SOUTHERN MAINE TOLL PLAZA

MAINE TURNPIKE

Maine Turnpike Authority

Department of Environmental Protection
General Permit for the Maine Turnpike Authority
Project Documentation

Prepared For:

Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

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HNTB

CDM Smith
listen. think. deliver.

Stantec

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SEBAGO TECHNICS

October 17, 2016

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SECTION I. INTRODUCTION

Background and Site Selection

The Maine Turnpike Authority (MTA) is in the process of rehabilitation and/or reconstruction of various toll plazas along the Maine Turnpike. The services include toll plaza replacements or toll Plaza rehabilitations including conversions from conventional mixed use lanes (electronic toll collection {ETC} and cash) to open road tolling (ORT) type facilities.

The keystone project for the MTA is the relocation of the York Toll Plaza. The existing plaza is located 7.3 miles north of the New Hampshire-Maine boarder and has served well beyond the planned structural life. The existing toll plaza in York does not meet the current design standards due to the lack of sight distance, physical structure, and its location on existing unsuitable soils. This relocation project is intended to improve safety, facility conditions, to accommodate current and projected traffic, and to allow open road tolling (ORT), alternatively called high speed tolling. The York Toll plaza is currently processing more than three times the traffic it did initially and has been experiencing several operational issues as well as infrastructure deficiencies. Over the past decade the MTA stopped expenditures on all non-critical repairs and commissioned several studies to evaluate the existing plaza issues and investigate alternatives including the retention of the existing site in order to meet the goals of operating a safe, efficient, and modern southern toll plaza.

After 10 years of extensive studies for several alternative sites, the MTA Board voted to begin design of a relocated York Toll Plaza at mile 8.8 on the Maine Turnpike in York, Maine which was determined to best meet the siting criteria and result in the Least Environmentally Damaging Practical Alternative. Throughout the planning and design process, the facility designed focused on avoiding and minimizing environmental impacts as detailed in the MaineDEP Natural Resources Protection Act Permit application the U.S. ACOE 404 permit application. Design measures limiting direct impacts to fringe wetlands, avoiding habitat areas through the design alignment of the access roadway, a stormwater design that treats runoff to the MaineDEP general standards and providing a compensation for the impacts.

The proposed design is a culmination of approximately ten years of data evaluation, alternatives analysis, and design work. The project area includes the exiting right of way at mile 8.8 and a portion of the areas immediately adjacent to the existing right of way. The Project includes the following components:

- Toll Booth Construction
- Space Frame Construction with ETC equipment
- Highway Reconstruction of mainline to accommodate approach and departure lanes
- Service Tunnel
- Access Road from Chases Pond Road to a new Administration Building
- Administration building and Parking Lot

Regulatory Permitting

Permitting for this project will include:

1. A tier three Natural Resources Protection Act (NRPA) issued by the Maine Department of Environmental Protection (Maine DEP);
2. A Category 2 U.S. Army Corp of Engineers Permit; and
3. The MTA has received a General Permit hereinafter described as the MTA General Permit for the Site Location of Development Act Permit that authorizes the MTA to construct or cause to be constructed or operate or cause to be operated all developments under the MTA's authority for which approval is required pursuant to the Site Law, 38 M.R.S.A __481-490, after the approval by the DEP of the Notice of Intent as set forth in 38 M.R.S.A._ 486-B (3).

SECTION II. STANDARDS

A.   FINANCIAL CAPACITY

Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102

Daniel E. Wathen, Augusta, Chairman
Robert D. Stone, Auburn, Vice Chairman
Michael J. Cianchette, Cumberland
Bryan P. Cutchen, West Gardiner
John E. Dority, Augusta
Freeman R. Goodrich, Wells
Karen S. Doyle, Chief Financial Officer MaineDOT, Ex-Officio

Peter Mills, Executive Director
Douglas Davidson, Chief Financial Officer & Treasurer
Peter S. Merfeld, P.E., Chief Operations Officer
Jonathan Arey, Secretary & General Counsel

September 8, 2016

Maine Department of Environmental Protection
17 State House Station
Augusta, Maine 04333

Re: Maine Turnpike Authority Site Location of Development Act
General Permit, Financial Capacity- York Toll Plaza Project

To Whom it May Concern:

The estimated cost of the York Toll Plaza is $40,000,000.00 and will be self-financed. The proposed project is included in the Maine Turnpike Authority's 30-Year finical plan and the Maine Turnpike Authority's 4-Year Capital Plan.

The current MTA bonding capacity is $400,000,000.00, without a toll increase or failing any financial industry stress test.

Please feel free to contact me with any questions.

Regards,

Douglas Davidson
Chief Financial Officer & Treasurer
Maine Turnpike Authority

B. NO ADVERSE EFFECT ON THE NATURAL ENVIRONMENT

In order to obtain the required permits to complete this project, under the Natural Resources Protection Act, an alternatives analysis was carried out to find the Least Environmentally Damaging Practicable Alternative (LEDPA). The results of the analysis, carried out through several evaluations and finalized with the Jacobs Technical Memorandum, indicated that locating the project at mile 8.8 would fit this description. A full description of how this site was chosen can be accessed in the Natural Resources Protection Act Permit Application submitted to the Maine Department of Environmental Protection by the Maine Turnpike Authority.

Wetlands and Waterbodies:

The wetlands in the selected project area, mile 8.8, are governed by the U.S. Army Corps of Engineers (USACE) under Section 404 of the clean water Act and Section 10 of the Rivers and Harbors Act and by the Maine Department of Environmental Protection (MDEP) under the Natural Resources Protection Act (NRPA) (38 M.R.S.A. §480A- HH) and the applicable Wetland and Waterbodies Protection Rules (Chapter 310). The wetlands at this location were delineated by Gary M. Fullerton of Sebago Technics in April and May of 2015. The delineation conforms to the standards and methods outlined in the 1987 Wetlands Delineation Manual and Regional Supplement authored and published by the U.S. Army Corps of Engineers. The delineated wetland boundaries were located in the field using a Trimble global positioning system (GPS) backpack unit.

The wetlands on the site fall within two general classifications as defined by Classification of Wetlands and Deepwater Habitats (Cowardin, et al., 1979). The two classifications are forested and emergent wetlands all within the Palustrine (non-tidal) system.

There are several significant vernal pools that have been identified within the project area. None of these significant vernal pools will be directly impacted as a result of this project, though there will be small impacts to the upland habitat surrounding these pools. The Maine Department of Inland Fisheries and Wildlife (MDIFW) has indicated the access road will cause some fragmentation between the upland habitat between these pools, but the impact should be minimal as traffic will be limited to toll plaza and maintenance employees. The terrestrial habitat impacts will amount to 20.33 percent, including existing development. The impacts are below the prescribed 25 percent threshold determined by USACE, meaning they will not require mitigation for these impacts. The MDEP requires compensation for the lost terrestrial habitat.

A detailed report describing the findings of the field evaluation of wetland and vernal pool characteristics, photos, and field data forms, are provided in the wetland and vernal pool reports completed by Sebago Technics, Inc. The total direct wetland impacts are 1.46 acres with 1.16 acres of vernal pool terrestrial habitat area impacted.

Conclusion:

A mitigation and compensation plan has been incorporated into this project for all wetland impacts that will occur as a result of this project. The Maine Turnpike Authority has elected to participate in the In-Lieu Fee Program as compensation for the wetland impacts along with a mitigation plan for wetlands impacted that are directly associated with an identified turtle habitat. Total direct wetland impacts are 1.46 acres. An In-Lieu Fee amount of 276,196.50 is proposed with a separate mitigation package of the spotted turtle habitat valued at 170,000.

Natural Areas:

The Maine Natural Areas Program (MNAP) responded to the request for information on Rare and Exemplary Botanical Features within the project area and determined that there were several locations where such features were mapped. There were four locations with Sweet-Pepper Bush and one location with Smooth Winterberry Holly near the mile 8.8 project location but not within the direct impact area. MNAP was contacted again February 18, 2016 to request an updated review of the selected location.

Conclusion:

The response indicated that MNAP has no concerns about the project area as the Exemplary Botanical Features do not fall within the direct impact of the project.

Wildlife and Fisheries:

The Maine Department of Inland Fisheries and Wildlife (MDIFW) responded to the request for information on threatened or endangered species and determined that there were no Essential Habitats that would be directly impacted by this project. Within the project area of mile 8.8 there are several state-listed Endangered, Threatened, and Species of Special Concern that have been documented in the project area. The species are as follows; New England Cottontail (Endangered), Spotted Turtle (Threatened), and Eastern Ribbon Snake (Special Concern). The project area is immediately adjacent to Inland Waterfowl and Wading Bird Habitats (IWWHs).

Impacts to a small cluster of wetlands on the Northeast end of the project area are considered impacts to spotted turtle habitat because evidence of their presence and use in the wetlands was observed in the pre-application study. The Maine Turnpike Authority was requested to fund the Maine Department of Inland Fisheries and Wildlife project for a turtle crossing on route 236 in Elliot, Maine. This has been accepted by both MDEP and MDIFW as part of the mitigation and compensation plan for the York Toll Plaza Replacement Project. The value of this mitigation is $170,000 and will be paid by the MTA in support of a MaineDOT habitat improvement project planned for 2017.

Conclusion:

Wildlife and fisheries impacts will be limited to a nesting area for the spotted turtle. Through correspondence with the Maine IF&W, the MTA will participate in mitigation program for replacement of the impacted functions and values.

Maine Threatened or Endangered Species:

The New England Cottontail is identified by the Maine Department of Inland Fisheries and Wildlife Service as a candidate for listing as an endangered species. The New England Cottontail is limited to York and Cumberland County Maine, although their range once extended as far north as Augusta according to IF&W information. The IF&W reports that in recent years cottontails have been found in Berwick, Biddeford, Cape Elizabeth, Cumberland, Dayton, Elliot, Falmouth, Gorham, Kittery, Portland, Saco, Scarborough, South Berwick, South Portland, Wells, Westbrook, Windham, and York. As part of the permitting, IF&W requires a review of the site for potential habitat and indications of Cottontail presence. In July 2010 a New England Cottontail Pellet Study was completed by Normandeau Associates, Inc. in the area of mile 7.3 to 8.7 and noted no conclusive signs of the New England Cottontail. The Maine Department of Inland Fisheries and Wildlife (MDIFW) has confirmed that there has been no evidence observed that New England Cottontail are present at the project site, but that there are populations both north and south of the area. MDIFW intends to conduct a snow-tracking survey during the winter to determine the status of the New England Cottontail in and around the project area.

