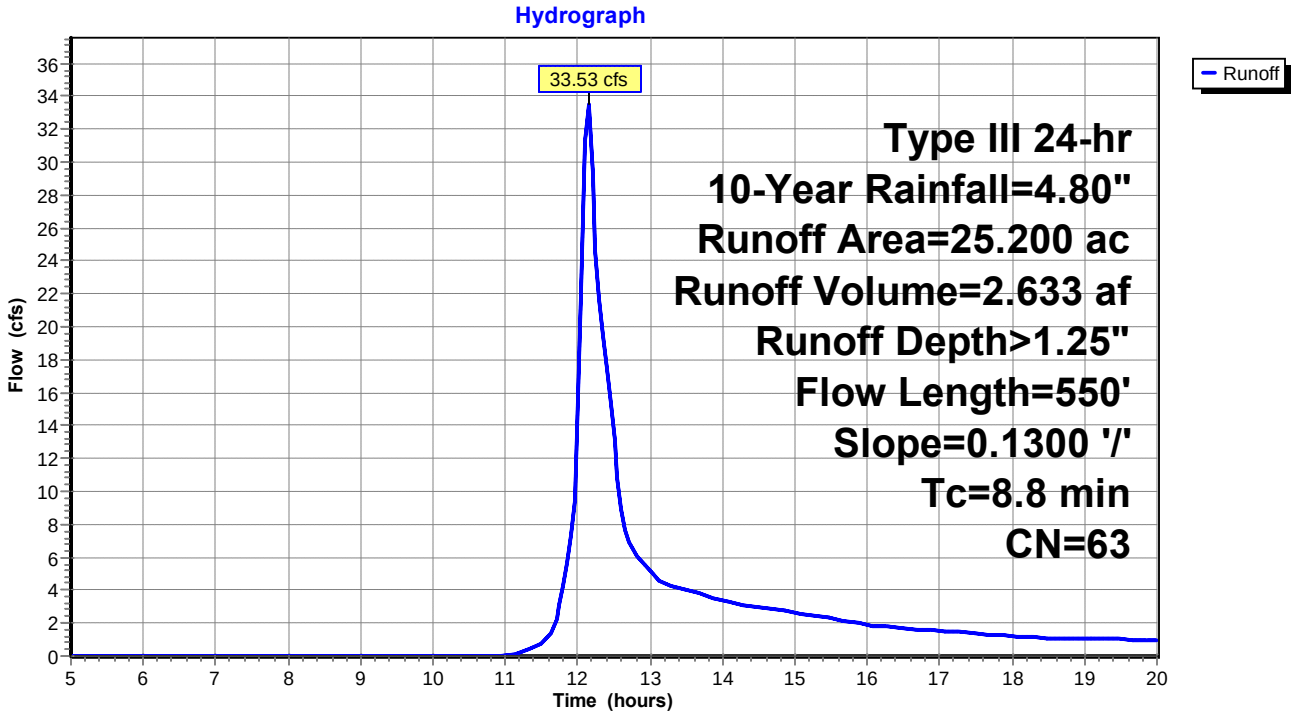
Runoff = 33.53 cfs @ 12.14 hrs, Volume= 2.633 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
	14.900	55	Woods, Good, HSG B
	8.600	77	Woods, Good, HSG D
	1.350	61	>75% Grass cover, Good, HSG B
*	0.350	72	Crushed Stone Surface, HSG B
	25.200	63	Weighted Average
	25.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	550	0.1300	1.05		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Direct to Wetlands



Summary for Subcatchment 1S': Drainage Area to Basin

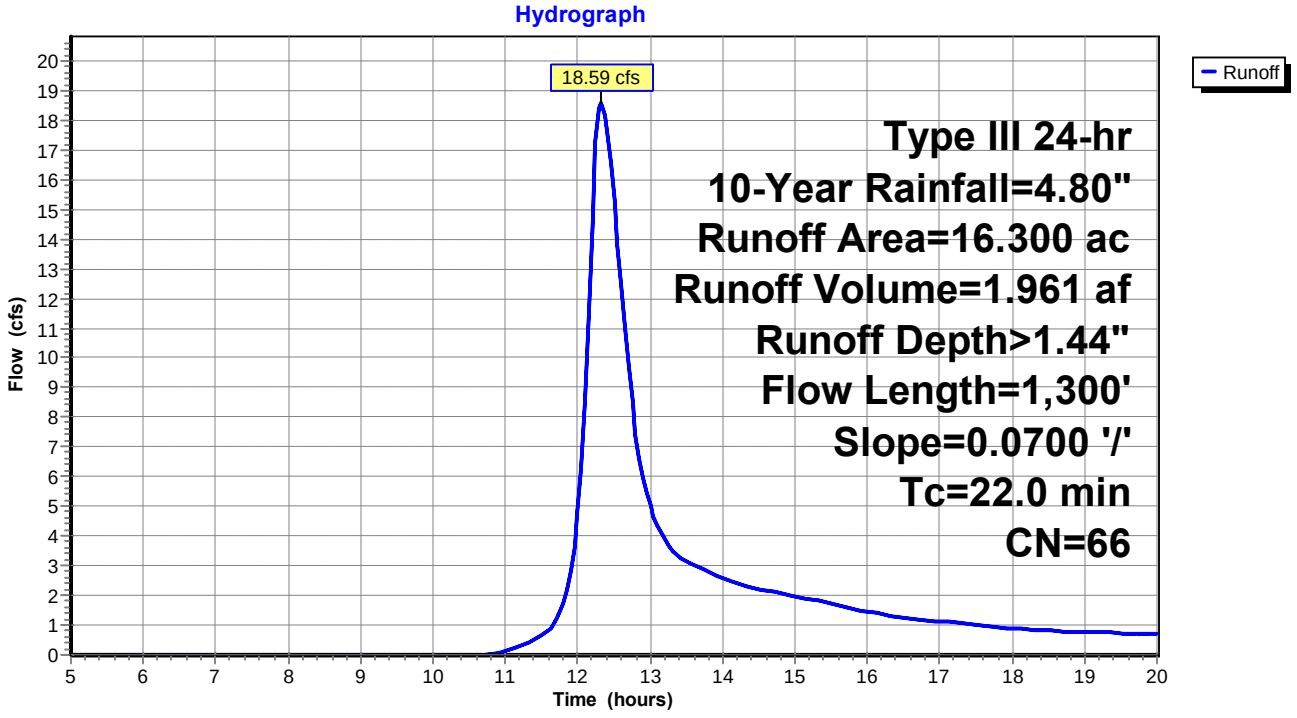
Runoff = 18.59 cfs @ 12.33 hrs, Volume= 1.961 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	6.400	65	Impervious roof & pavement
*	4.500	72	Crushed Stone surface, HSG B
	5.400	61	>75% Grass cover, Good, HSG B
	16.300	66	Weighted Average
	16.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	1,300	0.0700	0.99		**Lag/CN Method, Tc-1**

Subcatchment 1S': Drainage Area to Basin



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

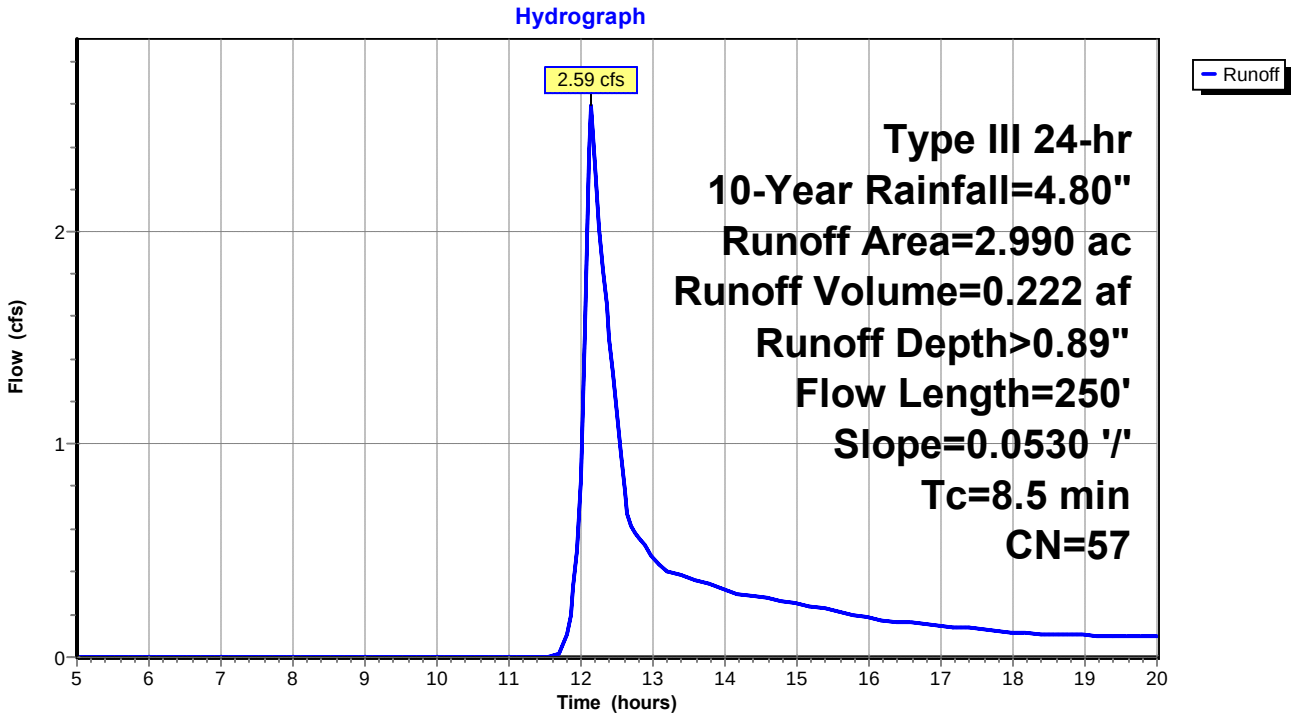
Runoff = 2.59 cfs @ 12.15 hrs, Volume= 0.222 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
1.760	55	Woods, Good, HSG B
1.230	61	>75% Grass cover, Good, HSG B
2.990	57	Weighted Average
2.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	250	0.0530	0.49		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

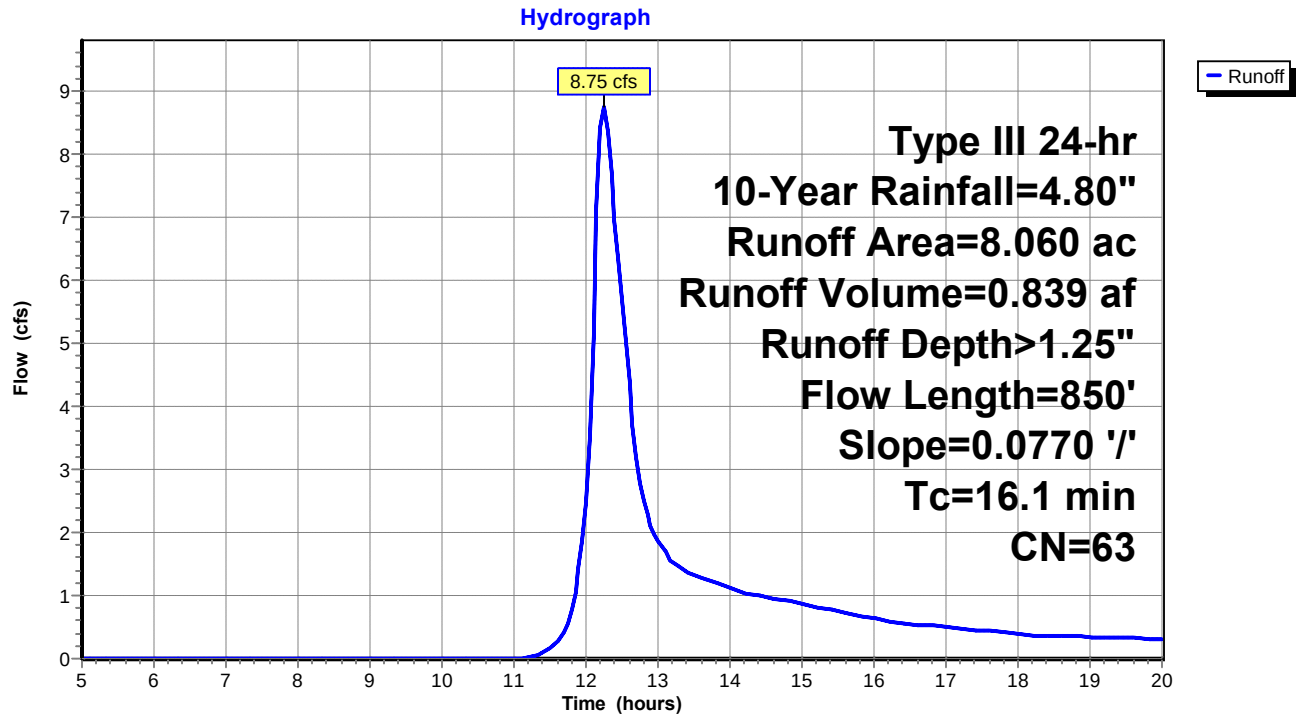
Runoff = 8.75 cfs @ 12.25 hrs, Volume= 0.839 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	4.650	55	Woods, Good, HSG B
*	1.600	72	Crushed stone surface
	8.060	63	Weighted Average
	7.250		89.95% Pervious Area
	0.810		10.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	850	0.0770	0.88		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



Summary for Subcatchment DB1: Drainage to B1

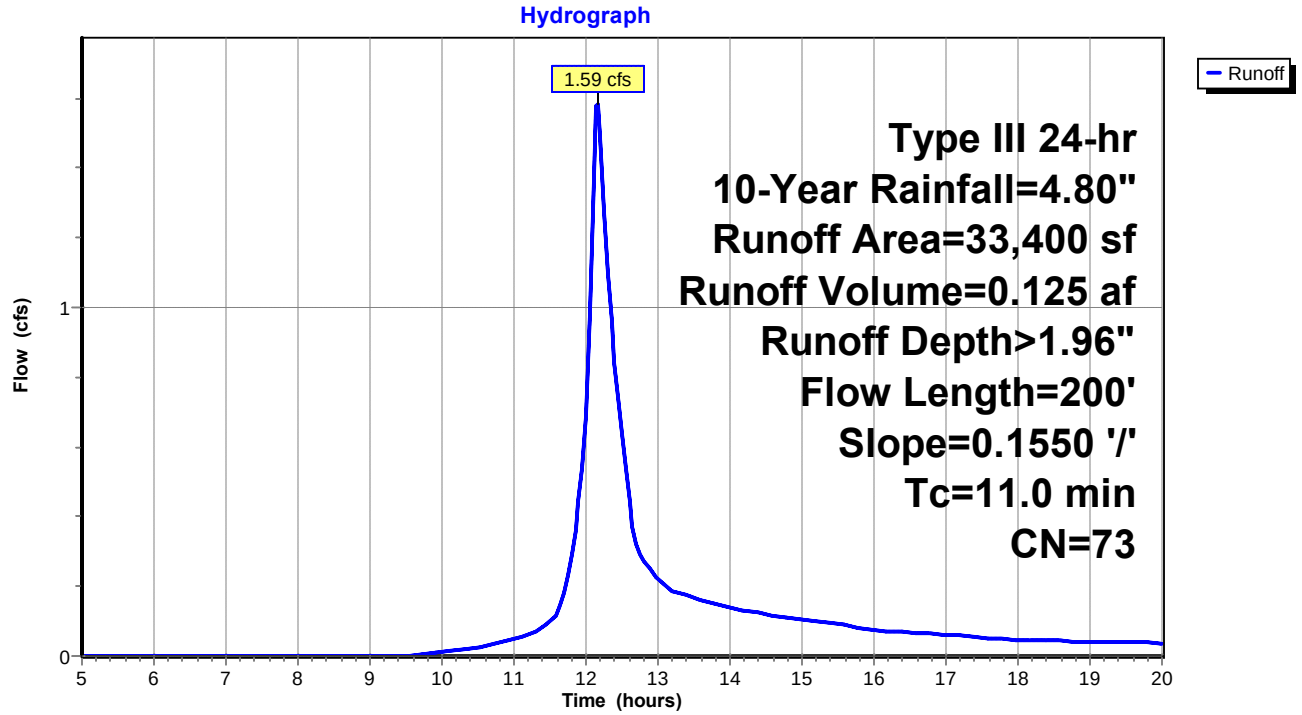
Runoff = 1.59 cfs @ 12.16 hrs, Volume= 0.125 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
22,400	61	>75% Grass cover, Good, HSG B
11,000	98	Roofs, HSG B
33,400	73	Weighted Average
22,400		67.07% Pervious Area
11,000		32.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	200	0.1550	0.30		**Sheet Flow, Tc-DB-1** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB1: Drainage to B1



Summary for Subcatchment DB2: Drainage to B2

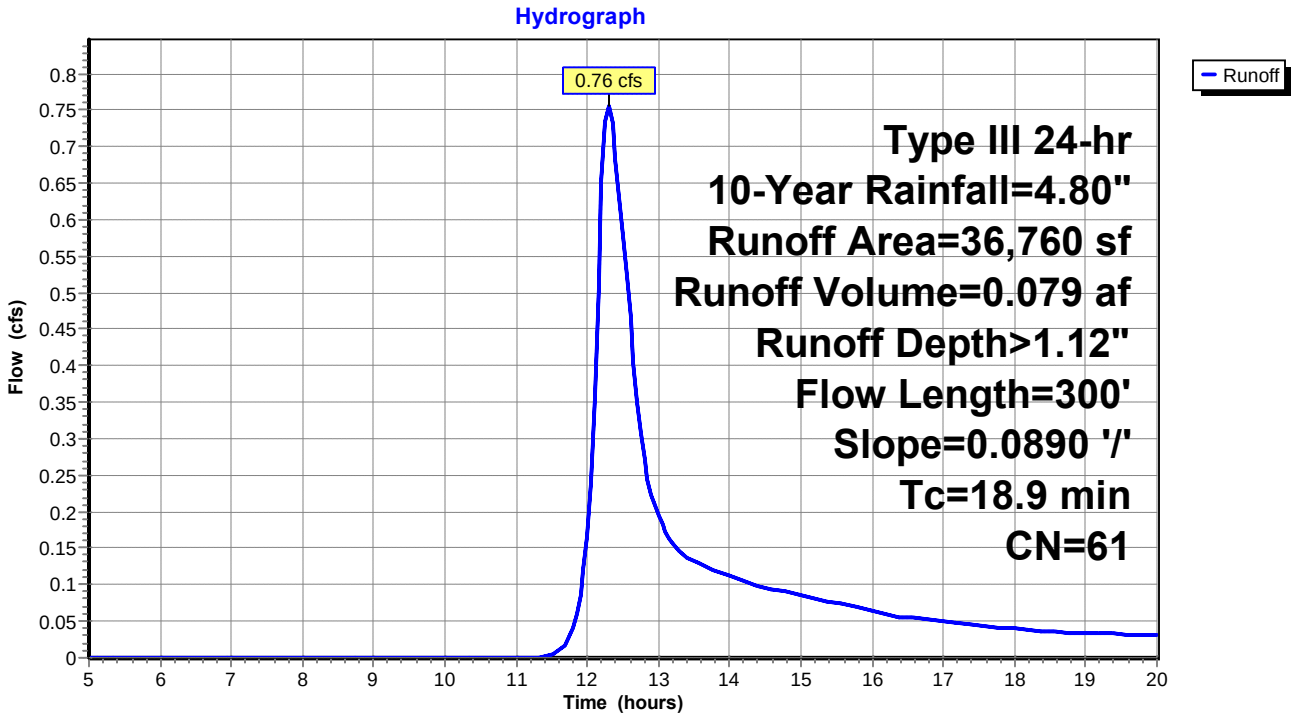
Runoff = 0.76 cfs @ 12.30 hrs, Volume= 0.079 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
36,760	61	>75% Grass cover, Good, HSG B
36,760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	300	0.0890	0.26		**Sheet Flow, Tc-DB2** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB2: Drainage to B2



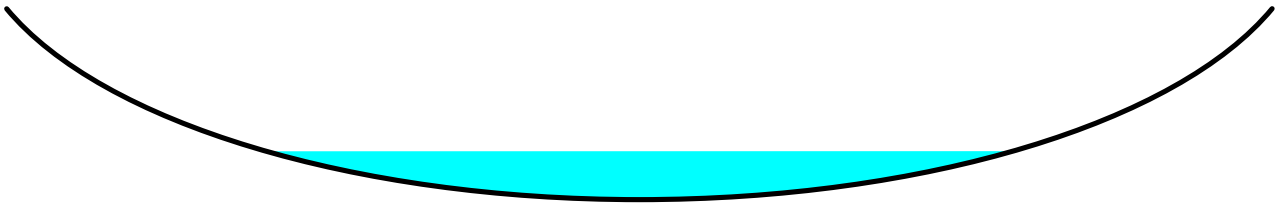
Summary for Reach 1R: Wetlands

Inflow Area = 41.500 ac, 0.00% Impervious, Inflow Depth > 0.98" for 10-Year event
Inflow = 33.53 cfs @ 12.14 hrs, Volume= 3.395 af
Outflow = 19.55 cfs @ 12.67 hrs, Volume= 3.251 af, Atten= 42%, Lag= 31.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.14 fps, Min. Travel Time= 19.0 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 32.9 min