A final version of the Northern Long-Eared Bat 4(d) rule of the Endangered Species Act was published in January of 2016 to replace the interim rule initially used to evaluate the York Toll Plaza Relocation Project. The final 4(d) rule states that any incidental take of Northern Long-Eared Bats resulting from tree removal is prohibited if activity occurs within a 0.25 mile radius of known Northern Long-Eared Bat hibernacula or if the activity cuts or otherwise destroys known occupied maternity roosts or any other trees within a 150-foot radius of the known maternity roosts between June 1 and July 31. In July 2015 a Rare Bat Acoustic Study was completed by Stantec Consulting Services, Inc. for the project area at mile 8.8 (Appendix 9G). The conclusion of this study indicated an “unlikely presence” of the Northern Long-Eared Bat (*Myotis septentrionalis*) within the project area. The actions taken to satisfy the interim 4(d) rule remain sufficient in the adoption of the final 4(d) rule.

Maine Department of Inland Fisheries and Wildlife (MDIFW) has identified a population of spotted turtles (*Clemmys guttata*) and a population of ribbon snake (*Thamnophis sauritus*) within the project area. Both the spotted turtles and ribbon snakes are likely to travel between surrounding wetlands within a larger complex. There are wetlands within the inhabited complex, wetlands 12, 13, and 15, which will be impacted by this project as well as some loss of the forested buffer for wetland 11.

Conclusion:

Correspondence between MTA and MDIFW has indicated that compensation and mitigation efforts, including plans to fund a turtle crossing on route 236 in Elliot, ME, as well as including exclusionary fencing along the right of way fence at the new toll plaza location, are sufficient for the minimal impacts to habitat.

Historic and Cultural Resources:

The Maine Historic Preservation Commission (MHPC) conducted a Phase I Historical Architectural Reconnaissance survey for three locations along the turnpike, one of which being the proposed location of the York Toll Plaza. In this survey there were no archaeological sites identified within the bounds of the project location.

Conclusion:

Correspondence from the MHPC has indicated that there is no concern for cultural or historic resources at this site. The Public Archaeological Laboratory (PAL) indicated to the MHPC that there would be no effect on historic architectural areas and no further work would be necessary.

No Unreasonable Adverse Effect on Air Quality :

In order to assess the overall impact of the York Toll Plaza Replacement Project on ambient air quality, a vehicular pollutant analysis was performed for emissions of carbon monoxide (CO), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and the combination of volatile organic compounds and nitrogen oxides (VOC and NOx) which react to form ground-level ozone.

The construction of the York Toll Plaza at mile 8.8 is going to include Open Road Tolling (ORT) lanes that allow vehicles to pass through the toll plaza at highway speed. It has been determined that approximately 70% of the existing toll booth traffic will use these lanes which will improve the operating efficiency and subsequently improve the ambient air quality.

Conclusion:

The study found that the total pollutant burden of the new plaza would be 15 percent less than the existing plaza as a result of the ORT utilization. The change in location will change the air quality at both the new location and the current location. At mile 8.8 the pollutant emissions will increase by 0.18 percent because of the introduction of the toll plaza and the use of the cash lanes, whereas the pollutants at mile 7.3 will be reduced by 26 percent without the toll plaza.

Jacobs Engineering has completed an Air Pollution analysis in compliance with Chapter 375, Section 1 of the Maine Department of Environmental Protection (MDEP) rules. This report can be found in appendix 3F of this application.

Noise:

This MTA project is exempt from noise standards under the General Permit from MDEP where it is stated that MTA has adopted a state wide policy for noise in accordance with the MaineDOT noise policy. By this policy, all projects will meet the standards defined in Chapter 375 §10 of the MDEP rules as applicable.

Conclusion:

The Relocation of the York Toll Plaza project is exempt from the noise standards through Chapter 375 §10 under section C subsection 5, "Exemptions" which states;

> "*Sounds associated with the following shall be exempt from regulation by the Department:*
>
> *…(c) Registered and inspected vehicles: (i) while operating on public ways, or …*"

The location of the project is within a public way and therefore will be exempt from the noise standards. Although exempt, the MTA retained Jacobs Engineering to complete a Noise study. The conclusion of this study determined there will be no perceptible difference in the applicable area.

C. SOIL TYPES

Soils types in the project vicinity are referenced from two sources. The first is the Natural Resources Conservation Service Soils Survey (following pages) and a site specific geotechnical investigation completed by Jacobs Engineering. The geotechnical investigation included borings and test pits to determine soils properties for design purposes and for stormwater buffers/treatment systems.

The geotechnical is appended to this General Permit.

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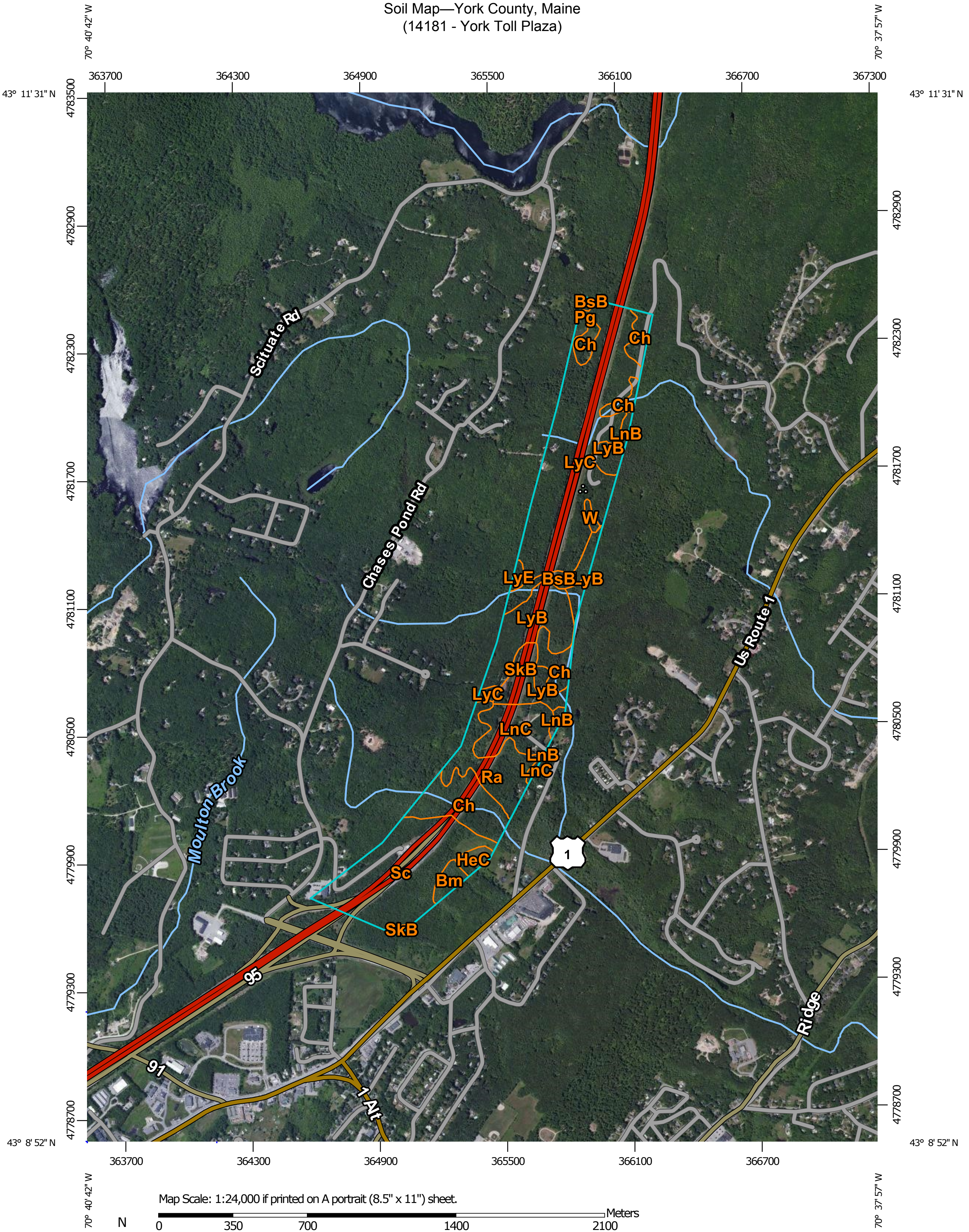
Soil Map—York County, Maine
(14181 - York Toll Plaza)



Map Scale: 1:24,000 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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
- Λ 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
- ø 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 1:20,000.

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: York County, Maine
Survey Area Data: Version 14, Sep 11, 2015

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

Date(s) aerial images were photographed: Jun 20, 2010—Jul 18, 2010

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

York County, Maine (ME031)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Bm	Biddeford mucky peat, 0 to 3 percent slopes	4.1	1.4%
BsB	Brayton and Westbury very stony fine sandy loams, 0 to 8 percent slopes	9.4	3.2%
Ch	Chocorua peat	41.8	14.1%
HeC	Hermon fine sandy loam, 8 to 15 percent slopes	3.5	1.2%
LnB	Lyman loam, 3 to 8 percent slopes, rocky	3.0	1.0%
LnC	Lyman loam, 8 to 15 percent slopes, rocky	18.7	6.3%
LyB	Lyman-Rock outcrop complex, 3 to 8 percent slopes	33.0	11.1%
LyC	Lyman-Rock outcrop complex, 8 to 15 percent slopes	92.1	31.0%
LyE	Lyman-Rock outcrop complex, 15 to 80 percent slopes	1.5	0.5%
Pg	Pits, gravel	0.4	0.1%
Ra	Raynham silt loam	22.2	7.5%
Sc	Scantic silt loam, 0 to 3 percent slopes	55.7	18.8%
SkB	Skerry fine sandy loam, 0 to 8 percent slopes	10.1	3.4%
W	Water bodies	1.3	0.4%
Totals for Area of Interest		**296.7**	**100.0%**

D. STORMWATER MANAGEMENT AND EROSION CONTROL

The Maine Turnpike Authority (MTA) has received a general permit from the Maine Department of Environmental Protection (MDEP). The General Permit requires that MTA design and apply engineering measures to the extent practicable such that the project drainage avoids adverse impacts to offsite property resulting from project related peak flows. The project design meets the general standards by achieving 70% stormwater treatment for the linear potions of the project and 90% (sliding scale since 60% of the parcel remains undeveloped) for the administration building and parking area.

In addition all MTA projects must meet the basic standards whereby an Erosion and Sedimentation Control Plan must be prepared by the contractor and approved by MTA in accordance with the *Maine Department of Transportation's Best Management Practices for Erosion and Sediment Control (BMP's).* The MTA and its consultant team will prepare contract documents including technical specifications and drawings that will be provided to bidding contractors. As part of their documents, the selected contractor will be required to submit a phasing plan and erosion control plan prior to construction for MTA approval. This plan will be required to meet the general permit requirements. Furthermore, these documents are designed to provide specifications for the installation and implementation of soil erosion and sedimentation control measures while allowing adequate flexibility to apply the most appropriate measures based on site-specific conditions, the construction sequence, timing, and weather. Bid packages and contracts for work to be performed for the project will include these specific guidelines to ensure the work is completed in an environmentally sensitive manner. MTA personnel and their representatives will ensure that the procedures contained in the Erosion and Sedimentation Control Plan prepared for the project are followed by regularly inspecting all work and requiring corrective action when necessary.

The York Toll Plaza relocation project will not trigger the Phosphorus standard, nor are there any urban impaired streams associated with the watershed where the project will be executed.

The Hydrologic soil group is used to categorize the hydrology of soils by rating the relative permeability of a soil. The hydrologic groups start at Group A, extremely permeable, and go to Group D, very low permeability. The majority of the soils found on the project site are classified as Group D, where ledge, impervious surface, compacted soils, and clay might be the reasoning for this classification. There are some soils present that have higher permeability as identified in the Stormwater Management Plan.

Conclusion:

The York Toll Plaza construction at mile 8.8 will be incompliance with the Stormwater Management and Erosion Control Standard of the General Permit through the implementation of best management practices to meet the general standards. The MTA requires an erosion control plan for all projects in accordance with the Maine Department of Transportation's (MDOT) Best Management Practices for Erosion and Sediment Control (2008). The scope of this project met the threshold of the Maine Department of Environmental Protection's (MDEP) Chapter 500 Stormwater Management Rules, therefore the MTA will comply with the General Standards put forth by these rules.

E. GROUNDWATER

According to the Maine Geologic Survey (MGS) Database on significant groundwater aquifers (publication no. 98-132) there are no significant groundwater aquifers within the bounds of the project area. There are two wetlands within the project area that function as groundwater recharge, one of which will not be altered (wetland 11) for the purposes of this project. These wetlands are not directly adjacent to any major sources of groundwater where the construction would pose an immediate threat. The best management practices for the stormwater management plan are in place to ensure that runoff is treated before it may carry pollutants to a water resource such as a great pond, or groundwater aquifer.

In the Geotechnical Report complete by Jacobs (April, 2016) the depth to groundwater was recorded when encountered. The depth below ground surface ranged from 1 foot to 9.7 feet. A detailed explanation of the depth to groundwater can be found in the Jacobs Geotechnical report attached to this application.

Conclusion:

The project will incorporate recommendations of the geotechnical investigation and will prepare contract documents that include technical specifications and drawings as guidance for an erosion control plan for bidding contractors. The selected contractor will be required to submit an erosion control plan prior to construction for MTA approval. The plan submitted will be required to meet the general permit requirements stated in this application.

F. INFRASTRUCTURE

The Maine Turnpike Authority (MTA) has coordinated with the York Water District to include the relocation of a segment of water main and the installation of a domestic water service to the administration building. The project will be served electric power provided by Central Maine Power Company from Chases Pond Road and telecommunications from Fairpoint or Time Warner Cable. A small wastewater disposal system (408 gpd) will be installed to serve the MTA employees. The system will include a 1,000 gallon treatment tank and a 1,536 square foot disposal field. This system was designed by Gary M. Fullerton LSE and includes an HHE-2w Form. Solid Waste management will include both construction waste and office waste once the project is completed. The MTA will contract with a commercial waste hauler for removal of office waste. Construction waste will be the responsibility of the selected contractors for the project.

G. FLOODING

The MTA project includes a stormwater management plan meeting the requirements of the MTA General Permit. Through meeting the permit standards, the flood flow control will be achieved thereby addressing this standard.

H. BLASTING

The Maine Turnpike Authority has developed a formal blasting document that incorporates the MaineDOT’s 2014 standard specifications.

This document shall be known as the Maine Turnpike Authority’s Supplemental Specifications 2015 Edition (http://www.maineturnpike.com/getattachment/project-and-planning/Construction-Contracts/Special-Provisions-Use-of-Explosives.pdf.aspx). This document consists of additions and alterations to the MaineDOT ‘s Standard Specifications November 2014 Edition, as detailed below. Sections from the MaineDOT November, 2014 standard specifications which are not altered herein are incorporated without change. References to “the Department” contained therein shall refer to “the Authority” and references to Department personnel shall apply to equivalent personnel at the Maine Turnpike Authority.

Maine Turnpike Authority Special Provisions shall be issued for all Contracts and shall amend or add to both these Maine Turnpike Authority Supplemental Specifications and the MaineDOT 2014 Standard Specifications. MaineDOT Special Provisions or revisions to the November 2014 specifications are not incorporated herein unless specifically stated.

I. Public Involvement

Although the engineering, environmental, and toll analyses needed for this project are substantial and require extensive expertise and experience, they are essentially straightforward. What makes this project extraordinary is the nature and extent of process over the years to gather, evaluate, and respond to concerns from York, which includes the Town of York and a local group known as Think Again. As will be seen below, the public has had dozens of opportunities to provide comments and concerns, review and critique documents, and provide design input, and York officials and residents have fully utilized those opportunities. In response to York concerns, the MTA undertook multiple expert analyses of critical project issues like ORT vs. AET, plaza sizing, and siting. This helps explain why this project has taken over 10 years and about $8 million to get to this permit application stage. These extraordinary efforts exceed the requirements in the MTA's Public Participation Policy and provide a useful context for anticipated additional requests from York for more process and study.

Overall, there have been over 40 meetings or other opportunities for local input over the last decade, and these do not count numerous direct email, phone calls, or other more informal communications. Although the passage of time makes a comprehensive list impractical, a list of easily identifiable meetings (Appendix 7), demonstrates the broad scope of the opportunities for York review and input. Further, a detailed project website with project reports, maps, and analyses provided extraordinary access to project information. See http://www.maineturnpike.com/project-and-planning/Planning-Projects/York-Toll-Plaza-Replacement.

More specifically, these York efforts can be segmented into two phases.

Early Analysis and Communication (Pre-2011)

After engineering analysis of the deteriorating condition of the existing barrier plaza, in 2006 the MTA staff began a wide-ranging study and communications process with staff and elected officials from York, Ogunquit, and Wells to discuss the need for a new toll plaza, the required alternatives analysis, and public involvement. Although initial reactions from municipal officials appeared positive or neutral, opinions from certain York residents regarding toll collection methodology created growing concerns with the project. In 2007, York area legislators initiated and passed a Legislative Resolve that required that the MTA report back certain information to the Legislature's Transportation Committee before building a new plaza.[1] As required, the MTA did so in April of 2008.

At that same time, the MTA also held public meetings in York laying out it preliminary analysis of numerous alternatives and sites in accordance with required federal and state permitting laws. Some of the preliminary alternatives considered were adjacent to neighborhoods, some included the potential taking of homes, and some had many acres of environmental impact. Due in part to the number of alternatives analyzed and underlying opinions on how to collect tolls, concern from York residents became passionate. Over 800 people attended the public meeting in York on April 3, 2008. This reaction from York caused the MTA to slow down, further document alternatives, and engage the public even more.

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[1] See LD 534, 123th Maine Legislature, and Resolves 2007, chapter 45.

By 2010, this process had included four general public meetings in the Town of York, one public meeting for potential abutters in York, multiple hearings and work sessions with the Legislature's Joint Standing Committee on Transportation, three public meetings of the MTA Board with the York Board of Selectmen, a number of meetings and facility tours in the Town of York with legislators, local officials, interest groups and individuals, and considerable written correspondence in response to questions posed by local officials and individuals. An example of the level of detail of local input in this early phase is represented by the 19-page MTA response to questions from York from the April 3, 2008 meeting (Appendix 8)

A Fresh Look (2011-Date)

In 2011, the MTA had a new Executive Director with an open and public policy-minded approach, and a new Board Chair, the former Chief Justice of the Maine Supreme Court, with a well-earned reputation for being straightforward and fair. The MTA Board of Directors also had many new Board members. Because of the desire to analyze the latest practices and on-going concerns in York, the MTA took a completely fresh look at critical project issues like tolling methodology (ORT vs. AET), plaza location, and plaza sizing with new expert consultants. This fresh analysis forms the core of this and related permit applications.

Critical Project Issues: Toll Collection Methodology Plaza Sizing and Siting.

The MTA spent almost three years on a completely fresh, unbiased look at whether All Electronic Tolling (AET) could be feasible and practicable. Among other things, the MTA commissioned a report from a new tolling expert (CDM Smith), initiated legislative and marketing efforts to allow increased the use of E-ZPass (a necessary predicate to AET), and improved toll collection across state lines with the nation's first multistate (ME, NH, and MA) reciprocity agreement. Obviously, if feasible and practicable, AET would reduce the project scope and impacts through the elimination of cash lanes. After another opportunity for input from York in June, the MTA Board of Directors determined on July 24, 2014 that AET is not feasible on the Maine Turnpike or in the best interest of the Maine Turnpike or Turnpike users for the foreseeable future.

The reasoned business and policy decision to use ORT cleared the way for a fresh look at other critical project issues such as plaza sizing, the viability of the existing plaza site at Mile 7.3 (the only site supported by the Town), and the analysis of other site alternatives as required by environmental laws. To perform this work, in August 2014 the MTA retained another experienced engineering consultant, Jacobs Engineering Group ("Jacobs"). During this work, the MTA kept York informed and involved in a manner that is likely unprecedented. Since Jacobs was retained, MTA staff has met with York officials and residents at least 14 times. York Town officials and residents had extraordinary access to project information, sometimes receiving it at the same time as MTA Board members. Special workshops with MTA staff, Jacobs, and a team of York residents designated by the Town were held to review environmental, plaza sizing, design, and other technical information.

In June 2015, after looking at the existing plaza site and other sites as required by law, Jacobs recommended the Mile 8.8 ORT site. Jacobs stated:

> Clearly, the alternative that locates the new plaza at approximately mile 8.8 has superior Engineering and Safety benefits while minimizing environmental and abutter impacts

> compared to reconstruction of the toll plaza in the vicinity of mile 7.3. . . . Additional benefits of the recommended alternative consist of less disruption to the traveling public, reduced construction time, and significant cost savings in the range of $20 million.

The MTA provided another forum to express concerns at its September 3, 2015 Board meeting. Twenty-one people from York spoke. The MTA listened and respectfully responded to all their questions, including those that have been answered before. See the 23-page MTA response to York questions attached as Appendix 9. No new issues were raised that significantly affected the Jacobs alternative analysis. On November 19, 2015, the MTA Board of Directors accepted the recommendation of MTA top management and project staff and selected its preferred alternative: a new ORT plaza at Mile 8.8 site.

Since that time, additional detailed design and analyses were conducted, providing significant additional support for the Mile 8.8 site. The MTA is confident that the MTA's preferred alternative is the least environmentally damaging practicable alternative (LEDPA).

Most recently, the MTA held a public informational meeting in York on October 5, 2016. In accordance with MaineDEP rules (Appendix 10) the MTA described the project and its impacts. About 52 members of the public attended, with almost all being from York. Detailed minutes of this meeting are available on the MTA website. Although there were some comments and questions on environmental impacts, the majority of comments remained on the MTA's business and policy decision on how to collect tolls (ORT vs. AET). Given almost ten years of communication on this project, it is not surprising that no significant new issues were raised at this meeting.