Peak Storage= 22,300 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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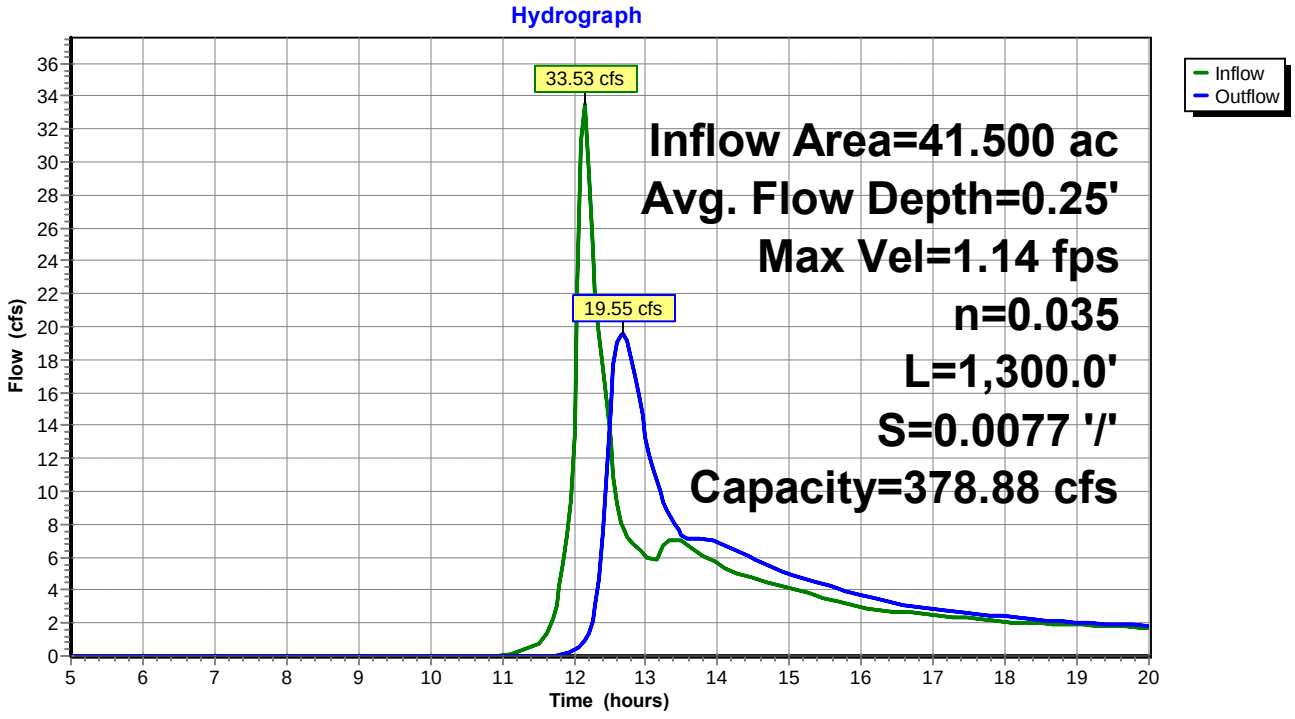
Reach 1R: Wetlands

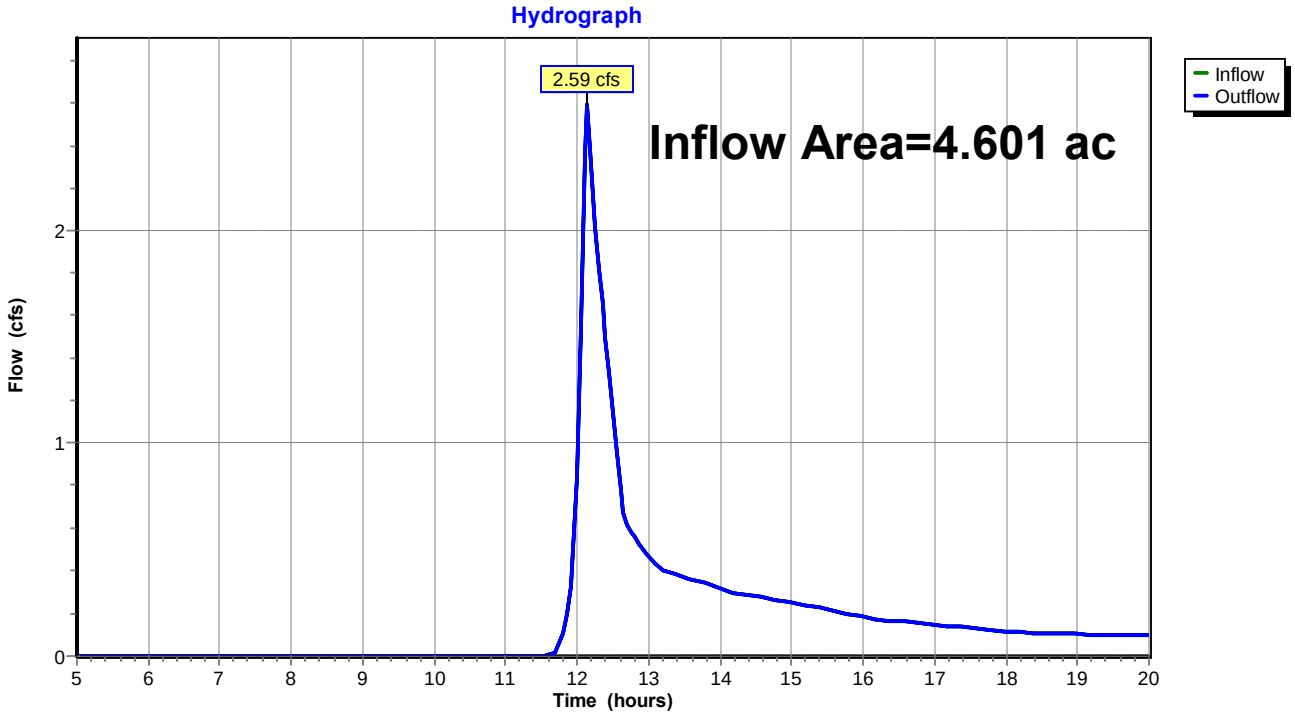


Summary for Reach 2R: Peak off site East

Inflow Area = 4.601 ac, 5.49% Impervious, Inflow Depth > 0.58" for 10-Year event
Inflow = 2.59 cfs @ 12.15 hrs, Volume= 0.222 af
Outflow = 2.59 cfs @ 12.15 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Peak off site East



Summary for Pond 1P: Sediment Forebay

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 1.44" for 10-Year event
Inflow = 18.59 cfs @ 12.33 hrs, Volume= 1.961 af
Outflow = 17.86 cfs @ 12.40 hrs, Volume= 1.806 af, Atten= 4%, Lag= 4.2 min
Primary = 17.86 cfs @ 12.40 hrs, Volume= 1.806 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.12' @ 12.40 hrs Surf.Area= 4,907 sf Storage= 11,034 cf

Plug-Flow detention time= 38.9 min calculated for 1.800 af (92% of inflow)
Center-of-Mass det. time= 13.9 min (843.3 - 829.4)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	15,801 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

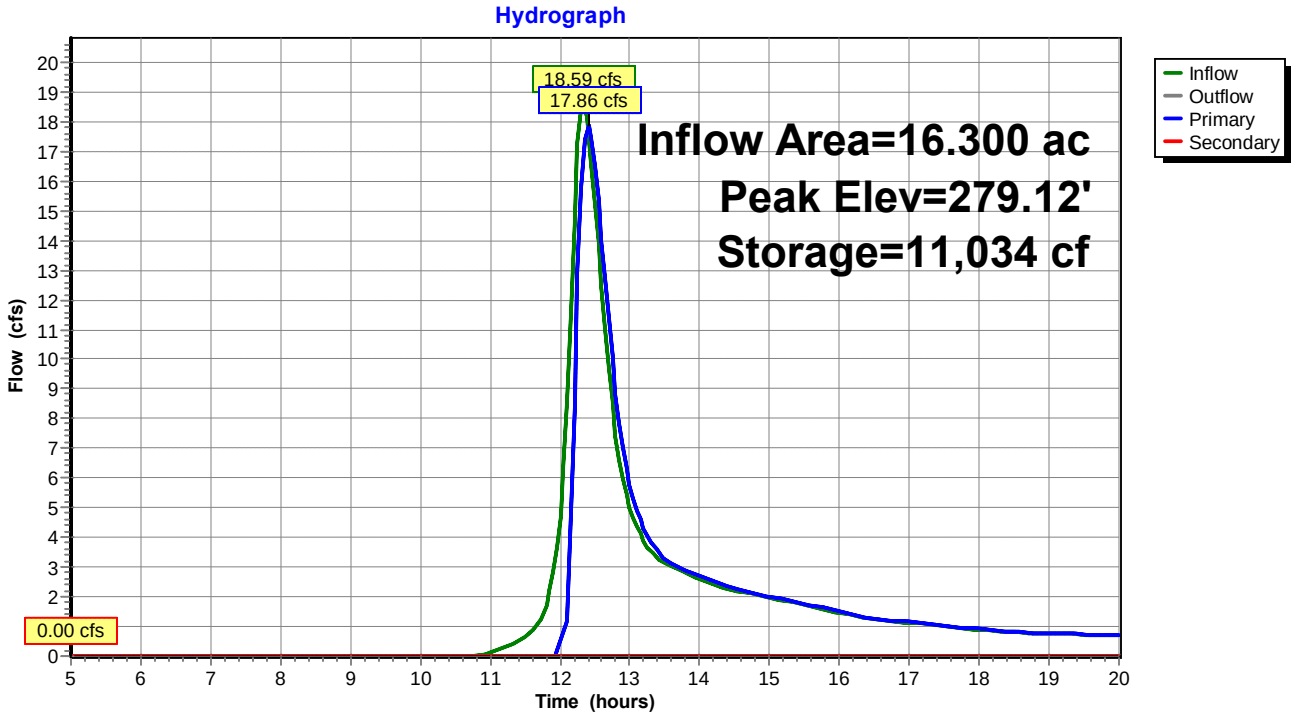
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	925	0	0
276.00	1,532	1,229	1,229
278.00	3,530	5,062	6,291
280.00	5,980	9,510	15,801

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	278.00'	**84.0" W x 18.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=17.85 cfs @ 12.40 hrs HW=279.12' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 17.85 cfs @ 2.27 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=275.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Sediment Forebay



Summary for Pond 2P: Stormwater Wetland

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 1.33" for 10-Year event
Inflow = 17.86 cfs @ 12.40 hrs, Volume= 1.806 af
Outflow = 17.54 cfs @ 12.45 hrs, Volume= 1.769 af, Atten= 2%, Lag= 2.9 min
Primary = 17.54 cfs @ 12.45 hrs, Volume= 1.769 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 277.61' @ 12.45 hrs Surf.Area= 3,303 sf Storage= 4,566 cf

Plug-Flow detention time= 12.2 min calculated for 1.769 af (98% of inflow)
Center-of-Mass det. time= 5.1 min (848.4 - 843.3)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	15,825 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

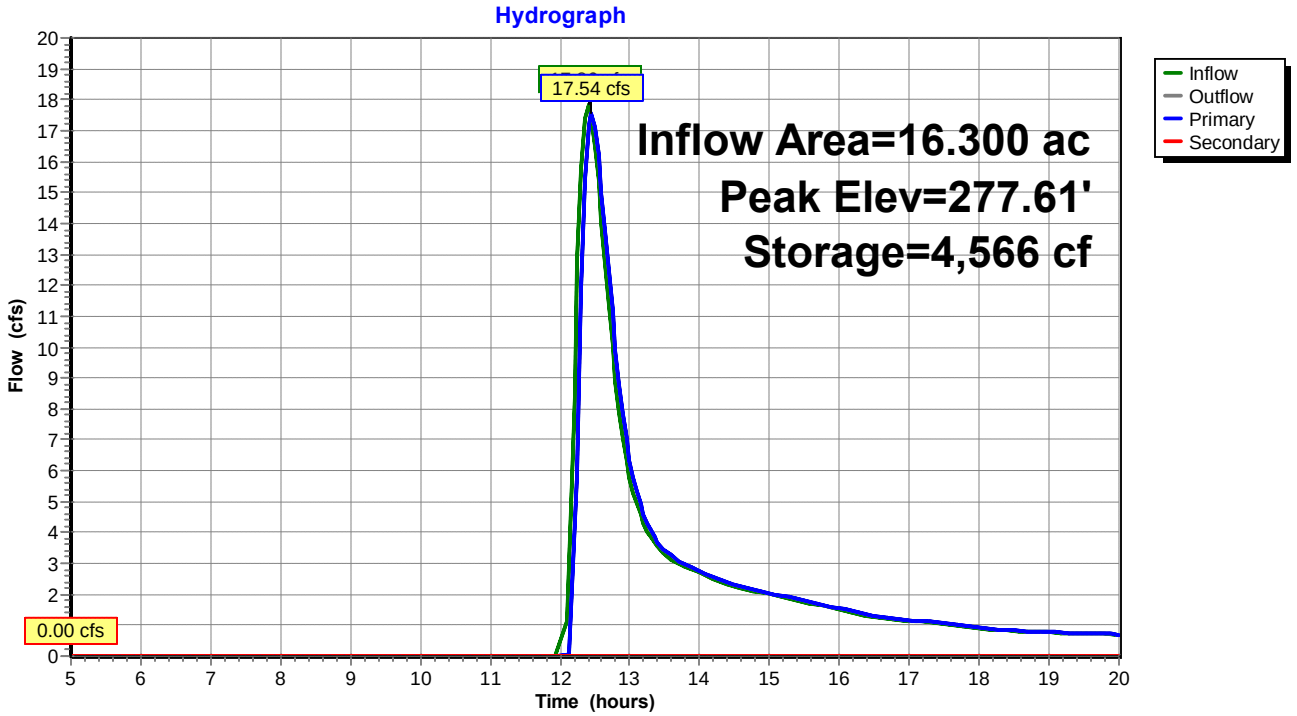
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	2,365	0	0
278.00	3,530	5,895	5,895
280.00	6,400	9,930	15,825

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	276.50'	**84.0" W x 36.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=17.53 cfs @ 12.45 hrs HW=277.61' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 17.53 cfs @ 2.26 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=276.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormwater Wetland



Summary for Pond 3P: Dry Basin

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 1.30" for 10-Year event
Inflow = 17.54 cfs @ 12.45 hrs, Volume= 1.769 af
Outflow = 3.67 cfs @ 13.41 hrs, Volume= 1.178 af, Atten= 79%, Lag= 58.0 min
Discarded = 0.68 cfs @ 13.41 hrs, Volume= 0.416 af
Primary = 1.02 cfs @ 13.41 hrs, Volume= 0.569 af
Secondary = 1.96 cfs @ 13.41 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.13' @ 13.41 hrs Surf.Area= 10,540 sf Storage= 34,892 cf

Plug-Flow detention time= 174.1 min calculated for 1.174 af (66% of inflow)
Center-of-Mass det. time= 101.0 min (949.4 - 848.4)

Volume	Invert	Avail.Storage	Storage Description
#1	274.50'	44,586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	4,780	2,246	2,246
276.00	6,750	5,765	8,011
278.00	9,075	15,825	23,836
280.00	11,675	20,750	44,586

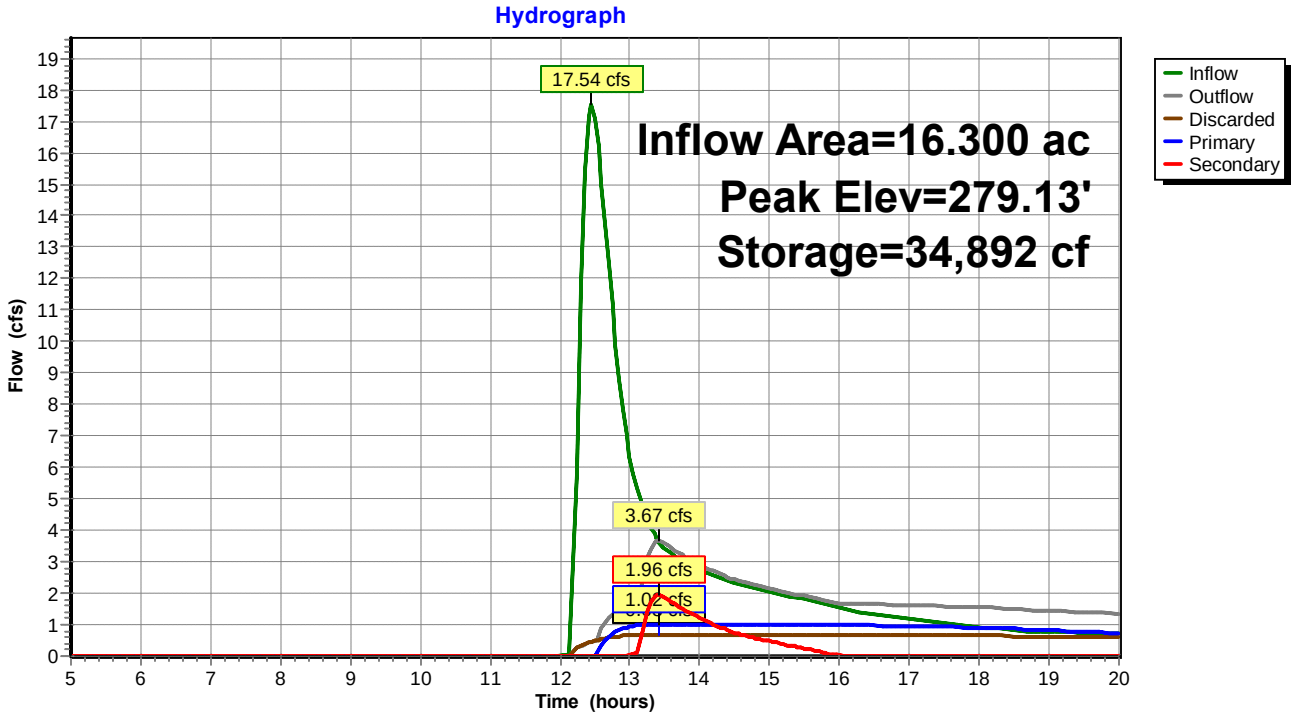
Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.00'	**6.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.00' / 275.00' S= 0.0714 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Discarded	274.50'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.68 cfs @ 13.41 hrs HW=279.13' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.68 cfs)

Primary OutFlow Max=1.02 cfs @ 13.41 hrs HW=279.13' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 1.02 cfs @ 5.21 fps)

Secondary OutFlow Max=1.94 cfs @ 13.41 hrs HW=279.13' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.94 cfs @ 0.95 fps)

Pond 3P: Dry Basin



Summary for Pond B1: Retention

Inflow Area = 0.767 ac, 32.93% Impervious, Inflow Depth > 1.96" for 10-Year event
Inflow = 1.59 cfs @ 12.16 hrs, Volume= 0.125 af
Outflow = 0.39 cfs @ 12.64 hrs, Volume= 0.125 af, Atten= 75%, Lag= 28.7 min
Discarded = 0.39 cfs @ 12.64 hrs, Volume= 0.125 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.35' @ 12.64 hrs Surf.Area= 6,030 sf Storage= 1,660 cf

Plug-Flow detention time= 35.6 min calculated for 0.125 af (100% of inflow)
Center-of-Mass det. time= 34.8 min (841.8 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

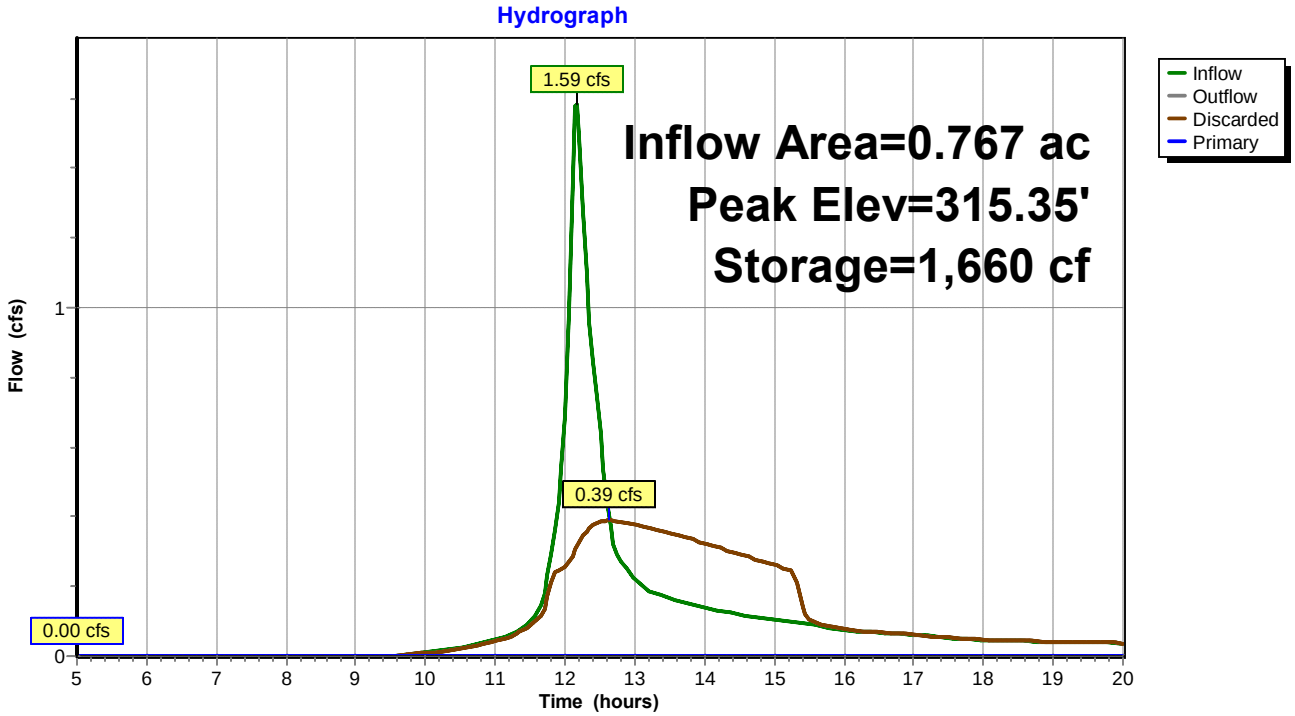
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' 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
#2	Discarded	315.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.39 cfs @ 12.64 hrs HW=315.35' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=315.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: Retention