SECTION III. SUBMITTALS

A. NOTICE OF INTENT

MAINE TURNPIKE AUTHORITY
NOTICE OF INTENT TO COMPLY WITH THE MAINE STATE TRANSPORTATION SITE LAW GENERAL PERMIT FOR MAINE TURNPIKE AUTHORITY DEVELOPMENTS

Notice of Intent (NOI) submission constitutes the expressed intent of the entity in Section A (of this form) and authorizes the development of the facility/site identified in Section B (of this form), under Maine's State Transportation Site Law General Permit. This also certifies that the responsible official understands and meets the eligibility conditions of the Transportation Site Law General Permit, agrees to comply with all applicable terms and conditions of the Transportation Site Law General Permit, and understands that continued authorization under the Transportation Site Law General Permit is contingent on maintaining eligibility for coverage. **In order to be granted coverage the information on this form must be correct and up-to-date. Please send the completed form to the Maine Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017. Please read the instructions on the back prior to completing the NOI form.**

A. Company Information – Legal Name & Billing Address

Name of Applicant: Maine Turnpike Authority
Mailing Address: 2360 Congress Street
City/Town: Portland State: ME Zip Code: 04102
Daytime Phone: (207) 871-7771

B. Facility/Site Physical Location

Facility/Site Name: York Toll Plaza
Physical Address: N/A
City/Town: York State: ME Zip Code:
Daytime Phone: (   )
Title, Right, or Interest (to this site location): Yes __X__ No _____
Facility UTM Northing: 4782245 Facility UTM Easting: 633966

C. Contact Person Information for this NOI

Name: Sara Zografos
Title: Project Planner/Liason
Contact Address: 2360 Congress St
City/Town: Portland State: ME Zip Code: 04102
Daytime Phone: (207) 871-7771x111
Email: szografos@maineturnpike.com

D. Permit Information

Brief Description of project:
Deconstruction of the existing York Toll Plaza at mile 7.3 on the Maine Turnpike and the construction of a new ORT Toll Plaza in York, ME at mile 8.8 on the Maine Turnpike.

Amount of Developed Area: ___21.014___ (Total Acres)
Amount of Existing Developed Area: ___11.531___ (Acres)
Amount of New Developed Area: ___9.483___ (Acres)

Natural Resource Protection Act Permit Required: Yes _X_ NO____
If Yes, Type of Permit: PBR ____ Tier 1 ____ Tier 2 ____ Full _X_

Name of waterbody project site drains to:

Attachments to this NOI:
☑ Site Location Map
☑ Site Plans

E. Certification of Responsible Official

I certify under penalty of law that I have personally examined the information submitted in this document and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. By my signature as a responsible official for the entity or individual identified in Section A of this NOI, I certify under penalty of law that that I am the operator of the facility, and have Title, Right or Interest, as indicated in Section B.

Printed Name: PETER MILLS
Title: EXECUTIVE DIRECTOR MAINE TURNPIKE **Date:** 10.17.16
Signature: Peter Mills

OFFICE USE ONLY

GP #: **Date Received:** **Staff:** **Accepted Date:** **Deficient Date:**

DEPLR 2/29/2016

MAINE TURNPIKE AUTHORITY
NOTICE OF INTENT TO COMPLY WITH THE MAINE STATE TRANSPORTATION SITE LAW GENERAL PERMIT FOR MAINE TURNPIKE AUTHORITY DEVELOPMENTS

Instructions for Completing the NOI Form

To complete and correct this form, type or print, in the appropriate areas only and use uppercase (ALL CAPS). Answer all applicable questions, keep a copy for your records, and mail the original signed completed form. Mail to the: **Director, Land Division, Bureau of Land Resources, Maine Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017.**

Section A: Company Information –Name & Mailing Address

1. Enter the **LEGAL Company Name** of the permit holder. The Legal entity is defined as:
    a. The full legal name of the person, partnership, co-partnership, firm, company, corporation, association, trust, estate, governmental entity or other legal entity that owns/operates the facility or site. This may be the given name of an individual (as listed on their social security card) or a registered legal entity (please provide Maine State Charter number).

    b. This will be the Maine Department of Transportation or the Maine Turnpike Authority.

2. The address of the Company will be the street address or P.O. Box, city/town, state and zip code to which all NOI questions and comments will be directed. All correspondence regarding the permit will be sent to this address, not the facility address in Section B of the NOI form.

B. Facility/Site Physical Location

1. Enter the name of the **Facility/Site** along with the **Physical Address** or location of the site (city/town, state and zip code). Include associated telephone number, including area code. If the physical name & address of the site is the same as the Company Information, write "same as company" in the Facility/Site section.
2. Indicate whether or not the legal entity in **Section A** holds **Title, Right or Interest** in the facility conducting the development covered by this NOI (Check **Yes** or **No**). If **Yes** is checked by signing the certification in **Section E** the responsible official certifies that there is **Title Right or Interest** held by the legal entity in **Section A** for the facility noted in this NOI.
3. Enter the **UTM coordinates** for the approximate center of the facility/site. UTM coordinates may be obtained by using a GPS unit, or by searching for your facility's address on several commercial map sites on the internet. UTMs are displayed in decimal form (i.e. 485862.4524)
4.

C. Contact Information for this Permit

Enter the name of the **Contact Person** for this facility/site, their title, mailing address (street or P.O. Box, city, state, zip code), telephone number with the area code, and an e-mail address. If this contact is your consultant please supply an e-mail address as well. If your contact for this permit uses the same address as the company, parent company or facility/site, please enter "same as company", etc.

D. Permit Information

Provide a brief description of the project along with the amount of developed area (total, existing and new). Developed area is considered as a structure defined as buildings, parking lots, roads, paved areas, wharves or areas to be stripped or graded and not to be revegetated that cause a total project to occupy a ground area in excess of 3 acres. Stripped or graded areas that are not revegetated within a calendar year are included in calculating the 3-acre threshold. (The 3-acre threshold is cumulative since 1975.)

Indicate if a Natural Resource Act Permit is required for this project and provide the name of the water body the project site drains to.

Attach a project site location map and site plans (displaying existing and proposed structures) to this NOI.

E. Certification Statement

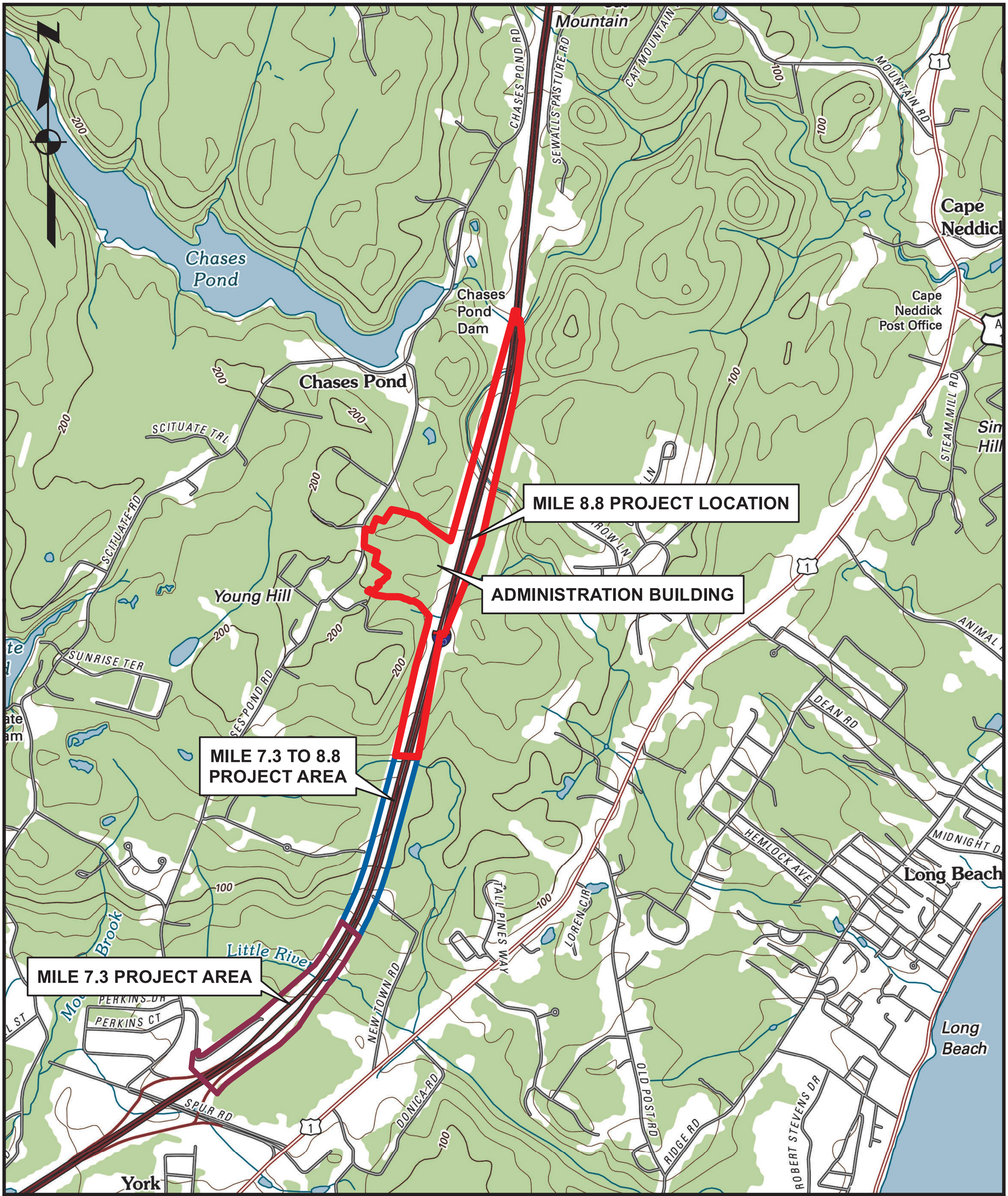
Legibly print the name and title of the responsible official. Have the official sign and date the application.

<u>If you have questions concerning this form, please contact</u>

Mike Mullen at 207-446-1611 or mike.mullen@maine.gov

B. LOCATION MAP

The following is a location map of the project site.



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75 John Roberts Rd. - Suite 1A
South Portland, ME 04106
Tel. 207-200-2100

250 Goddard Rd. - Suite B
Lewiston, ME 40240
Tel. 207-783-5656

PROJECT LOCATION MAP
OF SOUTHERN MAINE TOLL PLAZA

MAINE TURNPIKE

SCALE: 1 " = 2,000 '

DATE: 3/18/2016

LOCATION:
MILE MARKER 8.8
YORK, MAINE

INFORMATION:
2011 USGS QUADRANGLE
(YORK HARBOR, MAINE)

14181-Location Map.mxd

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C. PLANS

Design plans have been developed for the project by the Jacobs Engineering team and are attached for reference. These plans are 60% design plans and represent the extent of the project improvements for permitting purposes.

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Date:9/16/2016

Filename: ...\d0259637\072_HDPlan1.dgn

Scale:
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Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS

CONSULTANT PROJECT MANAGER: R. EMERY

	By	Date		By	Date
Designed	CSM	08/16	Checked	RRP	08/16
Drawn	AMS	08/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 1

SHEET NUMBER: GP-01

CONTRACT:2017.XX

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Date:9/16/2016

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MAINE TURNPIKE

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 2

SHEET NUMBER: GP-02

CONTRACT: 2017.XX

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Filename: ...\d0259637\073_HDPlan2.dgn

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MAINE TURNPIKE

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 3

SHEET NUMBER: GP-03

CONTRACT: 2017.XX

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Filename: ...\d0259637\074_HDPlan3.dgn

I95 ℄
CURVE DATA #1
PI = 276+10.55
D = 1°00'00.0"
Δ = 42°06'29.8" Lt.
R = 5729.57'
L = 4210.82'
T = 2205.59'
E = 409.86'

I95 NB ℄
CURVE DATA #1
PI = 1276+01.80
D = 0°59'44.4"
Δ = 42°06'29.8" Lt.
R = 5754.57'
L = 4229.20'
T = 2215.21'
E = 411.65'

I95 SB ℄
CURVE DATA #1
PI = 2276+19.30
D = 1°00'15.8"
Δ = 42°06'29.8" Lt.
R = 5704.57'
L = 4192.45'
T = 2195.97'
E = 408.07'

Date:9/16/2016

Filename: ...\d0259637\075_HDPlan4.dgn

Scale:
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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 4

SHEET NUMBER: GP-04

CONTRACT: 2017.XX

Date:9/16/2016

STA. 2281+60
SOUTHBOUND ℄ END PAVEMENT RECONSTRUCTION (SOUTHBOUND).
END FULL DEPTH RECONSTRUCTION (SOUTHBOUND).
MATCH EXISTING PAVEMENT.

STA. 1278+50
NORTHBOUND ℄ END THRIE BEAM DOUBLE RAIL.
BEGIN THRIE BEAM NB & SB.
BEGIN 15:1 NB TAPER.

STA. 1281+00
END 15:1 NB TAPER OF THRIE BEAM RAIL

STA. 1279+00
NORTHBOUND ℄
END FULL DEPTH RECONSTRUCTION (RIGHT LANE).
BEGIN MILL, SHIM AND PAVE (RIGHT LANE).

STA. 1281+94
NORTHBOUND ℄ END PAVEMENT RECONSTRUCTION (NORTHBOUND).
END FULL DEPTH RECONSTRUCTION (NORTHBOUND).
MATCH EXISTING PAVEMENT
BEGIN SHOULDER WIDENING (OUTSIDE SHOULDER)

Scale:

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Scale of Feet

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 5

SHEET NUMBER: GP-05

CONTRACT: 2017.XX

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Filename: ...\d0259637\076_HDPlan5.dgn

Date:9/16/2016

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Scale of Feet

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MAINE TURNPIKE

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 6

SHEET NUMBER: GP-06

CONTRACT: 2017.XX

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Date:9/16/2016

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MAINE TURNPIKE

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 7

SHEET NUMBER: GP-07

CONTRACT: 2017.XX

Date:9/16/2016

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YORK TOLL PLAZA

GENERAL PLAN 8

SHEET NUMBER: GP-08

CONTRACT: 2017.XX

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Date: 9/16/2016

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GENERAL PLAN 9

SHEET NUMBER: GP-09

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GENERAL PLAN 10

SHEET NUMBER: GP-10

CONTRACT: 2017.XX

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 11

SHEET NUMBER: GP-11

CONTRACT: 2017.XX

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Filename: ...\d0259637\082_HDPlan11.dgn

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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 12

SHEET NUMBER: GP-12

CONTRACT: 2017.XX

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Filename: ...\d0259637\083_HDPlan12.dgn

Date:9/16/2016

Filename: ...\d0259637\084_HDPlan13.dgn

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 13

SHEET NUMBER: GP-13

CONTRACT: 2017.XX

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 14

SHEET NUMBER: GP-14

CONTRACT: 2017.XX

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Filename: ...\d0259637\085_HDPlan14.dgn

Date:9/16/2016

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 15

SHEET NUMBER: GP-15

CONTRACT: 2017.XX

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Filename: ...\d0259637\086_HDPlan15.dgn

Date:9/16/2016

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JACOBS

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 16

SHEET NUMBER: GP-16

CONTRACT: 2017.XX

87 OF 465

Filename: ...\d0259637\087_HDPlan16.dgn

Date:9/16/2016

Filename: ...\d0259637\088_HDPlan17.dgn

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CONSULTANT PROJECT MANAGER: R. EMERY

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 17

SHEET NUMBER: GP-17

CONTRACT: 2017.XX

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Date:9/16/2016

Filename: ...\d0259637\089_HDPlan18.dgn

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No.	Revision	By	Date

Designed by:

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 18

SHEET NUMBER: GP-18

CONTRACT: 2017.XX

89 OF 465

Date:9/16/2016

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25 0 25 50
Scale of Feet

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 19

SHEET NUMBER: GP-19

CONTRACT: 2017.XX

90 OF 465

Filename: ...\d0259637\090_HDPlan19.dgn

Date:9/16/2016

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25 0 25 50

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Designed by:

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CONSULTANT PROJECT MANAGER: R. EMERY

	By	Date		By	Date
Designed	CSM	08/16	Checked	RRP	08/16
Drawn	AMS	08/16	In Charge of	---	--/--

JACOBS ENGINEERING GROUP
343 CONGRESS STREET
BOSTON, MA 02210
TEL (617) 242-9222
FAX (617) 242-9824

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 20

SHEET NUMBER: GP-20

CONTRACT: 2017.XX

91 OF 465

Filename: ...\d0259637\091_HDPlan20.dgn

Date:9/16/2016

Filename: ...\d0259637\092_HDPlan21.dgn

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Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS®

CONSULTANT PROJECT MANAGER: R. EMERY

	By	Date		By	Date
Designed	CSM	08/16	Checked	RRP	08/16
Drawn	AMS	08/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

GENERAL PLAN 21

SHEET NUMBER: GP-21

CONTRACT: 2017.XX

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APPENDIX 1

JACOBS ENGINEERING AIR STUDY

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YORK TOLL PLAZA

MAINE TURNPIKE AUTHORITY

AIR QUALITY REPORT

September 1, 2016

Cover Photo by Maine Turnpike Authority

Maine Turnpike in York, Maine

TABLE OF CONTENTS

TABLES

FIGURES

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1.0 EXECUTIVE SUMMARY

The Maine Turnpike Authority (MTA) proposes to construct a new highway speed Open Road Tolling (ORT) Plaza at mile 8.8 and demolish the existing barrier toll plaza at Mile 7.3. Approximately 70 percent of the total existing toll booth traffic (and 85 percent of truck traffic) is anticipated to use the ORT lanes at free-flow highway speeds, the operating efficiency of the proposed York Toll Plaza would be substantially increased with a corresponding improvement in ambient air quality.

To assess the overall impact of the York Toll Plaza Replacement Project on ambient air quality, a vehicular pollutant analysis was performed for emissions of carbon monoxide (CO), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and the combination of volatile organic compounds and nitrogen oxides (VOC and NOx) which react to form ground-level ozone. The latest state-of-the-science and USEPA-approved Motor Vehicle Emission Simulator (MOVES version 2014a), in concert with the latest version of our traffic simulation model VISSIM (Version 8) was used to calculate the total pollutant burden for both the No Build and Build scenarios in the form of project-level emission inventories

As will be shown below, the proposed ORT plaza would result in substantial ambient air quality improvement at Mile 7.3 and have a near net-zero effect on pollutant emissions at Mile 8.8. Accordingly, the net effect on overall air quality from this project is a sixteen percent reduction in total pollution burden..

As a result, the York Toll Plaza Replacement Project would not have an unreasonable adverse effect on ambient air quality.

2.0 INTRODUCTION

The Maine Turnpike Authority (MTA) retained Jacobs Engineering Group (Jacobs) to conduct an air quality modeling study to quantify the potential effect of the York Toll Plaza Replacement Project on vehicular pollutant emissions. The Maine Turnpike Authority (MTA) proposes to construct a new ORT Toll Plaza at Mile 8.8 and demolish the existing barrier Toll Plaza at Mile 7.3. Approximately 70 percent of the total existing toll booth traffic (and 85 percent of truck traffic) is anticipated to use the ORT lanes at free-flow highway speeds; the increased operating efficiency of the proposed York Toll Plaza would be substantial. Through the use of the latest available emissions modeling system Motor Vehicle Emissions simulator (Moves), and the latest guidance from DEP this study will quantify and compare peak hour pollutant burdens to demonstrate the extent of ambient air quality benefits that would be realized as a result of reconstructing the existing barrier toll plaza into a high speed ORT facility and demolishing the existing barrier toll plaza.

3.0 REGULATORY FRAMEWORK

The proposed York Toll Plaza Replacement project is located in an air quality region designated by the United States Environmental Protection Agency (USEPA) as an attainment area, signifying that no exceedances of national or state ambient air quality standards are present in York County, Maine. In addition, MTA does not receive federal funds for its construction and maintenance activities. Therefore, conformity provisions and related requirements (e.g., hot-spot analyses at the project level, regional conformity demonstration) based on National Ambient Air Quality Standards (NAAQS), at the federal level per the Clean Air Act or its associated state ambient air quality standards per Chapter 110 of the State of Maine Air Rules do not apply to the proposed project. Since the project is located within an attainment area, where air pollution levels are not in violation of NAAQS, a pollutant emissions burden analysis was performed to highlight the improvement in air quality from transportation related pollutants that would result from the proposed project.

On the state level, this project (aka development) is subject to Maine Site Location of Development Act (SLODA), 38 MRSA §§481-490. Pursuant to 38 MRSA §§486-B, the Maine Department of Environmental Protection (MDEP) issued the MTA a General Permit for SLODA projects. Section II(B)(6) of this General Permit provides that if the applicable MTA project is not included in a Maine DOT Statewide Transportation Improvement Program (STIP) that has undergone air quality analysis, the MTA will comply with Chapter 375, Section 1 of the DEP rules, 06-096 CMR Chapter 375, which may require, among other things, modeling of non-point sources and submittal of results. This project is not contained in a Maine DOT STIP.

4.0 METHODOLOGY

To demonstrate no unreasonable adverse air quality effects from the proposed project, vehicular emissions inventories during peak travel hours were calculated for the future No Build and future Build scenarios in year 2043, as follows:

- No Build pollutant burden
    - Existing barrier toll plaza remains at Mile 7.3; and,
    - No toll plaza at Mile 8.8.
- Build pollutant burden
    - No toll plaza at Mile 7.3; and,
    - ORT plaza constructed at Mile 8.8.