Summary for Pond B2: Retention

Inflow Area = 0.844 ac, 0.00% Impervious, Inflow Depth > 1.12" for 10-Year event
Inflow = 0.76 cfs @ 12.30 hrs, Volume= 0.079 af
Outflow = 0.20 cfs @ 13.00 hrs, Volume= 0.079 af, Atten= 74%, Lag= 41.9 min
Discarded = 0.20 cfs @ 13.00 hrs, Volume= 0.079 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 312.33' @ 13.00 hrs Surf.Area= 3,018 sf Storage= 977 cf

Plug-Flow detention time= 41.6 min calculated for 0.078 af (99% of inflow)
Center-of-Mass det. time= 40.4 min (878.1 - 837.7)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

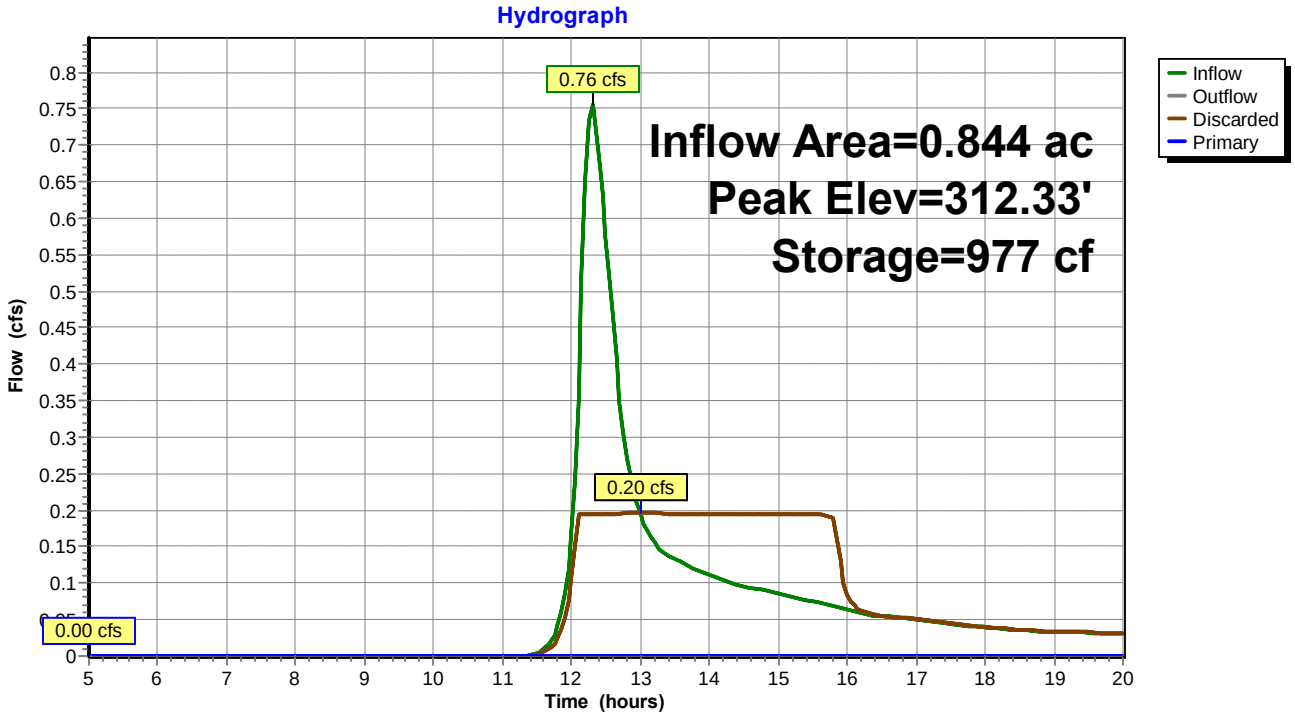
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' 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
#2	Discarded	312.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.20 cfs @ 13.00 hrs HW=312.33' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=312.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B2: Retention



Summary for Subcatchment 1S: Drainage Direct to Wetlands

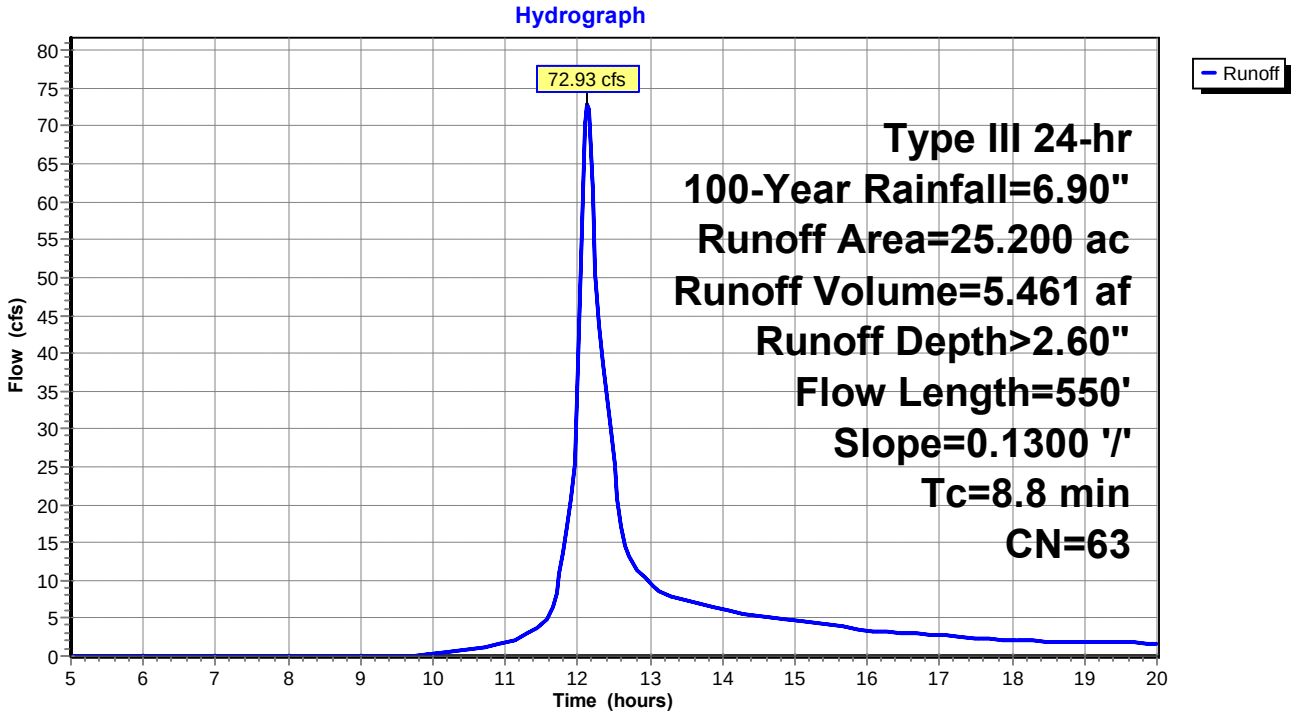
Runoff = 72.93 cfs @ 12.13 hrs, Volume= 5.461 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

	Area (ac)	CN	Description
	14.900	55	Woods, Good, HSG B
	8.600	77	Woods, Good, HSG D
	1.350	61	>75% Grass cover, Good, HSG B
*	0.350	72	Crushed Stone Surface, HSG B
	25.200	63	Weighted Average
	25.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	550	0.1300	1.05		**Lag/CN Method, Tc-1**

Subcatchment 1S: Drainage Direct to Wetlands



Summary for Subcatchment 1S': Drainage Area to Basin

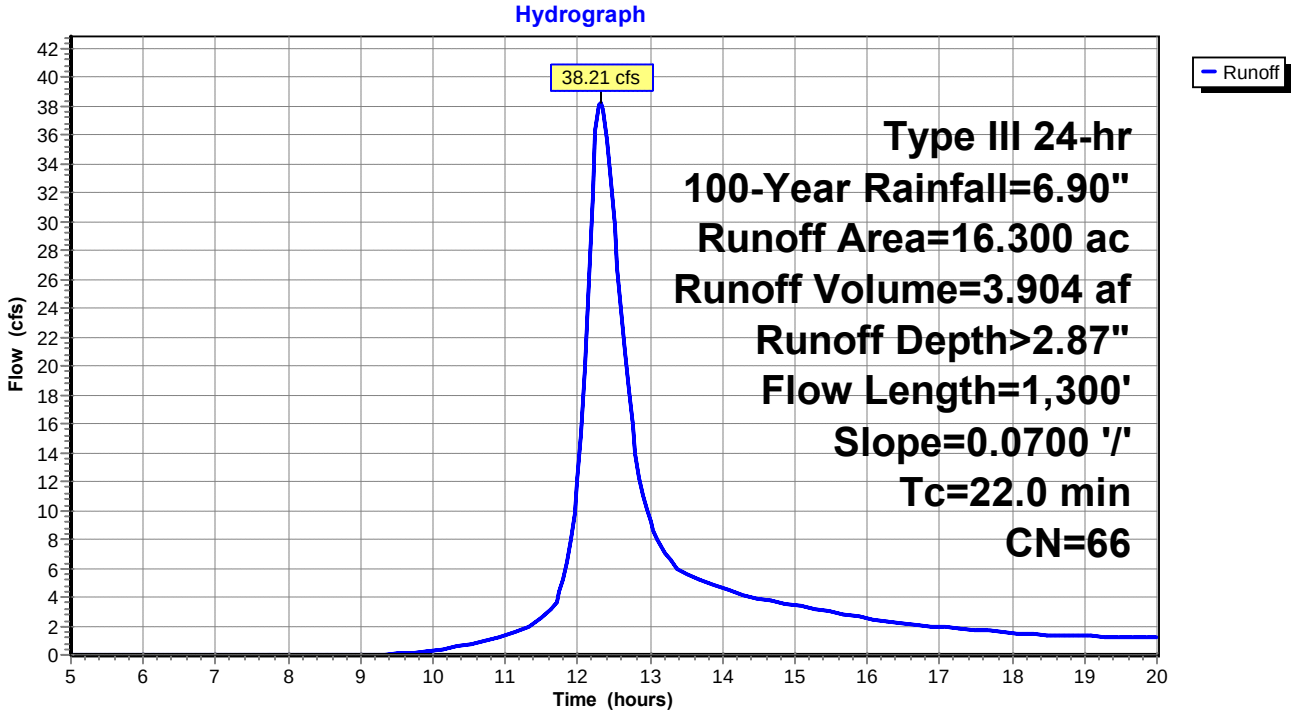
Runoff = 38.21 cfs @ 12.32 hrs, Volume= 3.904 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

	Area (ac)	CN	Description
*	6.400	65	Impervious roof & pavement
*	4.500	72	Crushed Stone surface, HSG B
	5.400	61	>75% Grass cover, Good, HSG B
	16.300	66	Weighted Average
	16.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	1,300	0.0700	0.99		**Lag/CN Method, Tc-1**

Subcatchment 1S': Drainage Area to Basin



Summary for Subcatchment 2S: Drainage Area 2 - Off site East

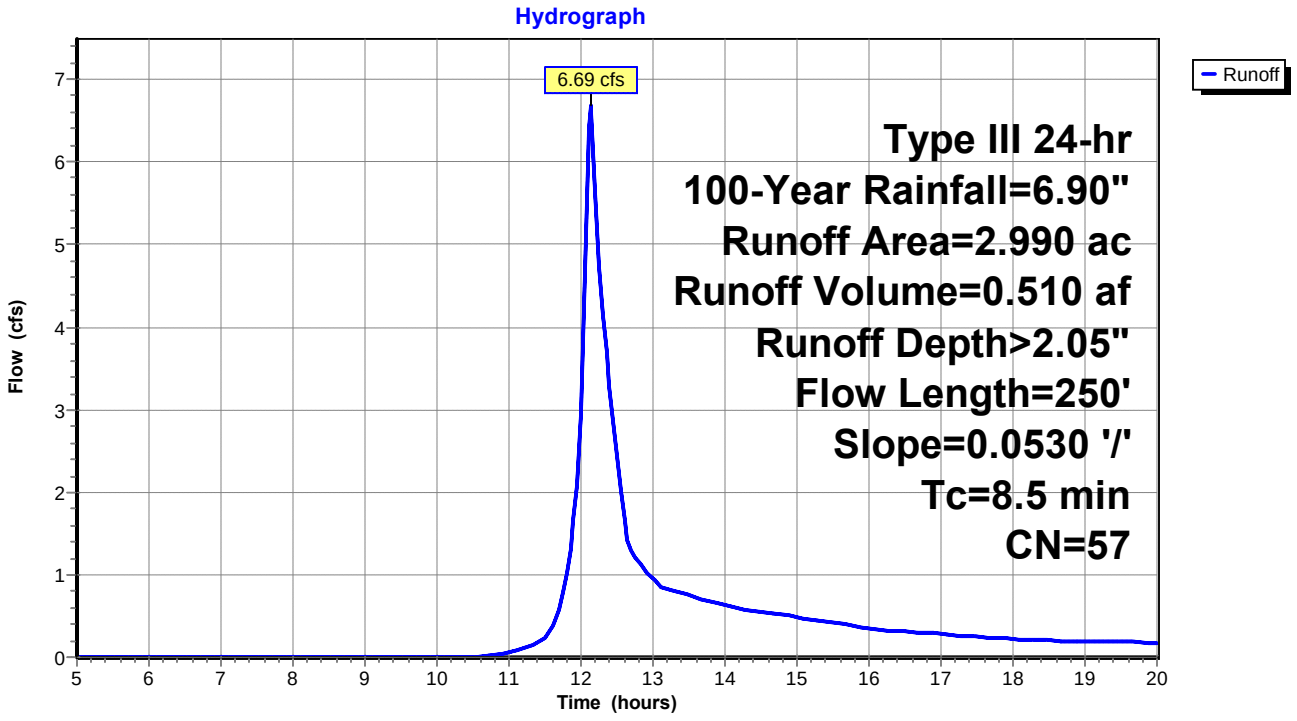
Runoff = 6.69 cfs @ 12.13 hrs, Volume= 0.510 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

Area (ac)	CN	Description
1.760	55	Woods, Good, HSG B
1.230	61	>75% Grass cover, Good, HSG B
2.990	57	Weighted Average
2.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	250	0.0530	0.49		**Lag/CN Method, Tc-2**

Subcatchment 2S: Drainage Area 2 - Off site East



Summary for Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands

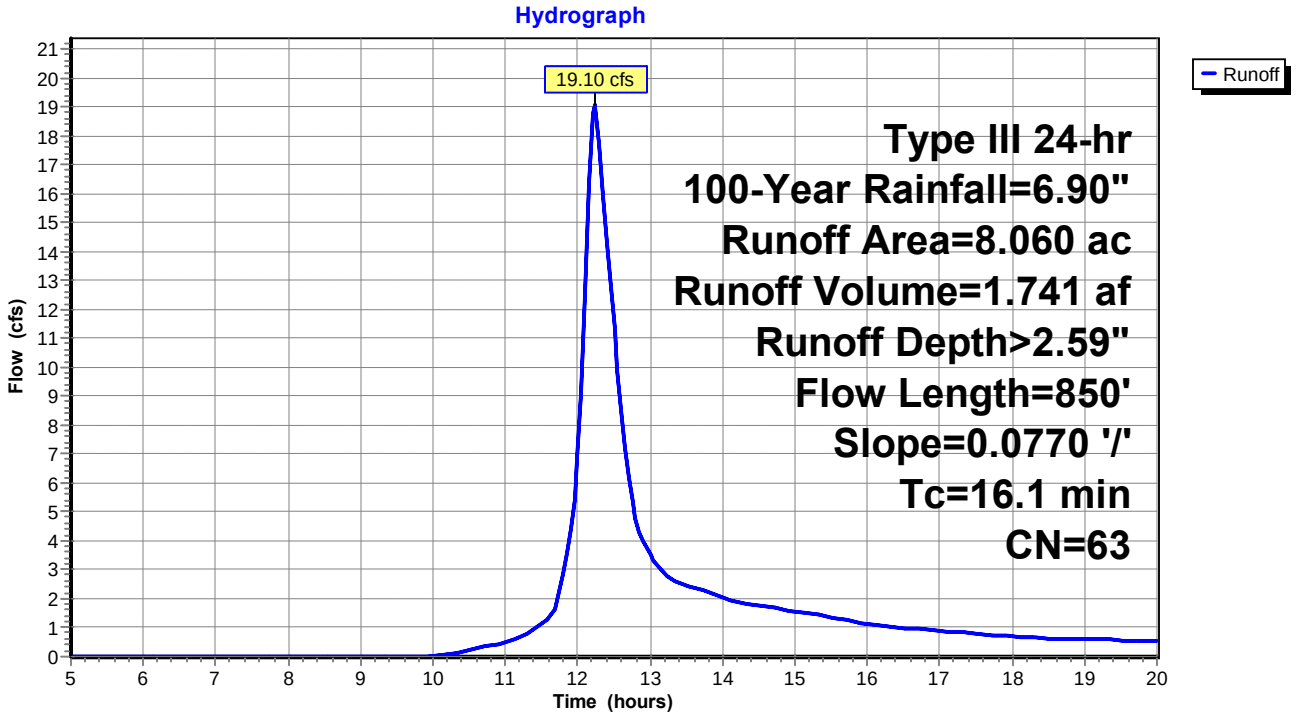
Runoff = 19.10 cfs @ 12.23 hrs, Volume= 1.741 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	4.650	55	Woods, Good, HSG B
*	1.600	72	Crushed stone surface
	8.060	63	Weighted Average
	7.250		89.95% Pervious Area
	0.810		10.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	850	0.0770	0.88		**Lag/CN Method, Tc-3**

Subcatchment 3S: Drainage Area 3 - Switchyard to Wetlands



Summary for Subcatchment DB1: Drainage to B1

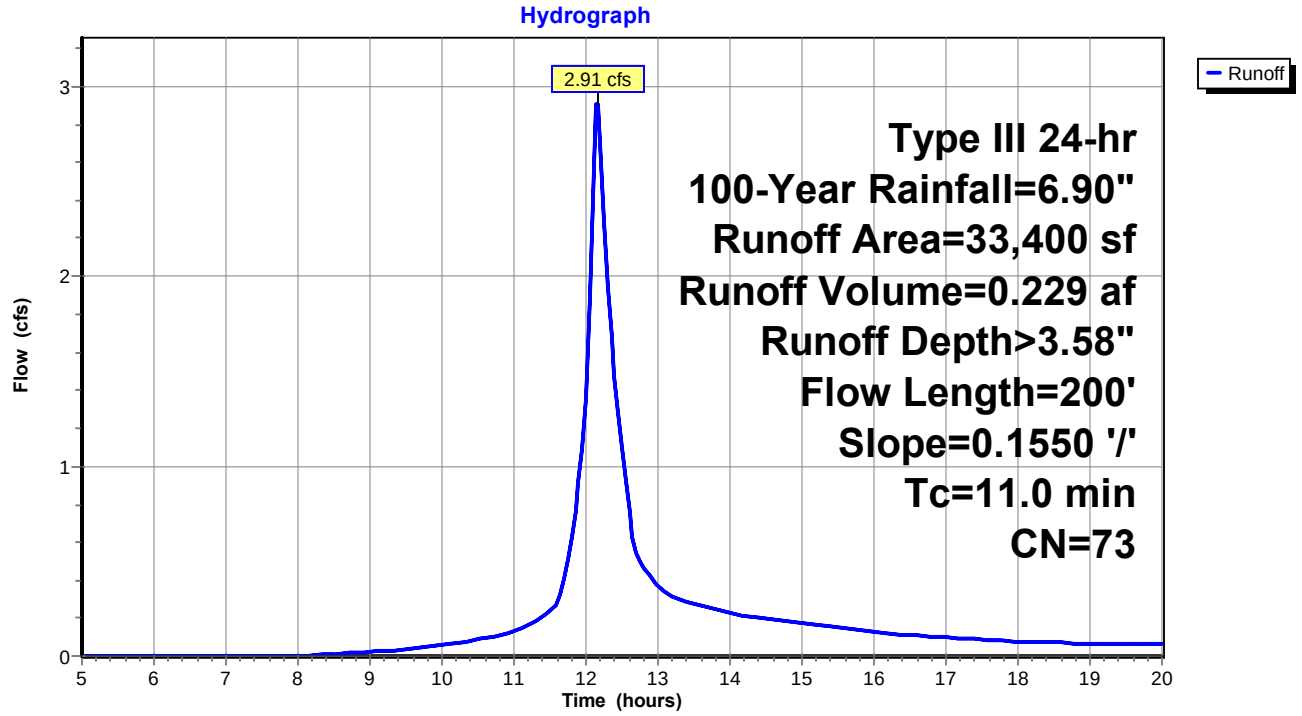
Runoff = 2.91 cfs @ 12.16 hrs, Volume= 0.229 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

Area (sf)	CN	Description
22,400	61	>75% Grass cover, Good, HSG B
11,000	98	Roofs, HSG B
33,400	73	Weighted Average
22,400		67.07% Pervious Area
11,000		32.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	200	0.1550	0.30		**Sheet Flow, Tc-DB-1** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB1: Drainage to B1



Summary for Subcatchment DB2: Drainage to B2

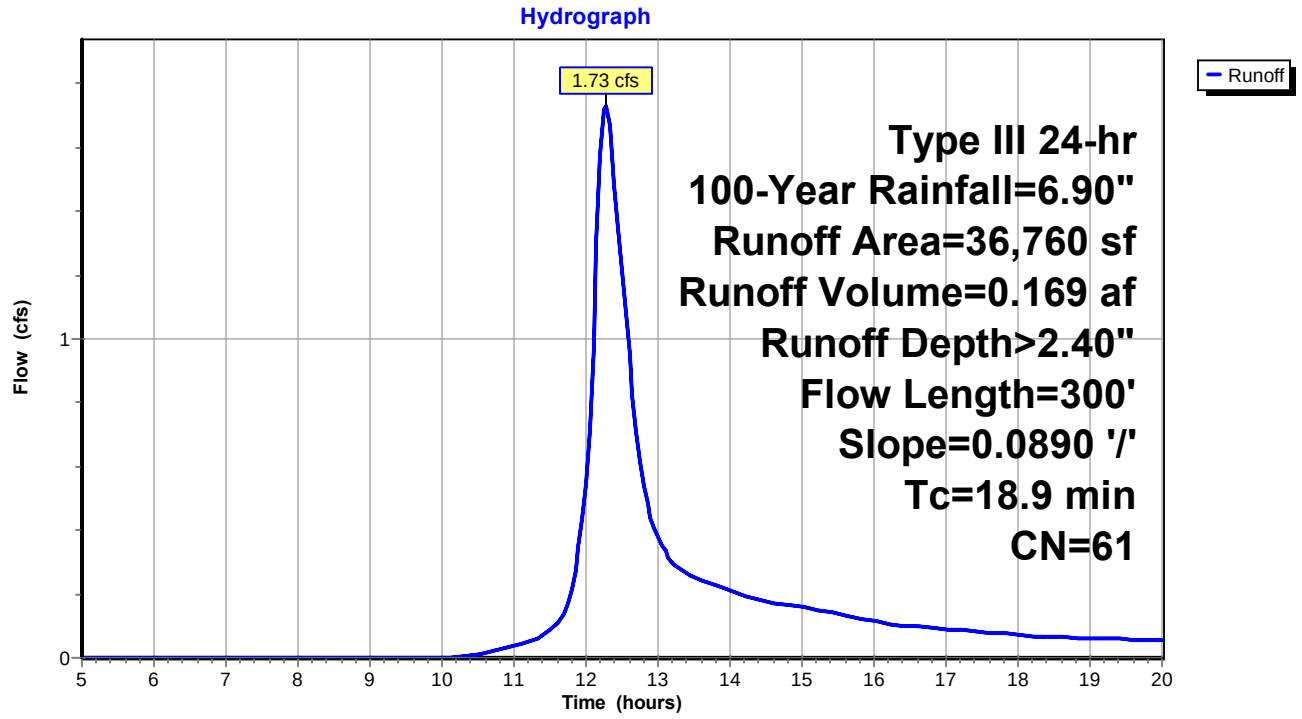
Runoff = 1.73 cfs @ 12.28 hrs, Volume= 0.169 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.90"

Area (sf)	CN	Description
36,760	61	>75% Grass cover, Good, HSG B
36,760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	300	0.0890	0.26		**Sheet Flow, Tc-DB2** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment DB2: Drainage to B2



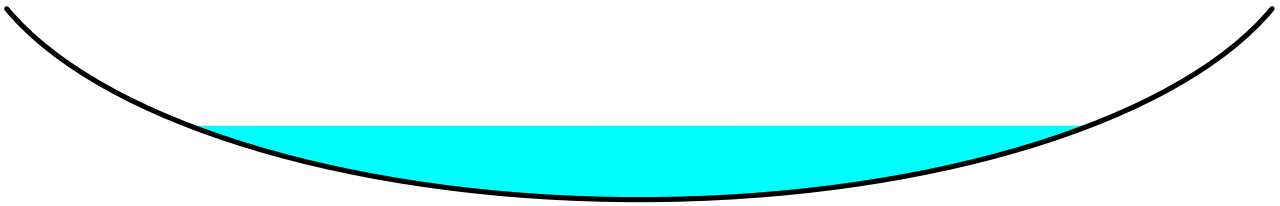
Summary for Reach 1R: Wetlands

Inflow Area = 41.500 ac, 0.00% Impervious, Inflow Depth > 2.31" for 100-Year event
Inflow = 72.93 cfs @ 12.13 hrs, Volume= 7.989 af
Outflow = 48.78 cfs @ 12.51 hrs, Volume= 7.805 af, Atten= 33%, Lag= 22.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 14.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 28.0 min

Peak Storage= 42,055 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 133.3 sf, Capacity= 378.88 cfs

200.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 1,300.0' Slope= 0.0077 '/'
Inlet Invert= 274.00', Outlet Invert= 264.00'



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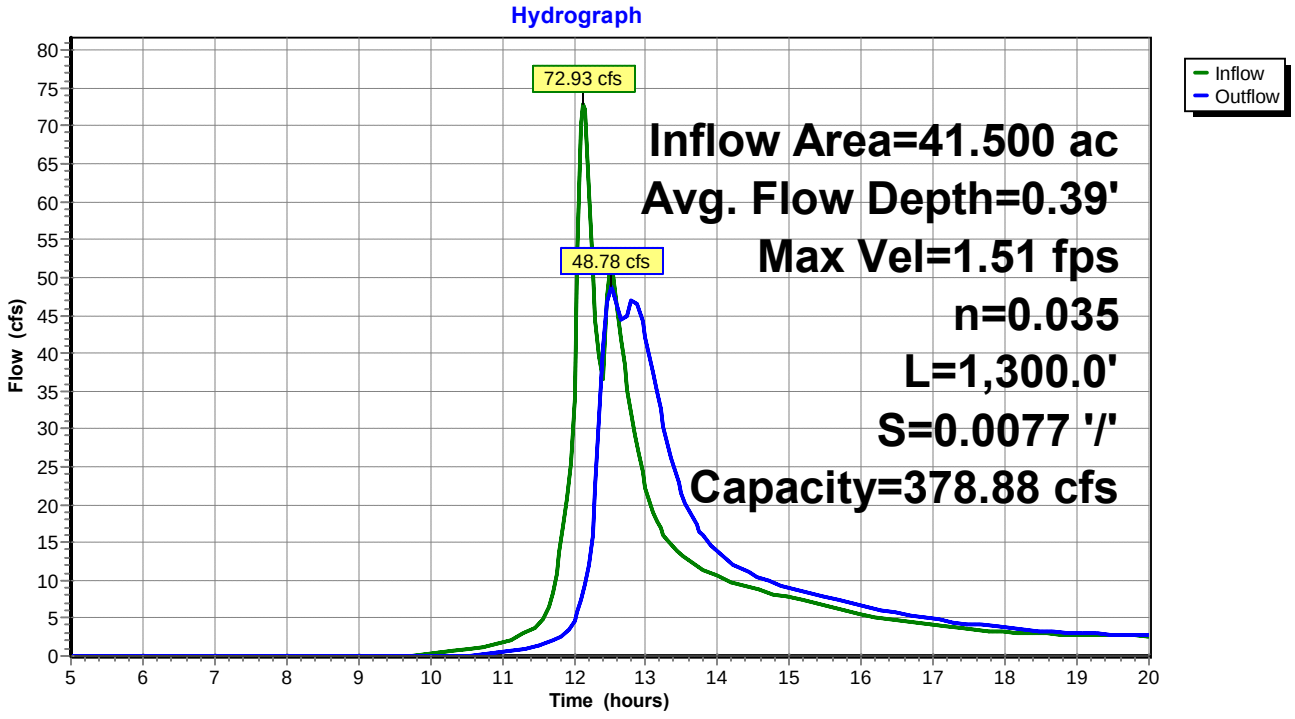
Reach 1R: Wetlands

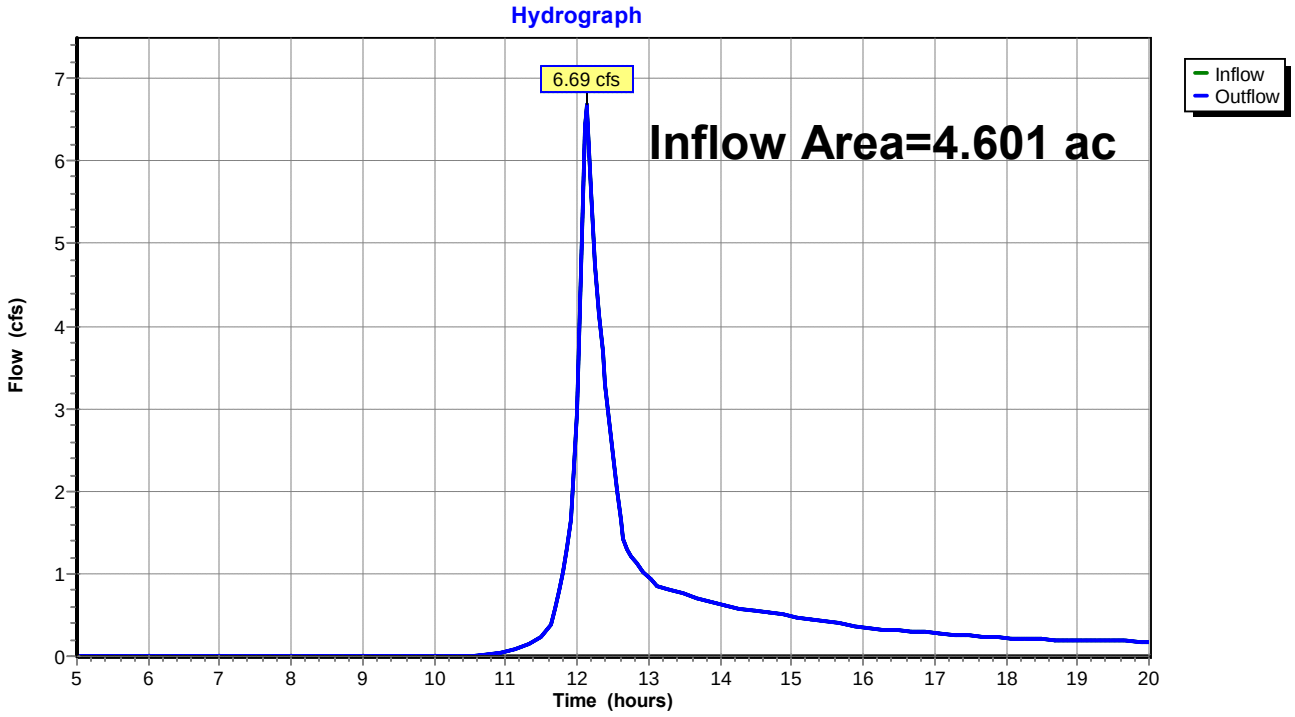


Summary for Reach 2R: Peak off site East

Inflow Area = 4.601 ac, 5.49% Impervious, Inflow Depth > 1.33" for 100-Year event
Inflow = 6.69 cfs @ 12.13 hrs, Volume= 0.510 af
Outflow = 6.69 cfs @ 12.13 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Peak off site East



Summary for Pond 1P: Sediment Forebay

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 2.87" for 100-Year event
Inflow = 38.21 cfs @ 12.32 hrs, Volume= 3.904 af
Outflow = 37.87 cfs @ 12.35 hrs, Volume= 3.744 af, Atten= 1%, Lag= 2.0 min
Primary = 32.11 cfs @ 12.35 hrs, Volume= 3.647 af
Secondary = 5.76 cfs @ 12.35 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.71' @ 12.35 hrs Surf.Area= 5,629 sf Storage= 14,135 cf

Plug-Flow detention time= 24.3 min calculated for 3.744 af (96% of inflow)
Center-of-Mass det. time= 10.0 min (824.3 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	15,801 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

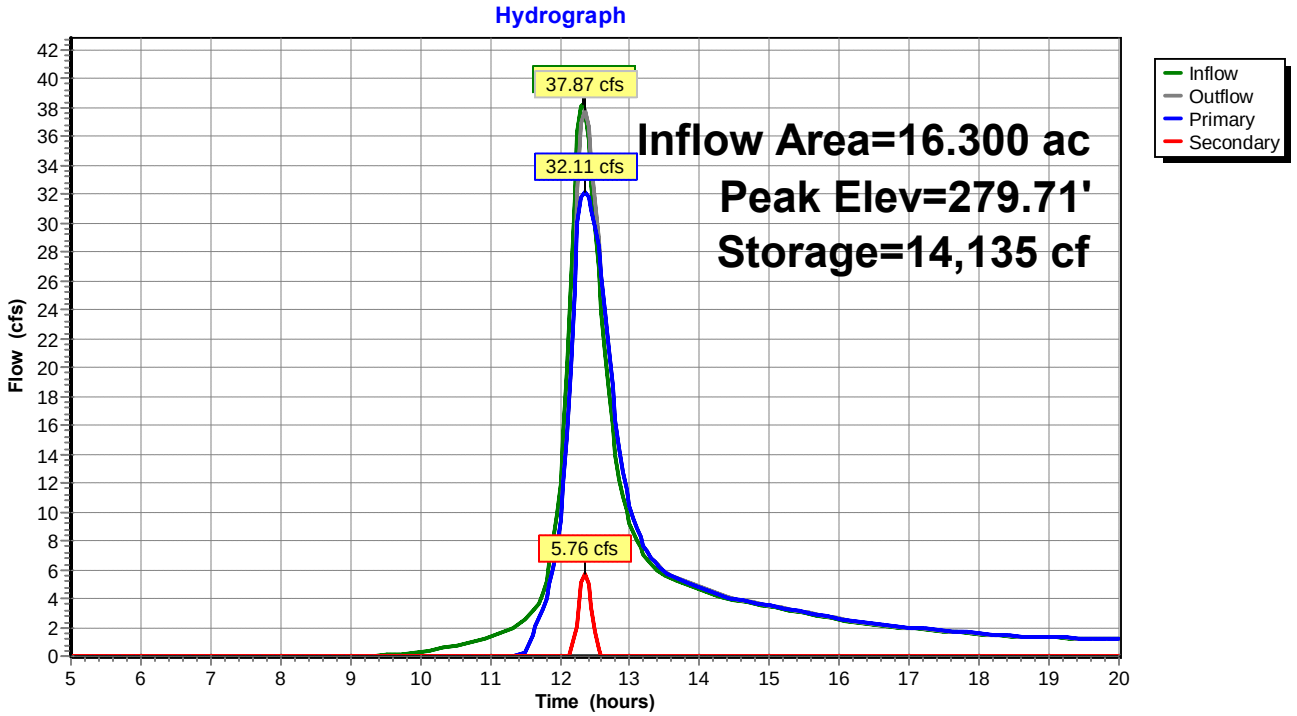
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	925	0	0
276.00	1,532	1,229	1,229
278.00	3,530	5,062	6,291
280.00	5,980	9,510	15,801

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	278.00'	**84.0" W x 18.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=32.10 cfs @ 12.35 hrs HW=279.71' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 32.10 cfs @ 3.06 fps)

Secondary OutFlow Max=5.70 cfs @ 12.35 hrs HW=279.71' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.70 cfs @ 1.12 fps)

Pond 1P: Sediment Forebay



Summary for Pond 2P: Stormwater Wetland

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 2.76" for 100-Year event
Inflow = 37.87 cfs @ 12.35 hrs, Volume= 3.744 af
Outflow = 37.17 cfs @ 12.39 hrs, Volume= 3.703 af, Atten= 2%, Lag= 2.5 min
Primary = 37.17 cfs @ 12.39 hrs, Volume= 3.703 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 278.33' @ 12.39 hrs Surf.Area= 4,008 sf Storage= 7,149 cf

Plug-Flow detention time= 7.7 min calculated for 3.703 af (99% of inflow)
Center-of-Mass det. time= 3.8 min (828.1 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	15,825 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

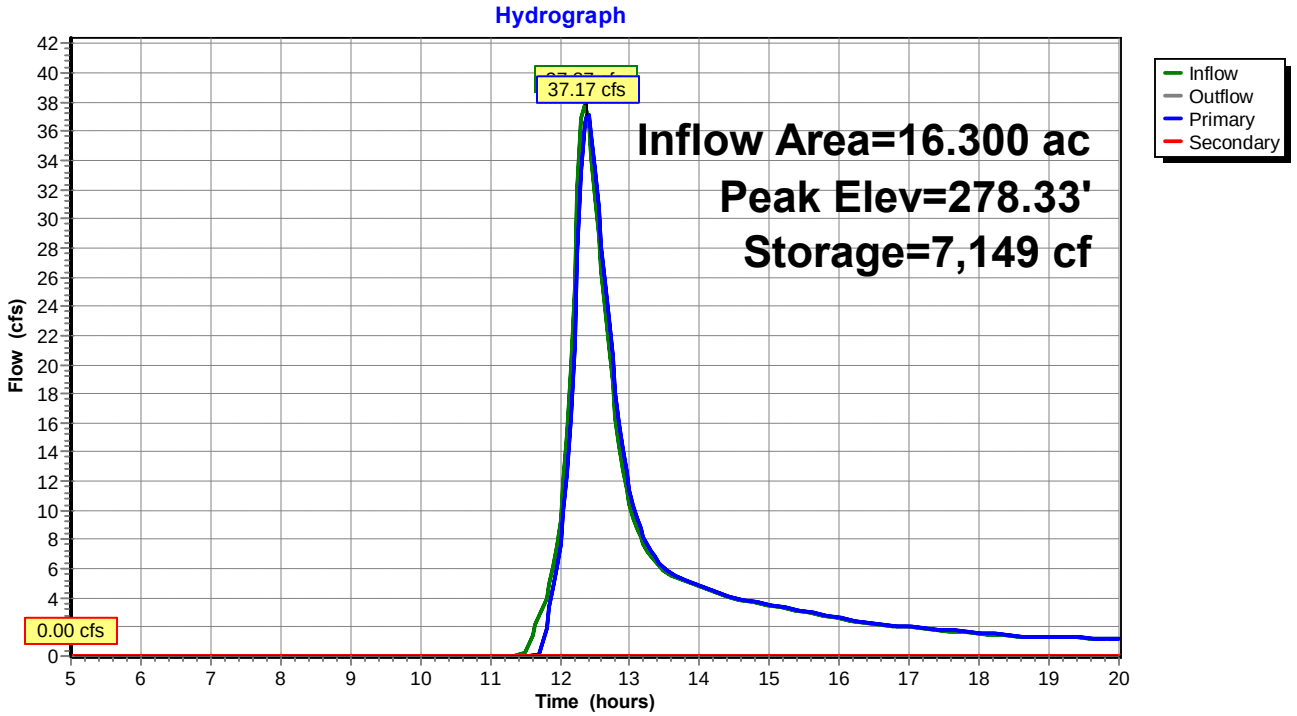
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	2,365	0	0
278.00	3,530	5,895	5,895
280.00	6,400	9,930	15,825

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	276.50'	**84.0" W x 36.0" H Vert. Orifice/Grate** C= 0.400

Primary OutFlow Max=37.01 cfs @ 12.39 hrs HW=278.33' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 37.01 cfs @ 2.89 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=276.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormwater Wetland



Summary for Pond 3P: Dry Basin

Inflow Area = 16.300 ac, 0.00% Impervious, Inflow Depth > 2.73" for 100-Year event
Inflow = 37.17 cfs @ 12.39 hrs, Volume= 3.703 af
Outflow = 30.41 cfs @ 12.57 hrs, Volume= 2.979 af, Atten= 18%, Lag= 10.7 min
Discarded = 0.74 cfs @ 12.57 hrs, Volume= 0.451 af
Primary = 1.18 cfs @ 12.57 hrs, Volume= 0.648 af
Secondary = 28.49 cfs @ 12.57 hrs, Volume= 1.880 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.77' @ 12.57 hrs Surf.Area= 11,372 sf Storage= 41,903 cf