As described in further detail in this chapter below, the emissions inventories predict the total vehicular pollutant burden associated with the No Build and Build toll plaza scenarios at Mile 7.3 and Mile 8.8 during peak travel hours. Each inventory represents the sum of all pollutants that are emitted into the local atmosphere as a result of different vehicle activities associated with each plaza design. The inventories are then summed to present the total pollutant burden for the No Build and Build scenarios. As such, the pollutant burdens calculated in this study provide comparative evidence directly linking the removal of the barrier toll plaza at Mile 7.3 and the addition of the more efficient ORT plaza at Mile 8.8 to the effects of those actions on the total amount of pollutants emitted into the local atmosphere.

As the proposed project affects only highway vehicular emissions, the criteria pollutants of concern are carbon monoxide (CO), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and the combination of volatile organic compounds and nitrogen oxides (VOC and NOx) which react to form ground-level ozone.

4.1 TRAFFIC MODELING METHODOLOGY

Traffic flow microsimulation software, VISSIM version 8.0, was used to simulate the traffic operations in the No Build and Build scenarios during peak travel hours throughout the 30th worst travel day in year 2043, which represents a summer weekend in July. The evaluation metrics derived include the physical lengths of vehicle cruise, queue, deceleration, and acceleration activity segments, as well as the average travel speed for each segment representing an aggregate mix of those activities. In addition, the traffic evaluation No Build and Build year of 2043 accounts for long-term traffic volume growth in the air quality analysis horizon.

Per USEPA air quality modeling guidance, the four worst traffic hours for both peak and off-peak traffic periods were modeled—morning peak, midday peak, evening peak, and overnight peak—to capture emission rate variability across the day. For each of the peak hours analyzed, ten 60-minute simulations were performed. A seeding time of 900 seconds was used for each simulation. Passenger vehicles and heavy trucks were included in the vehicle inputs.

4.2 AIR QUALITY MODELING METHODOLOGY

The latest state-of-the-science and USEPA-approved Motor Vehicle Emission Simulator (MOVES version 2014a), was used to calculate the total pollutant burden for both the No Build and Build scenarios in the form of project-level emission inventories. The MOVES model calculates emission inventories (referred to in this study as pollutant burdens) by performing a series of calculations that reflect real-world vehicle operating processes in order to estimate total exhaust and evaporative emissions over a twenty four hour period, as well as brake and tire wear emissions for all on-road vehicles including cars, trucks, motorcycle, and buses. Contextual MOVES data specific to York County—such as vehicle mix classification, fleet age distribution, formulation and market share of fuel types, and meteorology—are consistent with the latest planning assumptions developed by the Maine Department of Environmental Protection (MEDEP) for air quality goal conformity determinations made in York County.

All aspects of the traffic data were pre-processed in MOVES, including total vehicle miles traveled, evaluation timeframes, flow characteristics, road grades, as well as vehicle drive-activity cycles. Each roadway segment in MOVES is associated with a drive-activity cycle as defined by an average operating speed, which is calculated by VISSIM on a per-vehicle basis. Based on an average operating speed, MOVES extrapolates a drive cycle distribution appropriate to the defined roadway type. For example, highway segments defined by a low average operating speed would cause vehicle idling activity typical of heavy bumper-to-bumper congestion to dominate the MOVES drive cycle distribution, which would also include some acceleration and deceleration activities at near-idling speeds; highway segments defined by a high average operating speed would cause steady-state cruise activity to dominate the MOVES drive cycle distribution, which would also include a small amount of acceleration and deceleration activities near free-flow speeds.

4.3 ANALYSIS TIMEFRAME

Per USEPA modeling guidance, to account for seasonal variability in the emission rate of each pollutant, four representative pollutant inventories were individually calculated for January, April, July, and October as based on temperature and relative humidity data used by MEDEP for conformity determinations in York County. Additional pollutant inventories were individually calculated for the four peak and off-peak traffic analysis hours to account for emission rate variability across the 30th worst travel day of year 2043, as described in Section 4.1 above. These traffic data are assumed to be identical for all quarters of the year.

As recommended by USEPA for project-level hourly emissions modeling, the combination of four traffic hours over a four-month emissions analysis horizon—for a total of 16 MOVES inventory calculations in each plaza scenario—is sufficient to represent the maximum pollutant emissions (in kilograms) that may reasonably be experienced during peak travel hours throughout the analysis year.

For ease of comparison, all MOVES pollutant inventories have been summed and expressed in this air quality study as a single quantity.

4.4 AREAS OF STUDY

To isolate the change in pollutant emissions that would directly result from the proposed ORT plaza (and the change in associated traffic patterns), pollutant burden calculations in this study include all highway pollutants that would be emitted by vehicles traveling along the turnpike from 1 mile south of mile 7.3 and 1 mile north of mile 8.8. This is approximately from Mile 6.3 to 9.8. This area is depicted in Figure 5.1. This study area captures all the variations in the rate of pollutant emission associated with different vehicular travel speeds and activities (e.g., acceleration, deceleration, cruise, and queue) that are associated with toll plaza operations and travel within the length of turnpike included in the study..

5.0 ANALYSIS OF FUTURE POLLUTANT BURDENS

Two pollutant burden analyses comparing the No Build and Build scenarios were studied in Section 5, as summarized below:

- Section 5.2 analyzes the efficiency gains between the No Build and Build plaza designs in terms of pollutants emitted in year 2043:
  - Compares emissions from the existing barrier toll plaza at Mile 7.3 against emissions from the proposed ORT plaza at Mile 8.8.
- Section 5.3 analyzes No Build and Build emissions at both existing and proposed plaza locations in year 2043:
  - Compares emissions at Mile 7.3 with and without the existing barrier toll plaza, and;
  - Compares emissions at Mile 8.8 with and without an ORT toll plaza.
  - plaza against emissions from an ORT toll plaza during peak hours with higher traffic volumes.

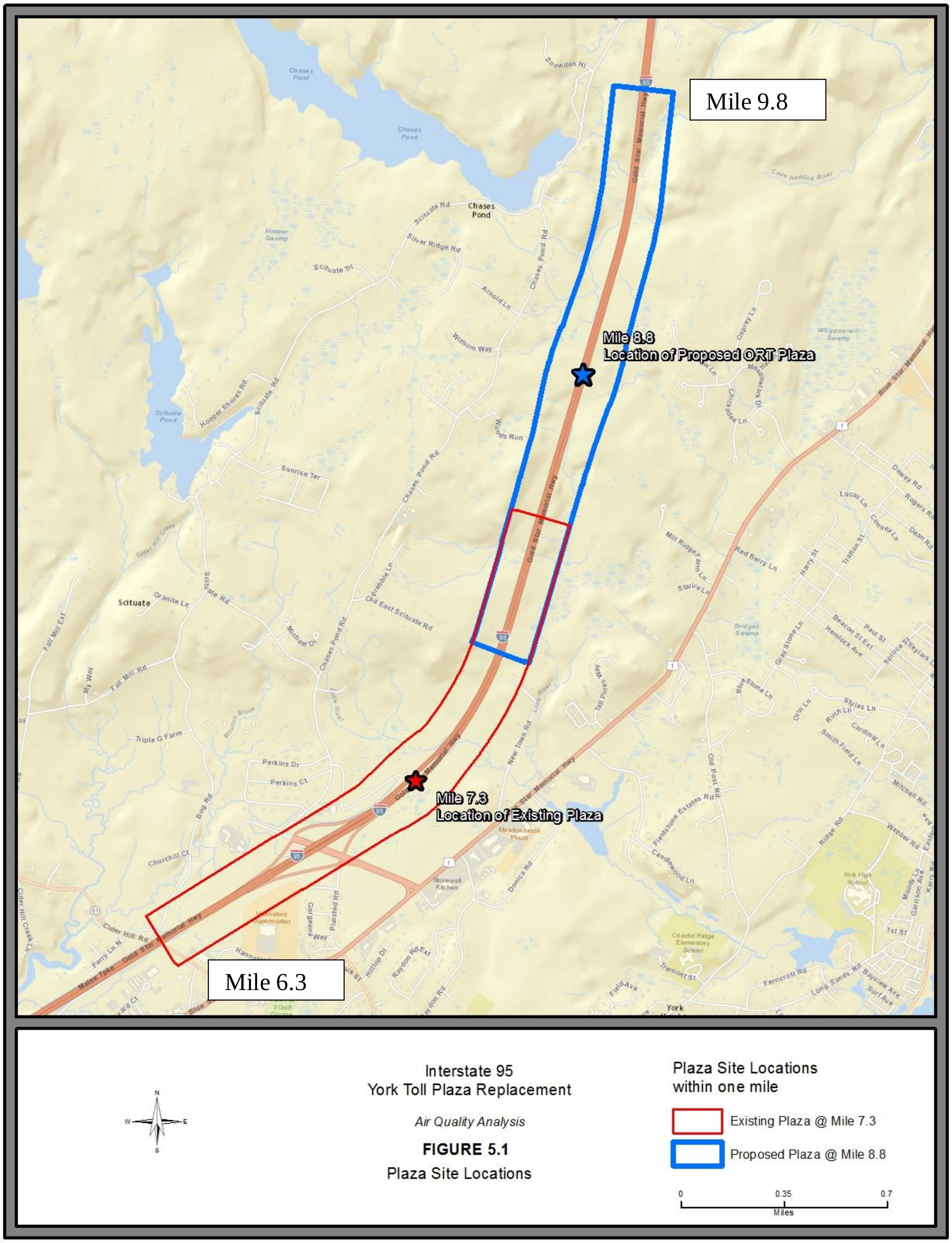
5.1 COMPARISON OF EMISSIONS FROM THE EXISTING AND PROPOSED PLAZA

Table 5.1 shows the overall improvement in year 2043 emissions along the turnpike road study limits: at Mile 7.3 with the existing barrier toll plaza, and at Mile 8.8 with the proposed ORT plaza. It is expected that as you move away from the turnpike road limits these values of emissions will be less. The total pollutant burden of the ORT plaza would be 16 percent lower than that of the existing plaza, with reductions of CO, NOx, and VOC emissions in the 13 to 18 percent range, while emissions of PM_{10} and $PM_{2.5}$ would be reduced by 50 to 61 percent. These improvements are due to a substantial increase in overall operating speed, as the ORT lanes are anticipated to attract 70 percent of future traffic (and 85 percent of trucks) previously bound for toll booths. Emissions of particulate matter (PM), in particular, would benefit from less vehicle braking activity, as highlighted by a 50 to 61 percent reduction.