Plug-Flow detention time= 85.0 min calculated for 2.979 af (80% of inflow)
Center-of-Mass det. time= 34.4 min (862.5 - 828.1)

Volume	Invert	Avail.Storage	Storage Description
#1	274.50'	44,586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	4,780	2,246	2,246
276.00	6,750	5,765	8,011
278.00	9,075	15,825	23,836
280.00	11,675	20,750	44,586

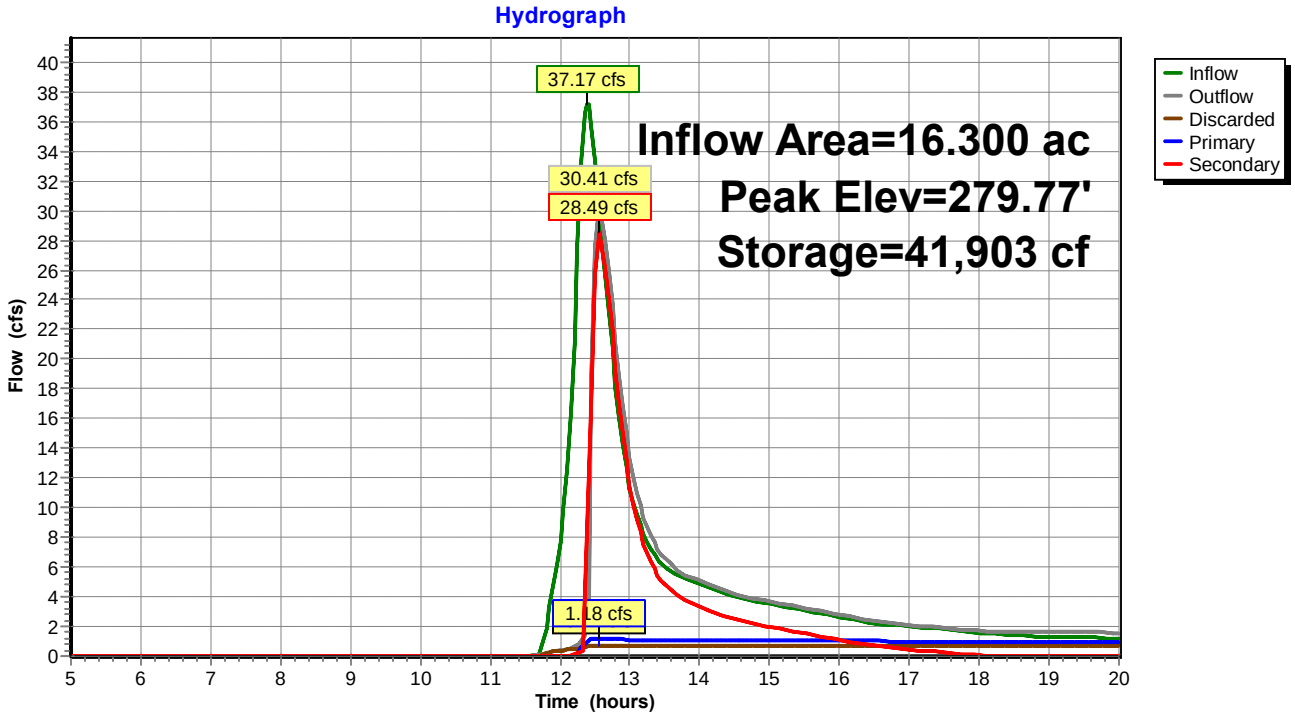
Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.00'	**6.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.00' / 275.00' S= 0.0714 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Discarded	274.50'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.74 cfs @ 12.57 hrs HW=279.76' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.74 cfs)

Primary OutFlow Max=1.18 cfs @ 12.57 hrs HW=279.76' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 1.18 cfs @ 6.02 fps)

Secondary OutFlow Max=28.13 cfs @ 12.57 hrs HW=279.76' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 28.13 cfs @ 2.31 fps)

Pond 3P: Dry Basin



Summary for Pond B1: Retention

Inflow Area = 0.767 ac, 32.93% Impervious, Inflow Depth > 3.58" for 100-Year event
Inflow = 2.91 cfs @ 12.16 hrs, Volume= 0.229 af
Outflow = 0.52 cfs @ 12.72 hrs, Volume= 0.229 af, Atten= 82%, Lag= 34.1 min
Discarded = 0.52 cfs @ 12.72 hrs, Volume= 0.229 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.63' @ 12.72 hrs Surf.Area= 8,065 sf Storage= 3,688 cf

Plug-Flow detention time= 67.8 min calculated for 0.228 af (99% of inflow)
Center-of-Mass det. time= 66.9 min (860.3 - 793.4)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

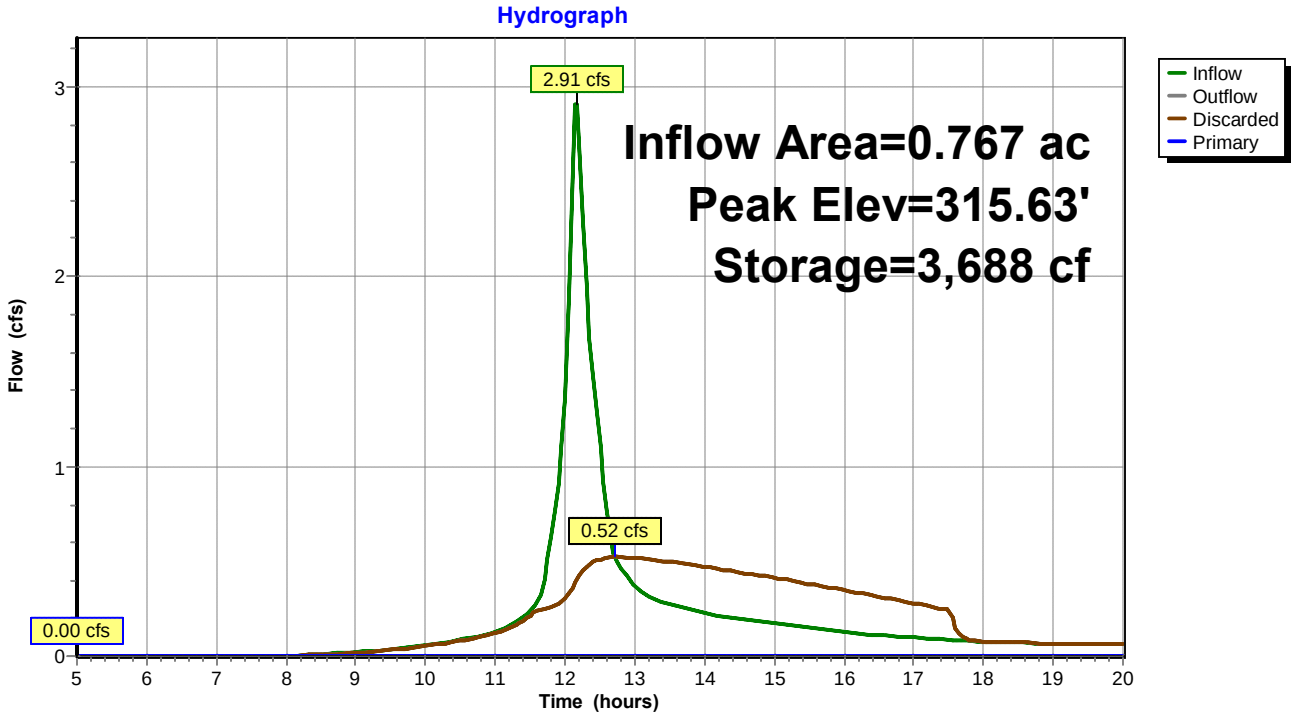
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' 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
#2	Discarded	315.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.52 cfs @ 12.72 hrs HW=315.63' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=315.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: Retention



Summary for Pond B2: Retention

Inflow Area = 0.844 ac, 0.00% Impervious, Inflow Depth > 2.40" for 100-Year event
Inflow = 1.73 cfs @ 12.28 hrs, Volume= 0.169 af
Outflow = 0.20 cfs @ 14.12 hrs, Volume= 0.140 af, Atten= 88%, Lag= 110.5 min
Discarded = 0.20 cfs @ 14.12 hrs, Volume= 0.140 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 313.09' @ 14.12 hrs Surf.Area= 3,083 sf Storage= 3,319 cf

Plug-Flow detention time= 170.8 min calculated for 0.140 af (83% of inflow)
Center-of-Mass det. time= 123.5 min (944.1 - 820.6)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

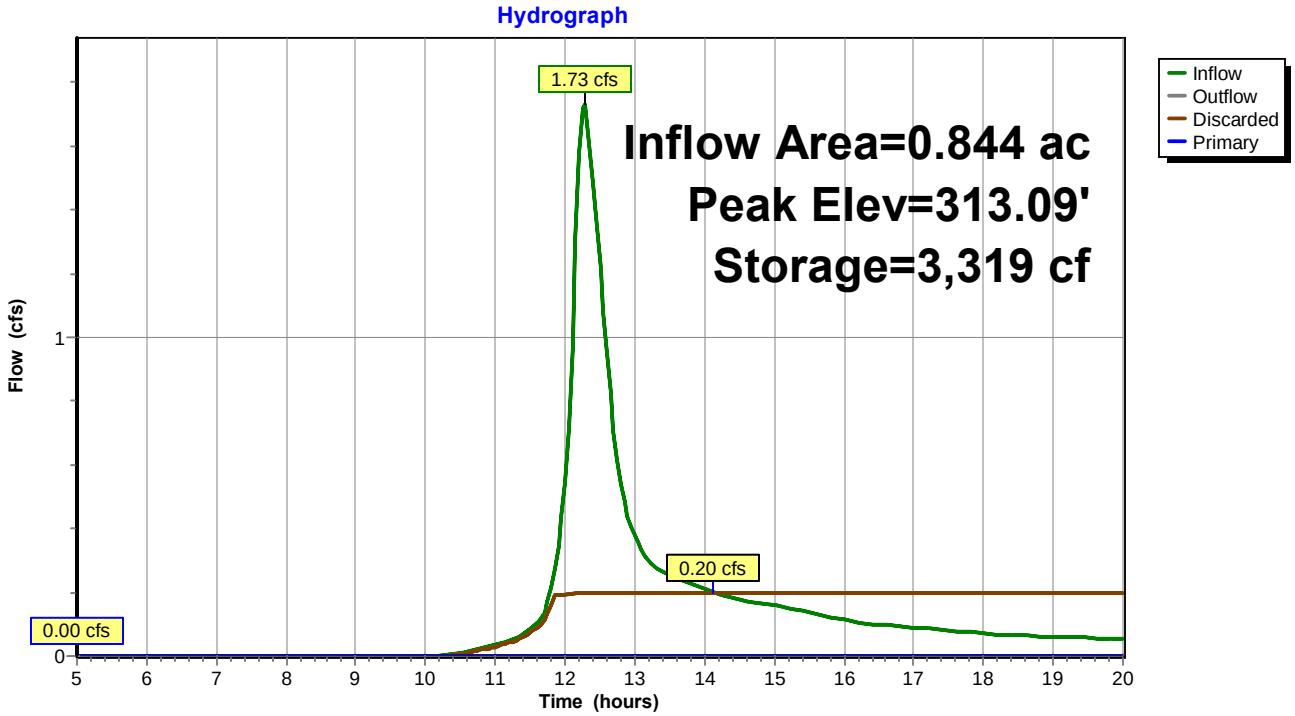
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' 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
#2	Discarded	312.00'	**2.800 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.20 cfs @ 14.12 hrs HW=313.09' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=312.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond B2: Retention



ATTACHMENT 4

WATER QUALITY BASIN CALCULATION

Water Quality Volume Requirements

Drainage Area to Basin = 16.3 Acres

Impervious Area = 6.4 Acres

% Impervious = 39.3%

WQV = 1ò (R) (A) / 12

R = 0.05 + 0.009 (I) = 0.05 + 0.009 (39.3) = 0.404

WQV = 1ò (0.404) (6.4) /12 = 0.215 Acre feet = 9,365 Cubic Feet

Total Provided

Sediment Forebay = 3,460 C.F.

Stormwater Wetland = 3,150 C.F.

Dry Basin = 14,190 C.F.

Total = 20,800 C.F.

Water Quality Flow (WQF)

Runoff Depth Q = WQV x 12ò per foot / DA = 0.215 x 12 / 16.3 = 0.16

Curve Number (CN) = 96

Ia = 0.083 (table 4-1)

Ia/P = Ia/1 = 0.083

q_u = 580 csm/in

WQF = $(q_u)(A)^*(Q)$ = (580)(.0255)(.16) = 2.36 CFS

*Square miles

ATTACHMENT 5

TEMPORARY SEDIMENTATION BASIN REQUIREMENTS

Temporary Sediment Trap Requirements

Per 5-11-5 / 5-11-25 of the 2002 CT guidelines for Soil & Erosion Control

Area	*DA (acres)*	*A (ton/acre/yr)*	*Tons per year*	*Density*	*Required Storage Volume (cubic feet)*
North	16.3	134	2184.2	85	**51,392.9**
South	5.2	134	696.8	85	**16,395.3**

Note: Individual sediment traps shall be field located after land clearing and prior to grading activities

ATTACHMENT 6

SAMPLE CONSTRUCTION STORMWATER INSPECTION REPORT

SEMI- ANNUAL STORMWATER COMPREHENSIVE SITE INSPECTION

Inspector:	
Date of Inspection:	
Weather Conditions:	

1. **Review the Stormwater Pollution Prevention Plan including the Site Map, Material Inventory/Potential Pollutants, Stormwater Control Measures, and Pollution Prevention Team Roster.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

2. **Review visual and analytical Stormwater Monitoring Reports since last inspection.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

3. **Review routine inspection reports and maintenance records, spill reports, etc. since last inspection.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

Additional Comments:

I have discussed the results of this inspection with the Stormwater Pollution Prevention Team members.

_____ _____

Signature of Inspector **Date**

COMPREHENSIVE SITE INSPECTION (CSI)

CSI Date: ____/____/____
CSI Start Time: _____
CSI End Time: _____
CSI Conducted During Rainfall Event? YES or NO
Page ____ of ____

Stormwater Management Measures and Spill Response Equipment	Location	Inspection Points – Verify That Each of the Following Conditions is Acceptable.	Conditions Acceptable? (Check One)		Explanation of Unacceptable Conditions, Remedial Action(s) Taken, Date(s) of Remedial Action(s), and Other Comments
Spill Response Equipment	In bins near transfer station tipping floor and in trailer load out area	• Adequate amount of absorbent booms, pads, Speedi-Dri® present and easily accessible			
Erosion Control Measures	Throughout site	• Erosion control measures being used as necessary during site construction and repair work			
Drainage Structures – Catch Basins, Sedimentation Basins, Infiltration Basins Channels/Swales, Outfalls	Located throughout site, see site plans	• In good physical condition			
		• Clear of debris			
		• No visible sheen or floating scum			
		• No excessive sediment build-up			

Any Additional Comments or Observations: _____

_____

_____

_____

Name(s) of Inspector(s) and Organization(s): _____

Signature(s) of Inspector(s): _____ **Date:** _____

Connecticut Department of
Energy & Environmental Protection
Bureau of Materials Management & Compliance Assurance
Water Permitting & Enforcement Division

General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, issued 8/21/13, effective 10/1/13
Stormwater Monitoring Report

SITE INFORMATION

Permittee: _____

Mailing Address: _____

Business Phone: _____ ext.: _____ Fax: _____

Contact Person: _____ Title: _____

Site Name: _____

Site Address: _____

Receiving Water (name, basin): _____

Stormwater Permit No. GSN _____

SAMPLING INFORMATION (Submit a separate form for each outfall)

Outfall Designation: _____ Date/Time Collected: _____

Outfall Location(s) (lat/lon or map link): _____

Person Collecting Sample: _____

Storm Magnitude (inches): _____ Storm Duration (hours): _____

Size of Disturbed Area at any time: _____

MONITORING RESULTS

Sample #	Parameter	Method	Results (units)	Laboratory (if applicable)
1	Turbidity			
2	Turbidity			
3	Turbidity			
4	Turbidity			

(provide an attachment if more than 4 samples were taken for this outfall) Avg =

STATEMENT OF ACKNOWLEDGMENT

I certify that the data reported on this document were prepared under my direction or supervision in accordance with the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. The information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Authorized Official: _____

Signature: _____ Date: _____

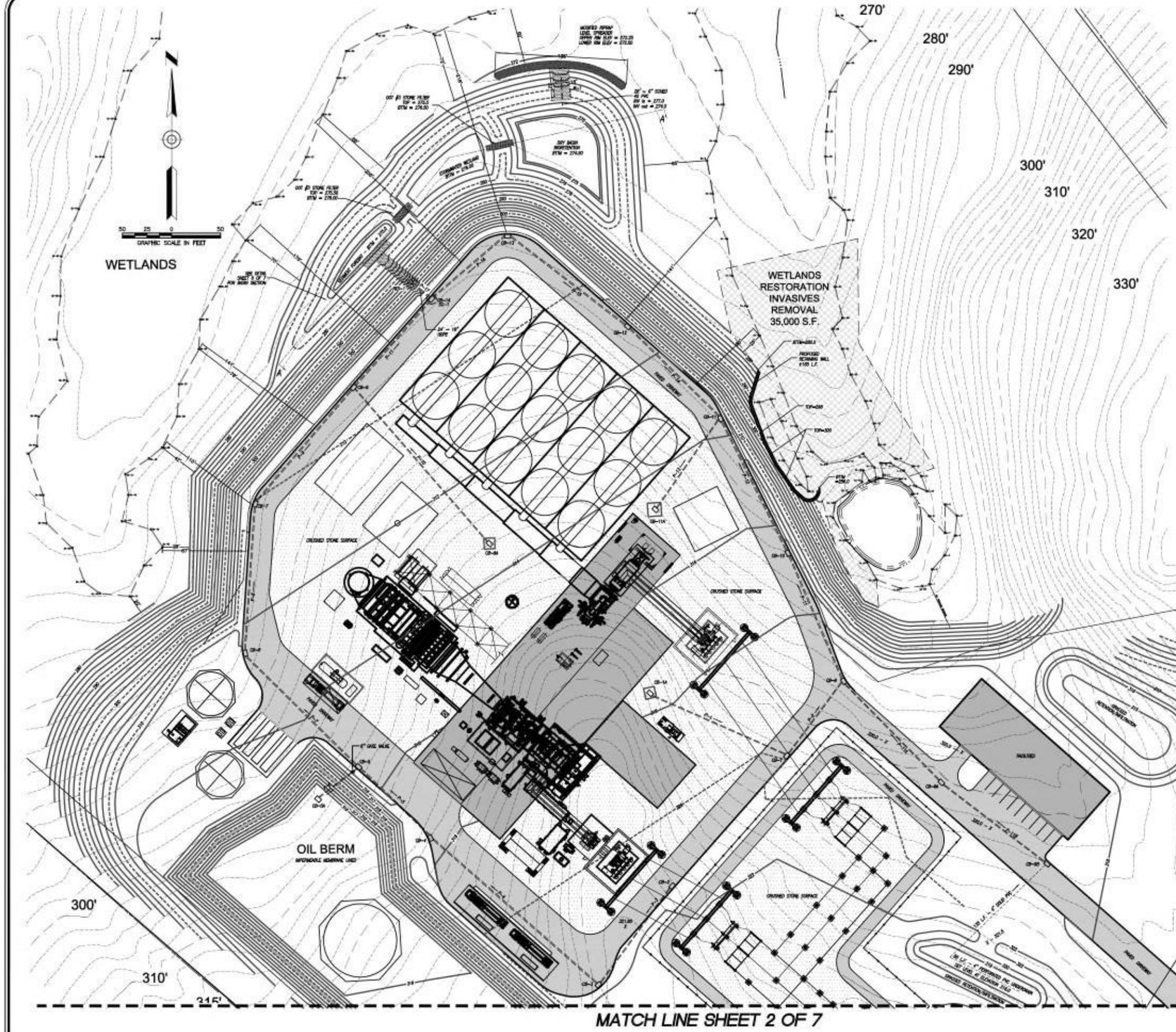
Please send completed form to:

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION
BUREAU OF MATERIALS MANAGEMENT AND COMPLIANCE ASSURANCE
79 ELM STREET
HARTFORD, CT 06106-5127
ATTN: NEAL WILLIAMS

ATTACHMENT 7

GRADING PLANS, EROSION AND SEDIMENTATION CONTROL PLANS & DETAILS

SEPARATE ENCLOSURE



STORM DRAINAGE STRUCTURE SCHEDULE

STRUCTURE ID	STRUCTURE TYPE	FRAME ELEV.	PIPE INVERT ELEVATION N	S	E	W	SUMP
CB-1A	TYPE C-L	317.75		OUT: 313.25 (SC)			309.25
CB-1	TYPE C	319.80	IN: 311.71 (NW)		OUT: 311.61 (NE)		307.61
CB-2	TYPE C	321.00		OUT: 316.90 (SW)			312.50
CB-3	TYPE C	321.00			IN: 315.22 (NE)	OUT: 315.12 (NW)	311.12
CB-4	TYPE C	315.34			IN: 310.58 (SE)	OUT: 310.48 (NW)	306.48
CB-5A	TYPE C-L	315.00			OUT: 311.48 (NE)		307.48
CB-5	TYPE C	315.56		IN: 310.00 (SW)		OUT: 309.90 (NW)	305.90
CB-6	TYPE C	312.25	OUT: 307.30		IN: 307.40 (SE)		303.30
CB-7	TYPE C	310.00		IN: 305.50	OUT: 305.40 (NE)		301.40
CB-8A	TYPE C-L	313.00				OUT: 308.00 (NW)	305.00
CB-8	TYPE C	309.20		IN: 303.50 (SW)	IN: 303.50 (SE)	OUT: 302.40 (NW)	299.40
CB-9	TYPE C	318.00		IN: 310.69 (SW & SE)		OUT: 310.59 (NW)	306.59
CB-9A	TYPE C-L	319.00		IN: 313.59 (SE)		OUT: 313.49 (NW)	309.49
CB-9B	TYPE C	318.00				OUT: 314.79 (NW)	310.79
CB-10	TYPE C	316.64	OUT: 308.63	IN: 308.73			304.63
CB-11A	TYPE C-L	316.80			OUT: 312.80 (NE)		308.80
CB-11	TYPE C	313.60	OUT: 307.00	IN: 307.10		IN: 307.10	303.00
CB-12	TYPE C-L	311.20	OUT: 305.59	IN: 305.69			301.59
CB-13	TYPE C	308.20	OUT: 303.50 (NW)	IN: 303.60			299.50
CB-14	TYPE C	309.20		IN: 301.00 (SW)	IN: 301.00 (NE)	OUT: 300.90 (NW)	295.90
SO-1	STORMCEPTOR EOS 18-1000 OIL-GRIT SEPARATOR						

PIPE SCHEDULE

PIPE ID	OUTLET DIA. (IN.)	MATERIAL	LENGTH (FT.)	SLOPE (%)
P-1	12	HDPE	154	1.0%
P-2	12	HDPE	92	1.0%
P-3	12	HDPE	129	1.0%
P-4	15	HDPE	227	2.0%
P-5	15	HDPE	102	1.0%
P-6	6	D.I.P	50	1.0%
P-7	15	HDPE	165	1.52%
P-8	15	HDPE	153	1.17%
P-9	18	HDPE	156	1.22%
P-10	12	HDPE	211	2.6%
P-11	12	HDPE	141	1.5%
P-11A	15	HDPE	140	2.0%
P-11B	12	HDPE	130	1.0%
P-12	15	HDPE	153	1.0%
P-13	12	HDPE	114	5.0%
P-14	15	HDPE	131	1.0%
P-15	15	HDPE	152	1.3%
P-16	15	HDPE	100	2.5%
P-17	18	HDPE	24	3.8%
P-18	15	RCP	140	TBD

STRUCTURE ID	TYPE	INVERT ELEVATION
FES-1	FLARED END	300.00
W-1	OVERFLOW WEIR	277.00
FES-2	FLARED END	313.50

DATE	DESCRIPTION

REVISIONS

PROPOSED GRADING & DRAINAGE

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates
Civil Engineering & Surveying
134 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

DATE: 06/30/2016	DRAWN: NET
SCALE: 1"=50'	DESIGN: NET
SHEET: 1 OF 7	CHK BY: ----
DWG. No: CLIENT FILE	JOB No: 16042

MATCH LINE SHEET 1 OF 7

MATCH LINE SHEET 1 OF 7

2 LINES
115 KV

LAKE ROAD

WETLANDS
RESTORATION
INVASIVES
REMOVAL
18,000 S.F.

RETAINING
WALL
top=346

340'

350'

360'

340'

330'

320'

GRAPHIC SCALE IN FEET

DATE	DESCRIPTION
REVISIONS	

PROPOSED GRADING & DRAINAGE

PREPARED FOR

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NTE ENERGY PROJECT

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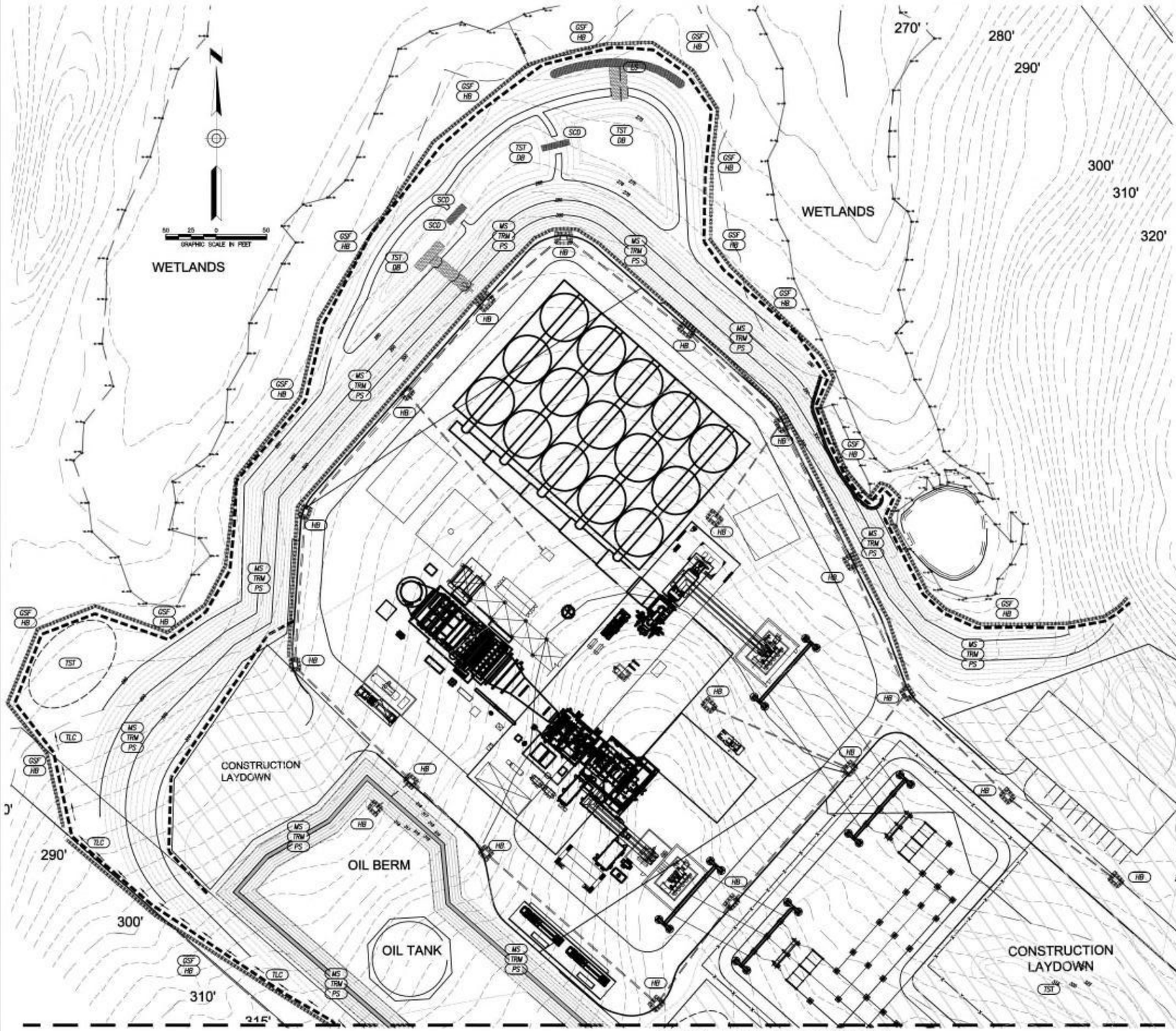
SHEET: 2 OF 7	CHK BY: ----
DWG. No: CLIENT FILE	JOB No: 16042



MEASURE	KEY	DESCRIPTION
Permanent Seeding	PS	Establishment of permanent stand of grass and/or legumes by seeding and mulching exposed soils with a seed mixture appropriate for long term stabilization. See Erosion Control Narrative for seed mix requirements.
Mulch for Seed	MS	Application of a mulch that will protect the soil surface on a temporary basis and promote the establishment of temporary or permanent seedings.
Construction Entrance	CE	A stone stabilized pad sometimes associated with a mud rack, automotive spray, or other measures located at points of vehicular ingress and egress on a construction site.
Geotextile Silt Fence	GSF	A temporary sediment barrier consisting of a geotextile fabric pulled taut and attached to supporting posts and entrenched.
Stone Check Dam	SCD	A temporary or permanent stone dam placed across a drainageway.
Haybale Barrier	HB	A temporary sediment barrier consisting of a row of entrenched and anchored bales of hay or straw.
Water Bar	WB	A channel with a supporting berm on the down slope side constructed across a construction access road, driveway, log road or other access way.
Temporary Lined Channel	TLC	A channel designed to convey flows on a short term basis and lined with an erosion resistant covering.
Temporary Sediment Trap	TST	A temporary ponding area with a stone outlet formed by excavation and/or constructing an earthen embankment.
Detention Basin	DB	An impoundment made by constructing a dam or an embankment (embankment detention basin) or by excavating a pit or dugout (excavated detention basin).
Level Spreader	LS	An outlet for diversions and other water conveyances consisting of an excavated depression with a broad stable point of discharge constructed at zero grade across a slope
Permanent Turf Reinforcement Mat	TRM	A manufactured mat composed of non-biodegradable polymer or synthetic fibers mechanically, structurally, or chemically bound to form a continuous matrix.

New England Erosion Control/Restoration Mix

The New England Erosion Control/Restoration Mix For Dry Sites provides an appropriate selection of native and naturalized grasses to ensure that dry and recently disturbed sites will be quickly revegetated and the soil surface stabilized. It is an appropriate seed mix for road cuts, pipelines, steeper slopes, and areas requiring quick cover during the ecological restoration process. The mix may be applied by hydro-seeding, by mechanical spreader, or on small sites it can be spread by hand. Lightly rake, or roll to ensure proper soil-seed contact. Best results are obtained with a Spring or late Summer seeding. Late Spring through Mid-Summer seeding will benefit from a light mulching of weed-free straw to conserve moisture. If conditions are drier than usual, watering will be required.
Fertilization is not required unless the soils are particularly infertile. Preparation of a clean weed free seed bed is necessary for optimal results.

APPLICATION RATE: 35 lb/acre | 1250 sq ft/lb

SPECIES: Creeping Red Fescue, (Festuca rubra), Canada Wild Rye, (Elymus canadensis), Annual Ryegrass, (Lolium multiflorum), Perennial Ryegrass, (Lolium perenne), Blue Grama, (Bouteloua gracilis), Little Bluestem, (Schizachyrium scoparium), Indian Grass, (Sorghastrum nutans), Rough Bentgrass, (Agrostis scabra), Upland Bentgrass, (Agrostis perennans).

NOTES:

1. CONSTRUCTION LAYDOWN AND STAGING AREAS SHALL BE RE-ESTABLISHED AS GREEN AREAS AT THE TERMINATION OF CONSTRUCTION. PORTIONS MAY BE ESTABLISHED AS OVERFLOW OR EMERGENCY PARKING WITH GRASS PAVE OR AN ENGINEER APPROVED TURF REINFORCEMENT OPTION.
2. TURF REINFORCEMENT MAT ON FILL AND CUT SLOPES SHALL BE ERONET C-125 LONG-TERM PHOTODEGRADABLE DOUBLE-NET BLANKET OR APPROVED EQUAL.
3. SEED MIX ON SLOPES SHALL BE NEW ENGLAND EROSION CONTROL RESTORATION MIX DISTRIBUTED BY NEW ENGLAND WETLANDS PLANTS, INC. APPLY AT A RATE OF 35 POUNDS PER ACRE AND SUPPLEMENT WITH 5% ANNUAL RYE GRASS (BY WEIGHT) AT TIME OF APPLICATION.

DATE	DESCRIPTION
REVISIONS	

EROSION AND SEDIMENTATION CONTROL PLAN

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates
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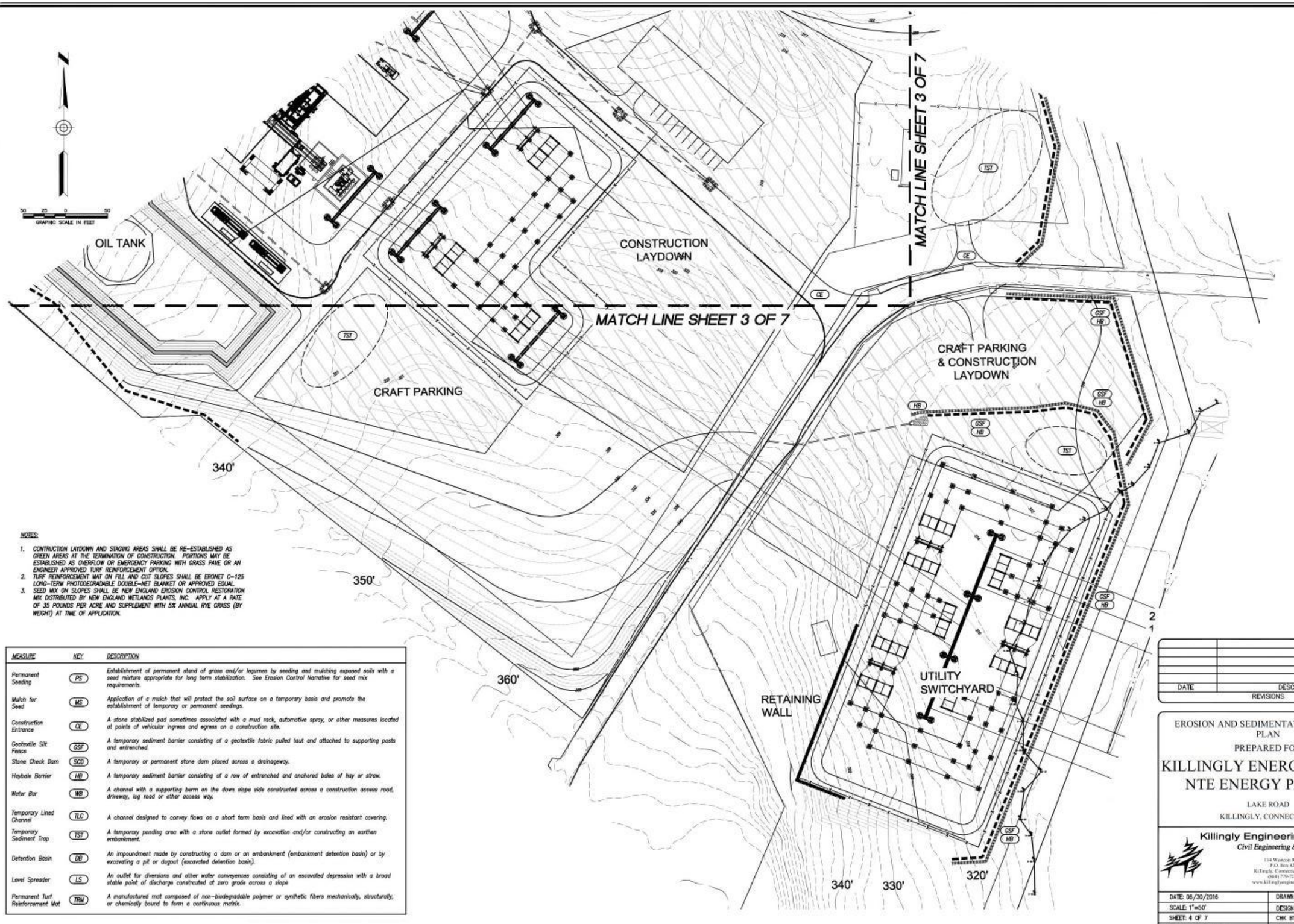

NOTES:

1. CONTRUCTION LAYDOWN AND STAGING AREAS SHALL BE RE-ESTABLISHED AS GREEN AREAS AT THE TERMINATION OF CONSTRUCTION. PORTIONS MAY BE ESTABLISHED AS OVERFLOW OR EMERGENCY PARKING WITH GRASS PAVE OR AN ENGINEER APPROVED TURF REINFORCEMENT OPTION.
2. TURF REINFORCEMENT MAT ON FILL AND CUT SLOPES SHALL BE ERONET C-125 LONG-TERM PHOTODEGRADABLE DOUBLE-NET BLANKET OR APPROVED EQUAL.
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MEASURE	KEY	DESCRIPTION
Permanent Seeding	PS	Establishment of permanent stand of grass and/or legumes by seeding and mulching exposed soils with a seed mixture appropriate for long term stabilization. See Erosion Control Narrative for seed mix requirements.
Mulch for Seed	MS	Application of a mulch that will protect the soil surface on a temporary basis and promote the establishment of temporary or permanent seedings.
Construction Entrance	CE	A stone stabilized pad sometimes associated with a mud rack, automotive spray, or other measures located at points of vehicular ingress and egress on a construction site.
Geotextile Silt Fence	GSF	A temporary sediment barrier consisting of a geotextile fabric pulled taut and attached to supporting posts and entrenched.
Stone Check Dam	SCD	A temporary or permanent stone dam placed across a drainageway.
Haybale Barrier	HB	A temporary sediment barrier consisting of a row of entrenched and anchored bales of hay or straw.
Water Bar	WB	A channel with a supporting berm on the down slope side constructed across a construction access road, driveway, log road or other access way.
Temporary Lined Channel	TLC	A channel designed to convey flows on a short term basis and lined with an erosion resistant covering.
Temporary Sediment Trap	TST	A temporary ponding area with a stone outlet formed by excavation and/or constructing an earthen embankment.
Detention Basin	DB	An impoundment made by constructing a dam or an embankment (embankment detention basin) or by excavating a pit or dugout (excavated detention basin).
Level Spreader	LS	An outlet for diversions and other water conveyances consisting of an excavated depression with a broad stable point of discharge constructed at zero grade across a slope
Permanent Turf Reinforcement Mat	TRM	A manufactured mat composed of non-biodegradable polymer or synthetic fibers mechanically, structurally, or chemically bound to form a continuous matrix.

DATE	DESCRIPTION
REVISIONS	

EROSION AND SEDIMENTATION CONTROL PLAN

PREPARED FOR

KILLINGLY ENERGY CENTER NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates

Civil Engineering & Surveying

134 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

DATE: 08/30/2016	DRAWN: NET
SCALE: 1"=50'	DESIGN: NET
SHEET: 4 OF 7	CHK BY: ----
DWG. No: CLIENT FILE	JOB No: 16042

EROSION AND SEDIMENT CONTROL PLAN:

REFERENCE IS MADE TO:

1. Connecticut Guidelines for Soil Erosion and Sediment Control 2002 (2002 Guidelines).
2. NRCS WSS (Web Soil Survey)

DEVELOPMENT CONTROL PLAN:

1. Development of the site will be performed by the Contractor, who will be responsible for the installation and maintenance of erosion and sediment control measures required throughout construction.
2. The sedimentation control mechanisms shall remain in place from start of PutnamKillingly will be notified when sediment and erosion control structures are initially in place. Any additional soil & erosion control measures requested by the Town or its agent, shall be installed immediately. Once the proposed development, seeding and planting have been completed, the representative shall again be notified to inspect the site. The control measures will not be removed until this inspection is complete.
3. All stripping is to be confined to the immediate construction area. Topsoil shall be stockpiled so that slopes do not exceed 2 to 1. A hay bale sediment barrier is to surround each stockpile and a temporary vegetative cover shall be provided.
4. Dust control will be accomplished by spraying with water. The application of calcium chloride is not permitted adjacent to wetland resource areas or within 100' of these areas.
5. The proposed planting schedule is to be adhered to during the planting of disturbed areas throughout the proposed construction site.
6. Final stabilization of the site is to follow the procedures outlined in "Permanent Vegetative Cover". If necessary a temporary vegetative cover is to be provided until a permanent cover can be applied.

SILT FENCE INSTALLATION AND MAINTENANCE:

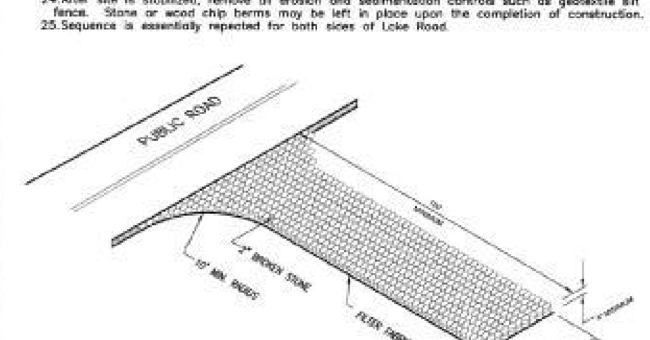
1. Dig a 6" deep trench on the uphill side of the barrier location.
2. Position the posts on the downhill side of the barrier and drive the posts 1.5 feet into the ground.
3. Lay the bottom 6" of the fabric in the trench to prevent undermining and backfill.
4. Inspect and repair barrier after heavy rainfall.
5. Inspections will be made at least once per week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater to determine maintenance needs.
6. Sediment deposits are to be removed when they reach a height of 1 foot behind the barrier or half the height of the barrier and are to be deposited in an area which is not regulated by the inland wetlands commission.
7. Replace or repair the fence within 24 hours of observed failure. Failure of the fence has occurred when sediment fails to be retained by the fence because:
- the fence has been overtopped, undercut or bypassed by runoff water,
- the fence has been moved out of position (knocked over), or
- the geotextile has decomposed or been damaged.