5.2 EFFECTS OF PLAZA RECONSTRUCTION ON AIR QUALITY AT MILE 7.3 AND MILE 8.8

The following table assess the net effect of plaza relocation in year 2043 on both the existing Mile 7.3 and proposed Mile 8.8 site locations as shown in Figure 5.1. The horizon year of 2043 was chosen to coincide with the same horizon year that the future toll plaza sizing study was performed. The future traffic analysis and resultant air quality analysis was based a significant increase (1.4%/per year) in travel predicted for the turnpike based on a separate traffic study performed by Jacobs to size the new ORT toll plaza. The air quality study recognizes the impact that the queuing behavior at the existing barrier toll plaza contributes to air pollutants as well as the reduction in queues that would be realized by the efficiency of the new ORT facility. The traffic modelling and associated air study does not account for influences outside the study area such as the capacity restraint of the Piscataqua River Bridge in Portsmouth. To calculate pollutant burdens for these relocation scenarios, the coverage of both No Build and Build models were extended to create a one-mile analysis overlap at Mile 7.3 and at Mile 8.8. This configuration allows MOVES to calculate emission burdens comparing No Build and Build scenarios specific to a site location, as opposed to comparing scenarios specific to a plaza design.

FIGURE 5.1: PLAZA SITE LOCATIONS



With the removal of the existing toll plaza at Mile 7.3, the change in ambient air quality within a one-mile vicinity would be 29 percent fewer pollutants emitted. In this scenario, Mile 7.3 would benefit from free-flow speeds at all times throughout the day; operating speeds are nearly doubled and pollutant emissions are substantially reduced.

With a new ORT toll plaza at Mile 8.8 and the removal of a barrier toll at mile 7.3, the change in pollutant emissions within a one-mile vicinity of Mile 8.8 would be negligible. The largest improvements would occur throughout the day in the southbound direction, where the ORT plaza would relieve severe congestion in traffic previously constrained by the existing barrier toll booth plaza at Mile 7.3. These improvements, however, are offset by increased emissions in the northbound direction, where traffic already traveling at near free-flow speeds in the No Build scenario would be affected by new acceleration, deceleration and idling activities introduced by the addition of the ORT plaza. Overall, with the predicted offset in emissions from northbound and southbound vehicles, Mile 8.8 within a one-mile radius would experience a near net-zero (0.18 percent) increase in pollutants emitted as a result of the ORT plaza construction.

The ORT plaza at Mile 8.8 would substantially reduce emissions of PM by relieving congestion and virtually eliminating deceleration and braking activities at Mile 7.3. Although emissions of CO are predicted to increase by 3 percent at Mile 8.8, this increase is marginal and would not affect local ambient air quality. While emissions of VOC would also increase by 9 percent at Mile 8.8, the increase would be mitigated by a 28 percent system-wide net decrease in VOC emissions, thereby ensuring that no new area ozone formation would occur. Overall, the net effect of the ORT plaza on ambient air quality at the Mile 7.3 and Mile 8.8 locations is a 16 percent reduction in total pollutants emitted.

TABLE 5.1 – NET EMISSIONS AT MILE 7.3 AND MILE 8.8

Pollutant	**Mile 8.8 Emission Burden (kg)**			**Mile 7.3 Emission Burden (kg)**			**Net Emission Burden (kg)**	
	No Plaza	**ORT Plaza**	**+/- %**	**Existing Plaza**	**No Plaza**	**+/- %**	**ORT Plaza**	**+/- %**
CO	163	168	+3%	192	149	-22%	-38	-11%
NOx	24	23	-3%	28	20	-29%	-9	-17%
VOC	14	15	+9%	19	8	-55%	-9	-28%
PM_{10}	9	5	-51%	12	2	-83%	-14	-69%
$PM_{2.5}$	2	1	-38%	2	1	-69%	-2	-55%
Grand Total	**212**	**212**	**+0.18%**	**252**	**180**	**-29%**	**-73**	**-16%**

6.0 SUMMARY OF FINDINGS

The proposed ORT plaza design at Mile 8.8 would result in substantially more efficient operations than the existing barrier toll plaza design at Mile 7.3. This effect has a corresponding improvement on ambient air quality, as the total pollutant burden would decrease by 16 percent with more than 50 percent reduction in particulate matter emissions, particularly from brake-wear (see section 5.1). The reconstruction of the plaza at Mile 8.8 would relieve severe traffic congestion in the southbound direction, although the 7 percent improvement in ambient air quality would be offset by 8 percent increased emissions from northbound traffic. When considering the total pollutant burden in both travel directions, however, the proposed ORT plaza scenario would have a near net-zero effect on ambient air quality at Mile 8.8 while reducing total pollutant emissions by 29 percent at Mile 7.3.

Construction of the proposed ORT plaza would result in substantial ambient air quality improvement at Mile 7.3, and have a near net-zero effect on pollutant emissions at Mile 8.8. As a result, the proposed York Toll Plaza Replacement Project would not result in any unreasonable adverse effect on air quality and would result in an overall improvement in air quality for York County.

7.0 EFFECT OF CONSTRUCTION ON AIR QUALITY

Although local inhalable PM, CO, and dust concentrations are concerns stemming from construction activities, the temporary increase in emissions would be self-correcting once the project is completed. Therefore, modeling analyses of short-term elevated emissions are not warranted, and the temporary effects of project construction on local and regional air quality would not be significant. During the construction phase of the project, effective control measures to limit airborne PM and dust during construction would be taken, including the wetting of exposed soil, covering of trucks and other dust sources, and other best practice means as applicable.

APPENDIX 2

AGENCY CORRESPONDENCE

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SEBAGO
TECHNICS

November 13, 2014
14181

Ms. Lisa St. Hilaire
Maine Natural Areas Program
93 State House Station
Augusta, ME 04333-0933

Maine Natural Areas Program Review
Maine Turnpike Authority, Corridor Study for Toll Plaza

Dear Ms. St. Hilaire:

Sebago Technics, Inc. has been retained by the Maine Turnpike Authority (MTA) to assist with an environmental corridor study for a section of the Maine Turnpike. The study is part of a larger planning assessment that Jacobs Engineering has recently undertaken for the Southern Maine Toll Plaza in York. The York Toll Plaza was constructed in 1969 and surpassed its useful design life due to traffic, operational and structural deficiencies.

During the past several years, the MTA has initiated a program to evaluate the feasibility for a new Toll Plaza within an identified corridor of the Turnpike that includes the existing Toll Plaza (mile marker 7.3) and an area extending northerly of the York Plaza to mile marker 10.4. In addition the area between mile marker 12.7 and 13.7 was also identified for a potential toll plaza.

As we conduct the planning study, we would appreciate the Maine Natural Areas Program's review of the study corridor for the identification rare and endangered plants, rare natural communities and ecosystems. If you have any questions, please do not hesitate to contact me.

Sincerely,

SEBAGO TECHNICS, INC.

Owens A. McCullough, P.E., LEED-AP
Vice President - Engineering & Project Development

OAM/llg
Enc.

cc: Ralph Norwood, P.E., PTOE - MTA
Rod Emery, P.E – Jacobs Engineering

75 John Roberts Road – Suite 1A, South Portland, ME 04106-6963 • 207-200-2100 • Fax: 207-856-2206

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
93 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0093

PAUL R. LEPAGE
GOVERNOR

WALTER E. WHITCOMB
COMMISSIONER

November 18, 2014

Owens McCullough
Sebago Technics
75 John Roberts Road, Suite 1A
South Portland, ME 04106

Re: Rare and exemplary botanical features in proximity to: Maine Turnpike Authority, Corridor Study for Toll Plaza, York, Maine

Dear Mr. McCullough:

I have searched the Natural Areas Program's Biological and Conservation Data System files in response to your request received November 18, 2014 for information on the presence of rare or unique botanical features documented from the vicinity of the project in York, Maine. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Our official response covers only botanical features. For authoritative information and official response for zoological features you must make a similar request to the Maine Department of Inland Fisheries and Wildlife (MDIFW), 284 State Street, Augusta, Maine 04333.

According to the information currently in our Biological and Conservation Data System files, there are a number of botanical features within the 500 meter study corridor for the toll plaza. Please refer to the attached maps, table below, and shapefile included in the response. A majority of these features occur within large wetland systems and require maintenance of the hydrology of these wetlands for future persistence. Also note that one of the rare plant species (Spicebush) in the Little River Tributary Swamp is host to a State Rare butterfly, the Spicebush Swallowtail (*Papilio Troilus*, Special Concern) at this location. Please contact us for additional information about the locations and ecology of the rare plants if any of the planning options will intersect or otherwise encroach upon their habitats. Contact MDIFW for more information on the habitat needs of the Spicebush Swallowtail.

Feature	**State Status**	**State Rank**	**Global Rank**	**Occurrence Rank**	**Notes**
Sweet Pepper-bush, *Clethra alnifolia*	SC	S2	G5	BC Good to Fair	Chases Pond South
Smooth Winterberry Holly, *Ilex laevigata*	SC	S3	G5	D Poor	Chases Pond South
Sweet Pepper-bush, *Clethra alnifolia*	SC	S2	G5	B Good	Chases Pond

MAINE NATURAL AREAS PROGRAM
MOLLY DOCHERTY, DIRECTOR

PHONE: (207) 287-8044
FAX: (207) 287-8040
TTY: (207) 287-2213

Spicebush, *Lindera benzoin*	SC	S3	G5	B Good	Little River Tributary Swamp
Sweet Pepper-bush, *Clethra alnifolia*	SC	S2	G5	B Good	Little River Tributary Swamp
Featherfoil, *Hottonia inflata*	T	S2	G4	E Extant	York Fish and Game Club

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all natural areas in Maine, and in the absence of a specific field investigation, the Maine Natural Areas Program cannot provide a definitive statement on the presence or absence of unusual natural features at this site.

The Natural Areas Program is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We would appreciate the contribution of any information obtained should you decide to do field work. The Natural Areas Program welcomes coordination with individuals or organizations proposing environmental alteration, or conducting environmental assessments. If, however, data provided by the Natural Areas Program are to be published in any form, the Program should be informed at the outset and credited as the source.