HAY BALE INSTALLATION AND MAINTENANCE:

1. Bales shall be placed as shown on the plans with the ends of the bales tightly abutting each other.
2. Each bale shall be securely anchored with at least 2 stakes and gaps between bales shall be wedged with straw to prevent water from passing between the bales.
3. Inspect bales at least once per week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs.
4. Remove sediment behind the bales when it reaches half the height of the bale and deposit in an area which is not regulated by the Inland Wetlands Commission.
5. Replace or repair the barrier within 24 hours of observed failure. Failure of the barrier has occurred when sediment fails to be retained by the barrier because:
- the barrier has been overtopped, undercut or bypassed by runoff water.
- the barrier has been moved out of position, or
- the hay bales have deteriorated or been damaged.

SEQUENCE OF CONSTRUCTION

1. Flag the limits of construction disturbance necessary to facilitate the pre-construction meeting.
2. Contact Call Before You Dig at 1-800-922-4455 to mark out existing utilities.
3. Hold the pre-construction meeting.
4. Install the anti-tracking construction entrance.
5. Cut trees within the defined clearing limits and remove cut wood. Chip brush, branches and small trees and stockpile chips for use on site for erosion and sedimentation control.
6. Install perimeter erosion and sedimentation controls.
7. Remove stumps and transport off site. No stumps shall be buried on site.
8. Remove topsoil and grade construction staging and laydown area. Install crushed stone or rolled gravel surface and grade to provide positive drainage to perimeter of laydown area. Construct temporary sediment basin and install perimeter erosion controls in accordance with plans.
9. Strip and stockpile topsoil within the footprint of the construction phase area. Install perimeter erosion and sedimentation controls around stockpiles.
10. Make required cuts and fills and construct proposed retaining wall as fills are being placed adjacent to wetlands area.
11. Establish the subgrade for topsoil areas, buildings, perimeter roadway and parking areas. Bench buildings to a subgrade and allow for sufficient area around building footprints for construction activities.
12. Begin building and equipment construction.
13. Install surface water controls such as temporary sedimentation basins, diversions, and stone or wood chip dikes and insure that discharge locations are stable. Engineer shall evaluate unstable conditions for recommended alternatives prior to installing surface controls.
14. Construct Stormwater basin, outlet and outlet protection and utilize basin as a temporary sedimentation basin during construction. Plug low level outlet until all areas on site have been stabilized and basin vegetation is established.
15. Install all utilities and drainage systems to within 5' of the buildings and facilities or as modified by the site engineer for specific site conditions.
16. Prepare sub-base, slopes, parking areas, shoulder areas, access roads and any additional areas of disturbance for final grading.
17. Install topsoil on fill and cut slopes, seed disturbed areas and install erosion control fabric to protect against runoff erosion or raindrop impact.
18. Install and compact processed aggregate for pavement areas.
19. Install crushed stone surfaces where call for on the design plans.
20. Place remaining topsoil where required and complete perimeter landscaping. Fine grade, rake, seed and mulch to within 2' of curbs or paved areas.
21. Upon substantial completion of the building(s) and plant equipment areas, complete the balance of the site work and stabilization of remaining disturbed areas. Install first course of paving.
22. When all other work has been completed, repair and sweep all paved areas for final course of paving. Inspect drainage system and stormwater basin and remove accumulated sediment.
23. Install final course of pavement and unplug low level outlet from stormwater basin.
24. After site is stabilized, remove all erosion and sedimentation controls such as geotextile silt fence. Stone or wood chip berms may be left in place upon the completion of construction.
25. Sequence is essentially repeated for both sides of Lake Road.



ANTI-TRACKING PAD

NOT TO SCALE

EROSION AND SEDIMENT CONTROL NARRATIVE:

PRINCIPLES OF EROSION AND SEDIMENT CONTROL

The primary function of erosion and sediment controls is to absorb erosional energies and reduce runoff velocities that force the detachment and transport of soil and/or encourage the deposition of eroded soil particles before they reach any sensitive area.

KEEP LAND DISTURBANCE TO A MINIMUM

The more land that is in vegetative cover, the more surface water will infiltrate into the soil, thus minimizing stormwater runoff and potential erosion. Keeping land disturbance to a minimum not only involves minimizing the extent of exposure at any one time, but also the duration of exposure. Phasing, sequencing and construction scheduling are interrelated. Phasing divides a large project into distinct sections where construction work over a specific area occurs over distinct periods of time and each phase is not dependent upon a subsequent phase in order to be functional. A sequence is the order in which construction activities are to occur during any particular phase. A sequence should be developed on the premise of "first things first" and "last things last" with proper attention given to the inclusion of adequate erosion and sediment control measures. A construction schedule is a sequence with time lines applied to it and should address the potential overlap of actions in a sequence which may be in conflict with each other.

- Limit areas of clearing and grading. Protect natural vegetation from construction equipment with fencing, tree armoring, and retaining walls or tree wells.
- Route traffic patterns within the site to avoid existing or newly planted vegetation.
- Phase construction so that areas which are actively being developed at any one time are minimized and only that area under construction is exposed. Clear only those areas essential for construction.
- Sequence the construction of storm drainage systems so that they are operational as soon as possible during construction. Ensure all outlets are stable before outletting storm drainage flow into them.
- Schedule construction so that final grading and stabilization is completed as soon as possible.

SLOW THE FLOW

Detachment and transport of eroded soil must be kept to a minimum by absorbing and reducing the erosive energy of water. The erosive energy of water increases as the volume and velocity of runoff increases. The volume and velocity of runoff increases during development as a result of reduced infiltration rates caused by the removal of existing vegetation, removal of topsoil, compaction of soil and the construction of impervious surfaces.

- Use diversions, stone dikes, silt fences and similar measures to break flow lines and dissipate storm water energy.
- Avoid diverting one drainage system into another without calculating the potential for downstream flooding or erosion.

KEEP CLEAN RUNOFF SEPARATED

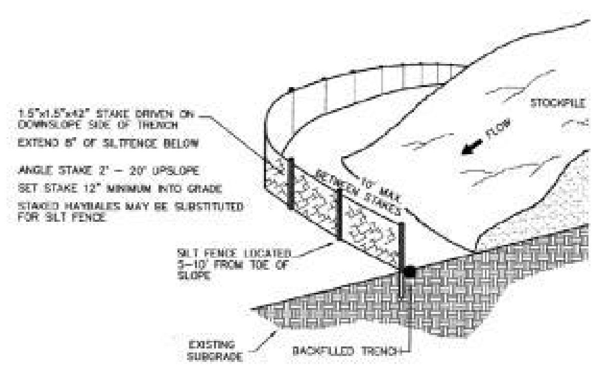
Clean runoff should be kept separated from sediment laden water and should not be directed over disturbed areas without additional controls. Additionally, prevent the mixing of clean off-site generated runoff with sediment laden runoff generated on-site until after adequate filtration of on-site waters has occurred.

- Segregate construction waters from clean water.
- Divert site runoff to keep it isolated from wetlands, watercourses and drainage ways that flow through or near the development until the sediment in that runoff is trapped or detained.

REDUCE ON SITE POTENTIAL INTERNALLY AND INSTALL PERIMETER CONTROLS

While it may seem less complicated to collect all waters to one point of discharge for treatment and just install a perimeter control, it can be more effective to apply internal controls to many small sub-drainage basins within the site. By reducing sediment loading from within the site, the chance of perimeter control failure and the potential off-site damage that it can cause is reduced. It is generally more expensive to correct off-site damage than it is to install proper internal controls.

- Control erosion and sedimentation in the smallest drainage area possible. It is easier to control erosion than to contend with sediment after it has been carried downstream and deposited in unwanted areas.
- Direct runoff from small disturbed areas to adjoining undisturbed vegetated areas to reduce the potential for concentrated flows and increase settlement and filtering of sediments.
- Concentrated runoff from development should be safely conveyed to stable outlets using rip rapped channels, waterways, diversions, storm drains or similar measures.
- Determine the need for sediment basins. Sediment basins are required on larger developments where major grading is planned and where it is impossible or impractical to control erosion at the source. Sediment basins are needed on large and small sites when sensitive areas such as wetlands, watercourses, and streets would be impacted by off-site sediment deposition. Do not locate sediment basins in wetlands or permanent or intermittent watercourses. Sediment basins should be located to intercept runoff prior to its entry into the wetland or watercourse.
- Grade and landscape around buildings and septic systems to divert water away from them.



SILT FENCE @ TOE OF SLOPE APPLICATION

NOT TO SCALE

TEMPORARY VEGETATIVE COVER:

SEED SELECTION

Grass species shall be appropriate for the season and site conditions. Appropriate species are outlined in Figure TS-2 in the 2002 Guidelines.

TIMING CONSIDERATIONS

Seed with a temporary seed mixture within 7 days after the suspension of grading work in disturbed areas where the suspension of work is expected to be more than 30 days but less than 1 year.

SITE PREPARATION

Install needed erosion control measures such as diversions, grade stabilization structures, sediment basins and grassed waterways.

Grade according to plans and allow for the use of appropriate equipment for seedbed preparation, seeding, mulch application, and mulch anchoring.

SEEDBED PREPARATION

Loosen the soil to a depth of 3-4 inches with a slightly roughened surface. If the area has been recently loosened or disturbed, no further roughening is required. Soil preparation can be accomplished by tracking with a bulldozer, discing, harrowing, raking or dragging with a section of chain link fence. Avoid excessive compaction of the surface by equipment traveling back and forth over the surface. If the slope is tracked, the cleat marks shall be perpendicular to the anticipated direction of the flow of surface water.

If soil testing is not practical or feasible on small or variable sites, or where timing is critical, fertilizer may be applied at the rate of 300 pounds per acre or 7.5 pounds per 1,000 square feet of 10-10-10 or equivalent. Additionally, lime may be applied using rates given in Figure TS-1 in the 2002 Guidelines.

SEEDING

Apply seed uniformly by hand cyclone seeder, drill, cultipacker type seeder or hydroseeder at a minimum rate for the selected species. Increase seeding rates by 10% when hydroseeding.

MULCHING

Temporary seedings made during optimum seeding dates shall be mulched according to the recommendations in the 2002 Guidelines. When seeding outside of the recommended dates, increase the application of mulch to provide 95%-100% coverage.

MAINTENANCE

Inspect seeded area at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater for seed and mulch movement and rill erosion.

Where seed has moved or where soil erosion has occurred, determine the cause of the failure. Repair eroded areas and install additional controls if required to prevent reoccurrence of erosion.

Continue inspections until the grasses are firmly established. Grasses shall not be considered established until a ground cover is achieved which is mature enough to control soil erosion and to survive severe weather conditions (approximately 80% vegetative cover).

Figure TS-2 Temporary Seeding Rates and Dates

Species[4]	Seeding Rates (pounds) per acre	Seeding Rates (pounds) per 1000 sq ft	Optimum Seed Depth[2] (inches)	Optimum Seeding Dates	Plant Characteristics
Annual ryegrass *Lolium multiflorum*	40	1.0	0.5		May be added in mixes. Will mow out of most stands.
Perennial ryegrass *Lolium perenne*	40	1.0	0.5		Good for winter cover. Tolerates cold and low moisture.
Winter Rye *Secale cereale*	120	3.0	1.0		Quick germination and heavy spring growth. Dies back in June with little regrowth.
Oats *Avena sativa*	86	2.0	1.0		In northern CT, will winter kill with the first killing frost and may drought out the stand in severe winters.
Winter Wheat *Triticum aestivum*	120	3.0	1.0		Quick germination with moderate growth. Dies back in June with no regrowth.
Millet *Echinochloa crusgalli*	20	0.5	1.0		Warm season small grain. Dies with frost in September.
Sudangrass *Sorghum sudanense*	30	0.7	1.0		Tolerates warm temperatures and drought conditions.
Buckwheat *Fagopyrum esculentum*	15	0.4	1.0		Hardy plant that will reseed itself and is good as a green manure crop.
Weeping lovegrass *Eragrostis curvula*	5	0.2	0.25		Warm season perennial. May bunch. Tolerates hot, dry slopes, and acidic soils. Excellent nurse crop. Usually winter kills.
DOT All Purpose Mix[3]	150	3.4	0.5		Suitable for all conditions.

[1] May be planted throughout summer if soil moisture is adequate or can be irrigated. Fall seeding may be extended 15 days in the coastal towns.
[2] Seed at twice the indicated depth for sandy soils.
[3] See Permanent Seeding Figure PS-3 for seeding mixture requirements.
[4] Listed species may be used in combinations to obtain a broader time spectrum. If used in combinations, reduce each species planting rate by 30% of that listed.

Figure PS-2 Selecting Seed Mix to Match Need

Area to be Seeded	Mixture Number: Mowing Desired	Mixture Number: Mowing Not Required
BORROW AREAS, ROADSIDES, DIKES, LEVEES, POND BANKS AND OTHER SLOPES AND BANKS		
A) Well or excessively drained soil[2]	1,2,3,4,5 or 6	5 or 7, 8, 9, 10, 11, 12, 16, 22
B) Somewhat poorly drained soils[2]	2	5, 6
C) Variable drainage soils[2]	2	5, 6, 11
DRAINAGE DITCH AND CHANNEL BANKS		
A) Well or excessively drained soils[2]	1, 4, 5, or 6	5, 10, 11, 13
B) Somewhat poorly drained soils[2]	2	
C) Variable drainage soils[2]	2	
DIVERSIONS		
A) Well or excessively drained soils[2]	2, 3 or 4	9, 10, 11
B) Somewhat poorly drained soils[2]	2	
C) Variable drainage soils[2]	2	
EFFLUENT DISPOSAL		5 or 6
GRAVEL PITS[3]		26, 27, 28
GULLIED AND ERODED AREAS		3, 4, 5, 8, 14, 11, 12
MINESPOIL & WASTE, AND OTHER SPOIL BANKS (If toxic substances & physical properties not limiting)[2]		15, 16, 17, 18, 26, 27, 28
SHORELINES (Fluctuating water levels)		5 or 6
SKI SLOPES		4, 10
SOD WATERWAYS AND SPILLWAYS	1, 2, 3, 4, 6, 7, or 8	1, 2, 3, 4, 6, 7, or 8
SUNNY RECREATION AREAS (Picnic areas and playgrounds or driving and archery ranges, nature trails)	1, 2 or 23	
CAMPING AND PARKING, NATURE TRAILS (Shaded)	01, 21 or 23	
SAND DUNES (Blowing sand)	25	
WOODLAND ACCESS ROADS, SKID TRAILS AND LOG YARDING AREAS		9, 10, 16, 22, 26
LAWNS AND HIGH MAINTENANCE AREAS	1, 10, 21 or 25	

[1] The numbers following in these columns refer to seed mixtures in **Figure PS-3**. Mixes for shady areas are in ***bold italics*** print (including mixes 20 through 24).
[2] See county soil survey for drainage class. Soil surveys are available from the County Soil and Water Conservation District Office.
[3] Use mix 26 when soil passing a 200 mesh sieve is less than 15% of total weight. Use mix 26 & 27 when soil passing a 200 mesh sieve is between 15 and 20% of total weight. Use mix 26, 27 & 28 when soil passing a 200 mesh sieve is above 20% of total weight.

PERMANENT VEGETATIVE COVER:

Refer to Figure PS-2, Permanent Seeding Measure in the 2002 Guidelines for specific applications and details related to the installation and maintenance of a permanent vegetative cover. In general, the following sequence of operations shall apply:

1. Topsoil will be replaced once the excavation and grading has been completed. Topsoil will be spread at a minimum compacted depth of 4".
2. Once the topsoil has been spread, all stones 2" or larger in any dimension will be removed as well as debris.
3. Apply agricultural ground limestone at a rate of 2 tons per acre or 100 lbs. per 1000 s.f. Apply 10-10-10 fertilizer or equivalent at a rate of 300 lbs. per acre or 7.5 lbs. per 1000 s.f. Work lime and fertilizer into the soil to a depth of 4".
4. Inspect seedbed before seeding. If traffic has compacted the soil, retill compacted areas.
5. Apply the chosen grass seed mix. The recommended seeding dates are: April 1 to June 15 & August 15 - October 1.
6. Following seeding, firm seedbed with a roller. Mulch immediately following seeding. If a permanent vegetative stand cannot be established by September 30, apply a temporary cover on the topsoil such as netting, mat or organic mulch.

Figure PS-3 Seed Mixtures for Permanent Seeding

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq.Ft.
1	Kentucky Bluegrass Creeping Red Fescue (Pennlawn, Wintergreen) Perennial Ryegrass (Yorktown, Manhattan)	20 20 5 Total 45	.45 .45 .10 1.00
2	Creeping Red Fescue (Pennlawn, Wintergreen) Redtop (Streaker, Common) Tall Fescue (Kentucky 31) or Smooth Bromegrass (Saratoga, Lincoln)	20 2 20 Total 42	.45 .05 .45 .95
3	Creeping Red Fescue (Pennlawn, Wintergreen) Birdsfoot Trefoil (Empire, Viking) with inoculant[1] Tall Fescue (Kentucky 31) or Smooth Bromegrass (Saratoga, Lincoln)	20 8 20 Total 48	.45 .20 .45 1.10
4	Creeping Red Fescue (Pennlawn, Wintergreen) or Tall Fescue (Kentucky 31) Redtop (Streaker, Common) Birdsfoot Trefoil (Empire, Viking) with inoculant[1]	20 2 8 Total 30	.45 .05 .20 .70
5	White Clover Perennial Rye Grass	10 2 Total 12	.25 .05 .30
6	Creeping Red Fescue Redtop (Streaker, Common) Perennial Rye Grass	20 2 20 Total 42	.50 .05 .50 1.05
7	Smooth Bromegrass (Saratoga, Lincoln) Perennial Ryegrass (Yorktown, Manhattan) Bird's-foot Trefoil (Empire, Viking) with inoculant[1]	15 5 10 Total 30	.35 .10 .25 .70
8	Switchgrass (Blackwell, Shelter, Cave-in-rock) Weeping lovegrass Little Bluestem (Blaze, Aldous, Camper)	10 3 10 Total 23	.25 .07 .25 .57
9	Creeping Red Fescue (Pennlawn, Wintergreen) Crown Vetch (Chemung, Penngift) with inoculant[1] (or Flatpea (Lathco) with inoculant[1]) Tall Fescue (Kentucky 31) or Smooth Bromegrass (Saratoga, Lincoln) Redtop (Streaker, Common)	10 15 (30) 15 2 Total 42 (or 57)	.25 .35 (.75) .35 .05 1.00 (or 1.40)
10	Creeping Red Fescue (Pennlawn, Wintergreen) Redtop (Streaker, Common) Crown Vetch (Chemung, Penngift) with inoculant[1] (or Flatpea (Lathco) with inoculant[1])	20 2 15 (30) Total 37 (or 52)	.45 .05 .35 (.75) .85 (or 1.25)
11	Bird's-foot Trefoil (Empire, Viking) with inoculant[1] Crown Vetch (Chemung, Penngift) with inoculant[1] Creeping Red Fescue (Pennlawn, Wintergreen) or Tall Fescue (Kentucky 31)	8 15	.20 .35

Figure PS-3 Seed Mixtures for Permanent Seeding (con't)

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq.Ft.
12	Switchgrass (Blackwell, Shelter, Cave-in-rock) Perennial Ryegrass (Yorktown, Manhattan) Crown Vetch (Chemung, Penngift) with inoculant[1]	10 5 15 Total [illegible]	.25 .10 .35 [illegible]
13	Crown Vetch (Chemung, Penngift) with inoculant[1] (or Flatpea (Lathco) with inoculant[1]) Switchgrass (Blackwell, Shelter, Cave-in-rock) Perennial Ryegrass (Yorktown, Manhattan)	10 (30) [illegible] 5 Total 20 (or 40)	.25 (.75) .10 .10 .45 (or .95)
14	Crown Vetch (Chemung, Penngift) with inoculant[1] (or Flatpea (Lathco) with inoculant[1]) Perennial Ryegrass (Yorktown, Manhattan)	15 (30) 10 Total 25 (or 40)	.35 (.75) .25 .60 (or 1.00)
15	Switchgrass (Blackwell, Shelter, Cave-in-rock) Big Bluestem (Niagara, Kaw) or Little Bluestem (Blaze, Aldous, Camper) Perennial Ryegrass (Yorktown, Manhattan) Birdsfoot Trefoil (Empire, Viking) with inoculant[1]	5 5 5 5 Total 20	.10 .10 .10 .10 .40
16	Tall Fescue (Kentucky 31) Flatpea (Lathco) with inoculant[1]	20 30 Total 50	.45 .75 1.20
17	Deer Tongue (Tioga) with inoculant Birdsfoot Trefoil (Empire, Viking) with inoculant[1] Perennial Ryegrass (Yorktown, Manhattan)	10 8 3 Total 21	.25 .20 .07 .52
18	Deer Tongue (Tioga) with inoculant Crown Vetch (Chemung, Penngift) with inoculant[1] Perennial Ryegrass (Yorktown, Manhattan)	10 15 3 Total [illegible]	.25 .35 .07 .67
19	Chewings Fescue Hard Fescue Colonial Bentgrass Birds-foot Trefoil (Empire, Viking) Perennial Ryegrass	35 30 1 10 20 Total 100	.80 .70 .03 .20 .50 2.30
20	Natural due to adaptive species		
21	Creeping Red Fescue (Pennlawn, Wintergreen)	Total 60	1.35
22	Creeping Red Fescue (Pennlawn, Wintergreen) Tall Fescue (Kentucky 31)	40 20 Total 60	.90 .45 1.35
23	Creeping Red Fescue (Pennlawn, Wintergreen) Flatpea (Lathco) with inoculant[1]	15 30 Total 45	.35 .75 1.00
24	Tall Fescue (Kentucky 31)	Total 150	3.60

Figure PS-3 Seed Mixtures for Permanent Seeding (con't)

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq.Ft.
25	American Beachgrass (Cape)	58,500 culms/acre	1,345 culms/100 sq. ft.
26	Switchgrass (Blackwell, Shelter, Cave-in-rock) Big Bluestem (Niagara, Kaw) Little Bluestem (Blaze, Aldous, Camper) Sand Lovegrass (NE-27, Bend) Bird's-foot Trefoil (Empire Viking)	4.0 4.0 2.0 1.5 2.0 Total 13.5	.10 .10 .05 .03 .05 .33
27	Flatpea (Lathco) Perennial Pea (Lathco) Crown Vetch (Chemung, Penngift) Tall Fescue (Kentucky 31)	10 2 10 2 Total 24	.20 .05 .20 .20 .65
28	Orchardgrass (Pennlate, Kay, Potomac) Tall Fescue (Kentucky 31) Redtop (Streaker, Common) Birds-foot Trefoil (Empire Viking)	5 10 2 5 Total 22	.10 .20 .05 .10 .45
29	Turf Type Tall Fescue (Bonanza, Mustang, Rebel II, Spartan, Jaguar) or Perennial Rye ("Fiesta 2000" mix, Fiesta II, Blazer II, and Dasher III)	175 to 250	6 to 8

[1] Use proper inoculant for legume seeds, use four times recommended rate when hydroseeding.
[2] Use Pure Live Seed (PLS) = % Germination X % Purity / 100

EXAMPLE: Common Bermuda seed with 70% germination and 80% purity:

70 X 80 / 100 = 56 / 100 = 56%

10 lbs PLS/acre / 56% = 17.9 lbs/acre of bagged seed

[3] DOT All purpose mix
[4] Wild flowers mix containing New England Aster, Baby's Breath, Black Eye Susan, Catchfly, Dwarf Columbine, Purple Coneflower, Lance-leaved Coreopsis, Cornflower, Ox eye Daisy, Dame's Rocket, Scarlet Flax, Foxglove, Gaillardia, Rocky Larkspur, Spanish Lobopaz, Corn Poppy, Spurred Snapdragon, Wallflower and/or Yarrow may be added to any seed mix given. Most seed suppliers carry a wild flower mixture that is suitable for the Northeast and contains a variety of both annual and perennial flowers. Seeding rates for the specific mixture should be followed.
[5] Considered to be a cool season mix.
[6] Considered to be a warm season mix.

DATE	DESCRIPTION
REVISIONS	

EROSION AND SEIMENTATION CONTROL NARRATIVE AND DETAILS

PREPARED FOR

KILLINGLY ENERGY CENTER NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

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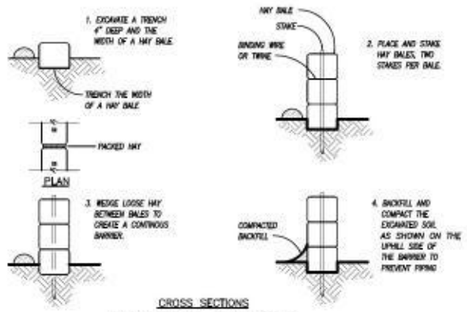
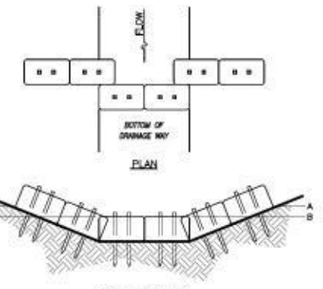


CROSS SECTIONS

HAYBALE BARRIER

NOT TO SCALE



CROSS SECTION

HAYBALE CHECK DAM

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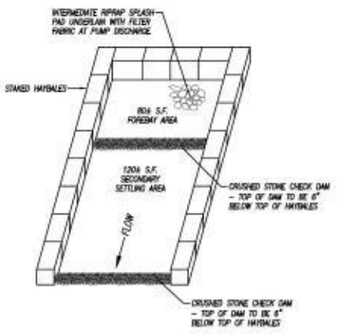
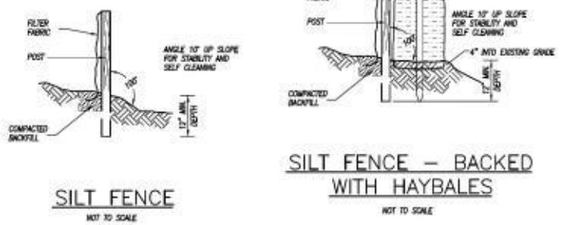


PUMPING OUTLET BASIN

NOT TO SCALE

NOTES:
1.) TO BE USED IN THE EVENT THAT CUTOFF TRENCH DEWATERING IS REQUIRED
2.) LOCATE BASINS OUTSIDE OF WETLANDS UPLAND REVIEW AREAS

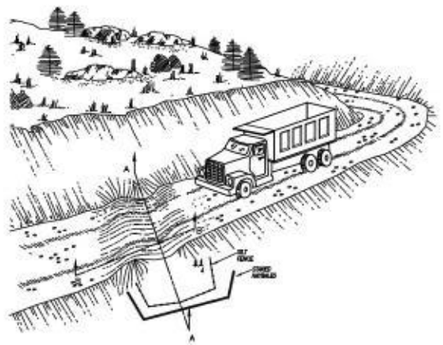


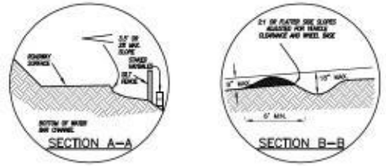
SILT FENCE

NOT TO SCALE

SILT FENCE – BACKED WITH HAYBALES

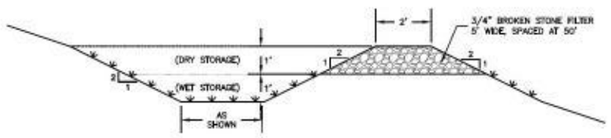
NOT TO SCALE





WATER BAR DETAIL

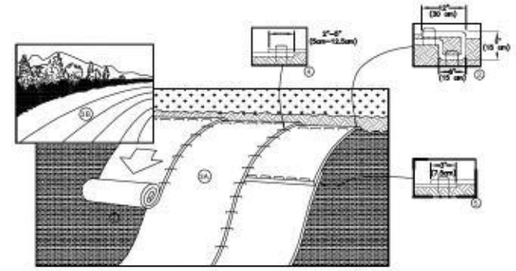
NOT TO SCALE



TEMPORARY SEDIMENTATION BASIN

NOT TO SCALE

NOTES:
1. Inspect the BASIN at least once a week (preferably twice) and after rainfall events of 0.5" or greater.
2. Remove sediment when deposits reach approximately 1/2 the height of the swale. Sediment shall be deposited in an area which is not regulated by the Inland Wetlands Commission.
3. Replace or repair within 24-hours of observed failure. Failure may include:
–Overtopping, undercutting or bypassed by runoff water.
–Stone filter has been moved or knocked over.



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED ON TOP OF SEED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM", STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

NOTES:
1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. TURF REINFORCEMENT MAT SHALL BE NORTH AMERICAN GREEN ECONET C-125 LONG TERM PHOTODEGRADEABLE BLANKET OR APPROVED EQUIVALENT.

TURF REINFORCEMENT MAT INSTALLATION

NOT TO SCALE

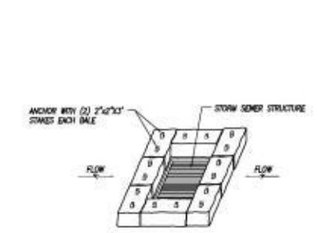
WETLAND SEED MIX FOR WET BASIN/STORMWATER WETLAND

The New England Wetmix (Wetland Seed Mix) contains a wide variety of native seeds that are suitable for most wetland restoration sites that are not permanently flooded. All species are best suited to moist ground as found in most wet meadows, scrub shrub, or forested wetland restoration areas. The mix is well suited for detention basin borders and the bottom of detention basins not generally under standing water. The seeds will not germinate under inundated conditions. If planted during the fall months, the seed mix will germinate the following spring. During the first season of growth, several species will produce seeds while other species will produce seeds after the second growing season. Not all species will grow in all wetland situations. This mix is comprised of the wetland species most likely to grow in created/restored wetlands and should produce more than 75% ground cover in two full growing seasons.

The wetland seeds in this mix can be sown by hand, with a hand-held spreader, or hydro-seeded on large or hard to reach sites. Lightly rake to insure good seed-to-soil contact. Seeding can take place on frozen soil, as the freezing and thawing weather of late fall and late winter will work the seed into the soil. If spring conditions are drier than usual watering may be required. If sowing during the summer months supplemental watering will likely be required until germination. A light mulch of clean, weed free straw is recommended.

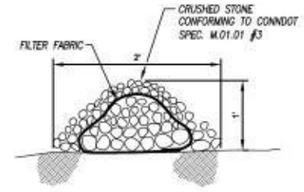
APPLICATION RATE: 1 LB/2500 sq. ft

SPECIES: Fox Sedge, (Carex vulpinoidea), Lurid Sedge, (Carex lurida), Blunt Broom Sedge, (Carex scoparia), Sensitive Fern, (Onoclea sensibilis), Blue Vervain, (Verbena hastata), Hop Sedge, (Carex lupulina), Green Bulrush, (Scirpus atrovirens), Nodding Bur Marigold, (Bidens cer-nua), Bristly Sedge, (Carex comosa), Fringed Sedge, (Carex crinita), American Mannagrass, (Glyceria grandis), Wool Grass, (Scirpus cyperinus), Soft Rush, (Juncus effusus), Spotted Joe Pye Weed, (Eupatorium maculatum), Boneset, (Eupatorium perfoliatum), Mud Plantain, (Alisma subcordatum), New England Aster, (Aster novae-angliae), Rattlesnake Grass, (Glyceria canadensis), Purplestem aster (Aster puniceus), Soft Stem Bulrush, (Scirpus validus), Blueflag (Iris versicolor), Swamp Milkweed, (Asclepias incarnata), Monkey Flower, (Mimulus ringens). The functionality of each mix will remain unchanged, although mix composition may vary during the year.



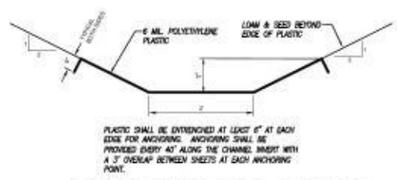
HAYBALE INSTALLATION AT CATCH BASIN

NOT TO SCALE



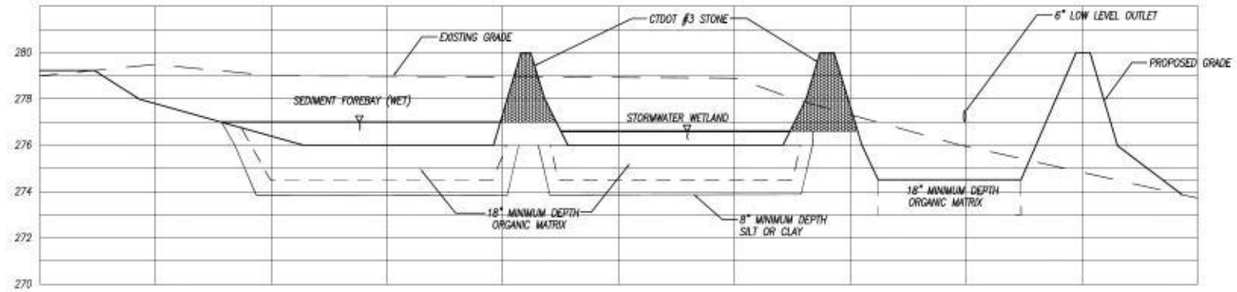
STONE CHECK DAM

NOT TO SCALE



TEMPORARY LINED CHANNEL

NOT TO SCALE



SECTION THROUGH DETENTION/WATER QUALITY BASIN

DATE	DESCRIPTION

REVISIONS

EROSION AND SEDIMENTATION CONTROL DETAILS

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

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DATE: 06/30/2016	DRAWN: NET
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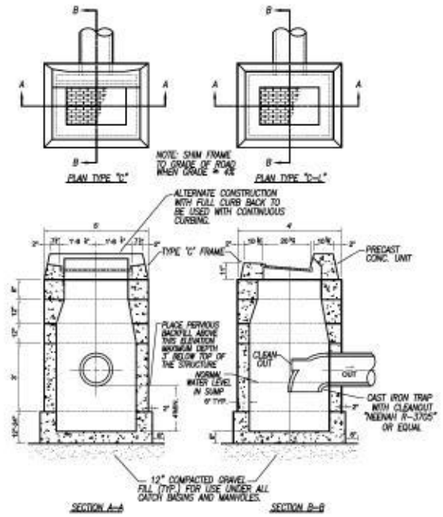
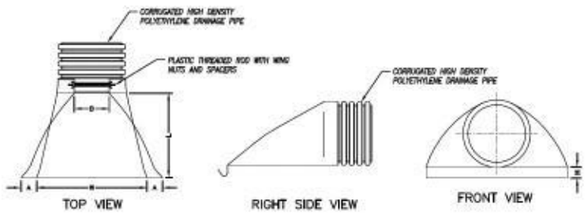
SHEET: 6 OF 7	CHK BY: ----
DWG. No: CLIENT FILE	JOB No: 16042



HOODED CATCH BASIN DETAIL

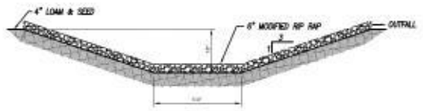
NOT TO SCALE



PIPE SIZE (IN)	A (IN)	B (IN, MAX)	H (IN)	L (IN)	W (IN)
12	6.50	10.00	6.50	25.00	29.00
15	6.50	10.00	6.50	25.00	29.00
18	7.50	15.00	6.50	32.00	35.00
24	7.50	18.00	6.50	36.00	45.00
30	7.50	12.00	8.60	58.00	63.00
36	7.50	25.00	8.60	58.00	63.00

FLARED END DETAIL

NOT TO SCALE

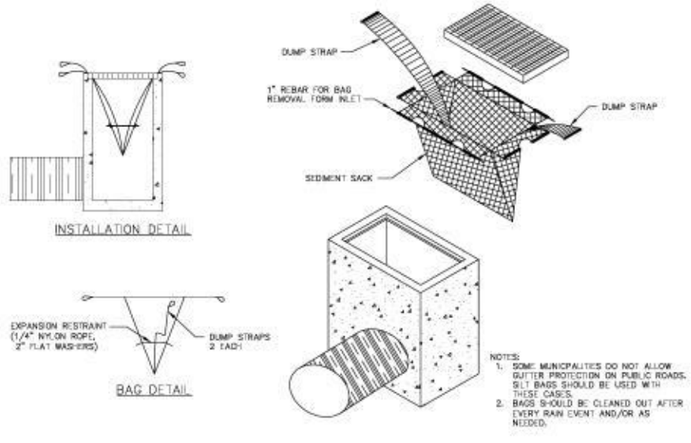


SECTION THROUGH LEVEL SPREADER

NOT TO SCALE

INTERMEDIATE RIPRAP SWALE

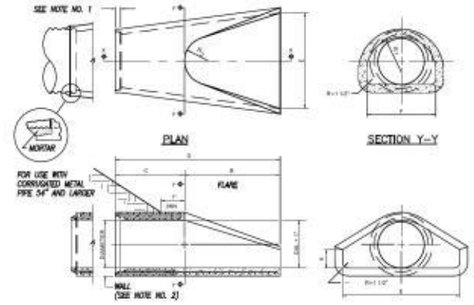
NOT TO SCALE



SILTBAG INLET SEDIMENT CONTROL DEVICE

NOT TO SCALE

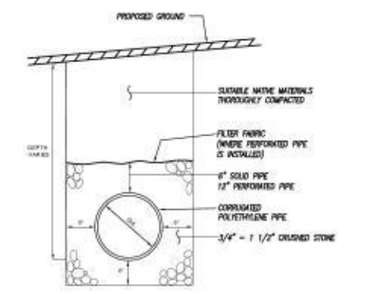
MAY BE USED IN LIEU OF OR IN COMBINATION WITH STAKED HAYBALES



DIMENSIONS FOR REINFORCED CONCRETE CULVERT END									FLARED REINFORCEMENT	
DIA.	A	B	C	D	E	F	R_1	R_2		
12"	4"	2'-0"	4'-0 3/8"	6'-0 3/8"	2'-0"	1'-7 13/16"	10 1/4"	8"	0.048	0.043
15"	6"	2'-3"	3'-11"	6'-1"	2'-0"	2'-0 5/16"	1'-0 1/2"	1'-1"	0.054	0.054
18"	8"	2'-6"	3'-11"	6'-1"	2'-0"	2'-0"	1'-3 1/2"	1'-3"	0.060	0.060
24"	8"	3'-0"	3'-11"	6'-1"	2'-0"	2'-2 1/2"	1'-4"	1'-7"	0.069	0.069
30"	8 1/2"	3'-7 1/2"	3'-6"	6'-1 1/2"	4'-0"	2'-6 3/16"	1'-4 15/16"	1'-11"	0.072	0.072
36"	1'-0"	4'-0"	1'-7 3/4"	6'-1 3/4"	5'-0"	3'-1"	1'-6 1/2"	2'-3"	0.086	0.084
36"	1'-0"	3'-0"	2'-10 3/4"	6'-1 3/4"	4'-0"	3'-10 13/16"	2'-0 5/16"	2'-3"	0.086	0.084
42"	1'-0"	3'-0"	2'-11"	6'-2"	4'-0"	4'-5 7/8"	2'-0 1/2"	2'-10"	0.100	0.100
48"	2'-0"	3'-0"	3'-0"	6'-0"	7'-0"	4'-8 1/2"	2'-4 1/2"	3'-0"	0.120	0.120
54"	2'-0"	3'-0"	2'-11"	6'-0"	7'-0"	5'-4 1/2"	2'-8 1/2"	3'-3"	0.132	0.132
60"	2'-0"	3'-0"	3'-0"	6'-0"	8'-0"	6'-0 1/2"	3'-0 11/16"	3'-9"	0.144	0.144

CULVERT END

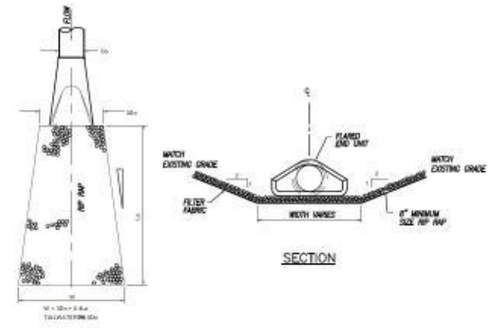
NOT TO SCALE



DRAINAGE PIPE INSTALLATION DETAIL

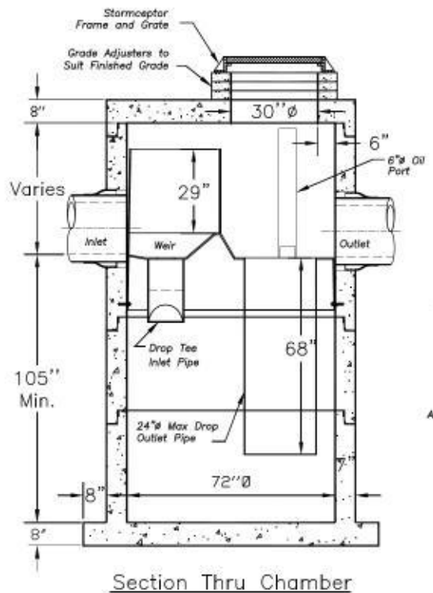
NOT TO SCALE

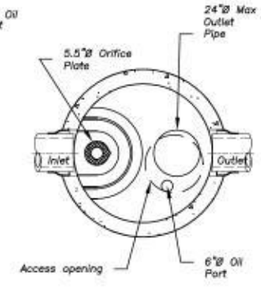
NOTE: PROVIDE WATER TIGHT GASKETED PIPE FOR INSTALLATIONS IN FILL SLOPES



RIP RAP OUTFALL

NOT TO SCALE





EOS 18–1000 Precast Concrete Stormceptor
(1000 U.S. Gallon Oil Capacity)

DATE	DESCRIPTION
REVISIONS	

STORMWATER CONSTRUCTION DETAILS

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD
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