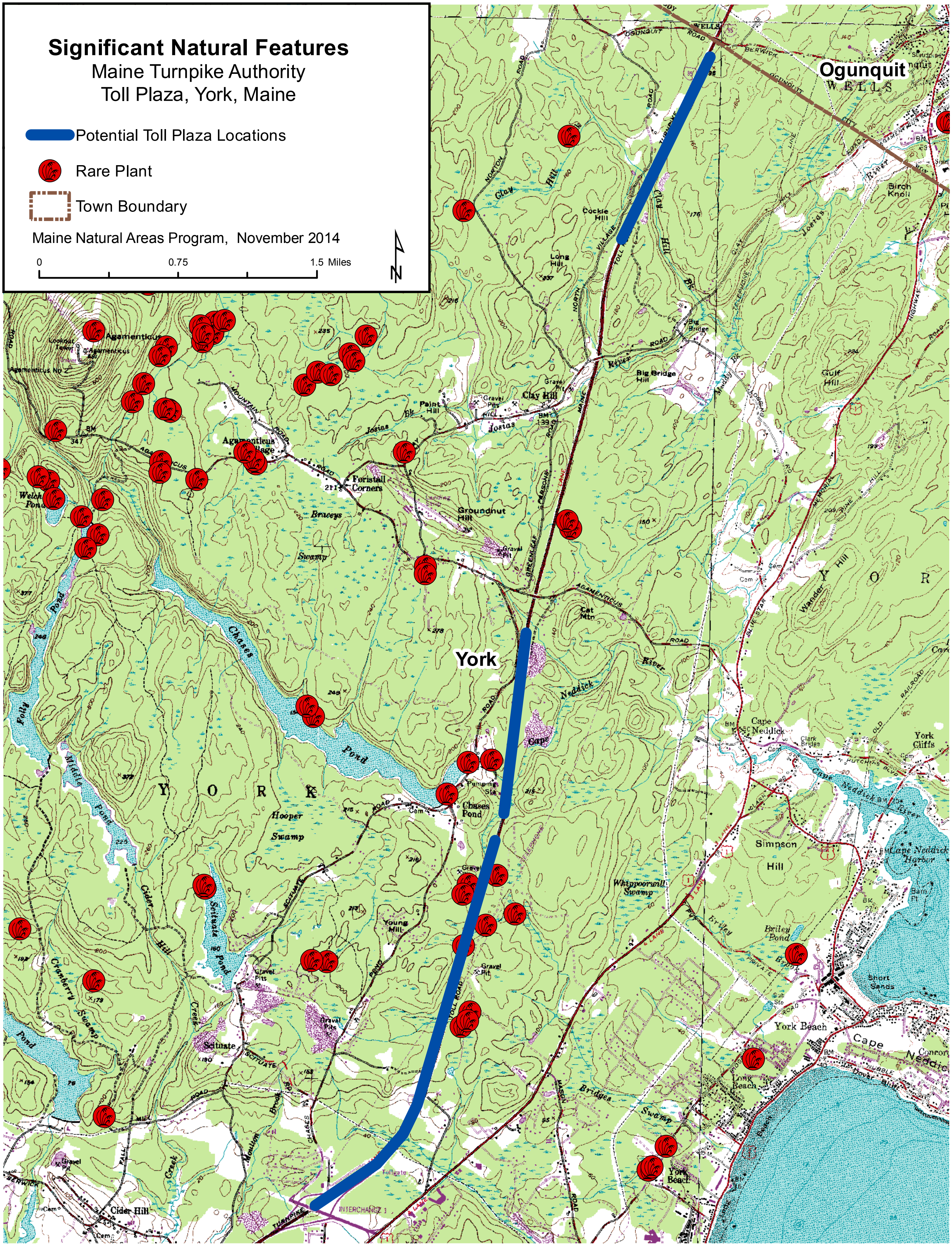
The Natural Areas Program has instituted a fee structure of $75.00 an hour to recover the actual cost of processing your request for information. You will receive an invoice for $150.00 for our services.

Thank you for using the Natural Areas Program in the environmental review process. Please do not hesitate to contact me if you have further questions about the Natural Areas Program or about rare or unique botanical features on this site.

Sincerely,

Don Cameron
Ecologist
Maine Natural Areas Program
207-287-8041
don.s.cameron@maine.gov

Enclosures

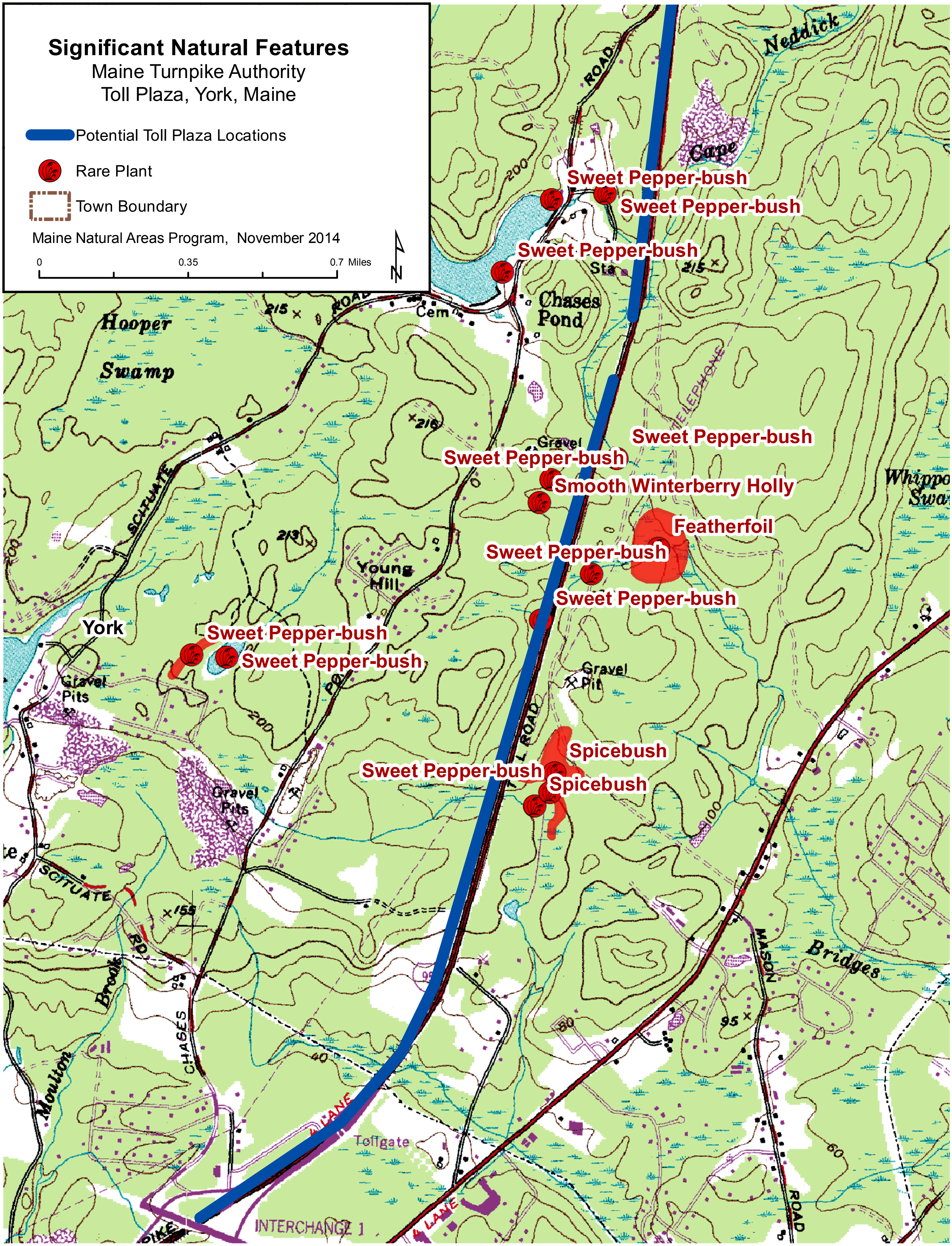


Significant Natural Features

Maine Turnpike Authority

Toll Plaza, York, Maine

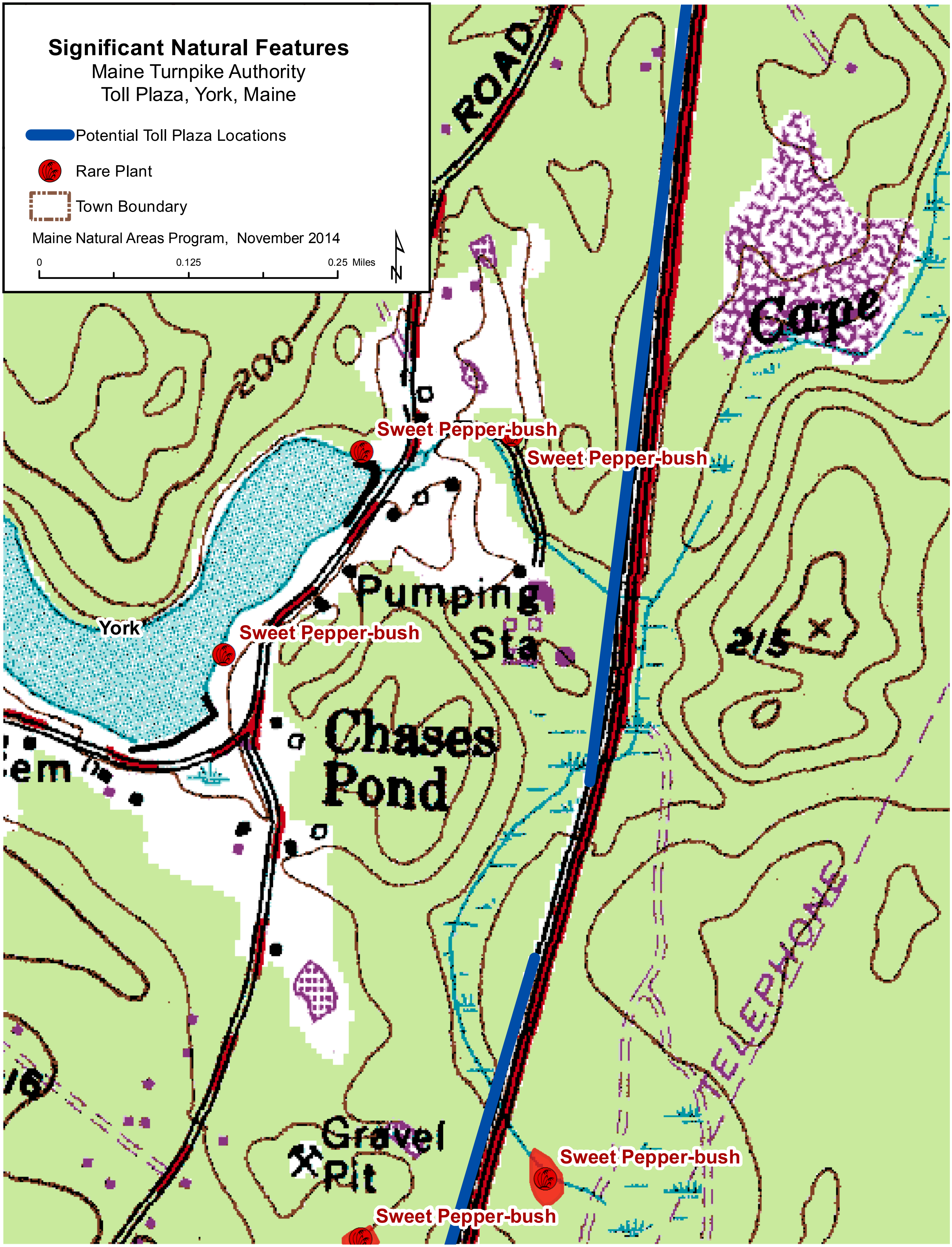
Maine Natural Areas Program, November 2014



Significant Natural Features

Maine Turnpike Authority
Toll Plaza, York, Maine

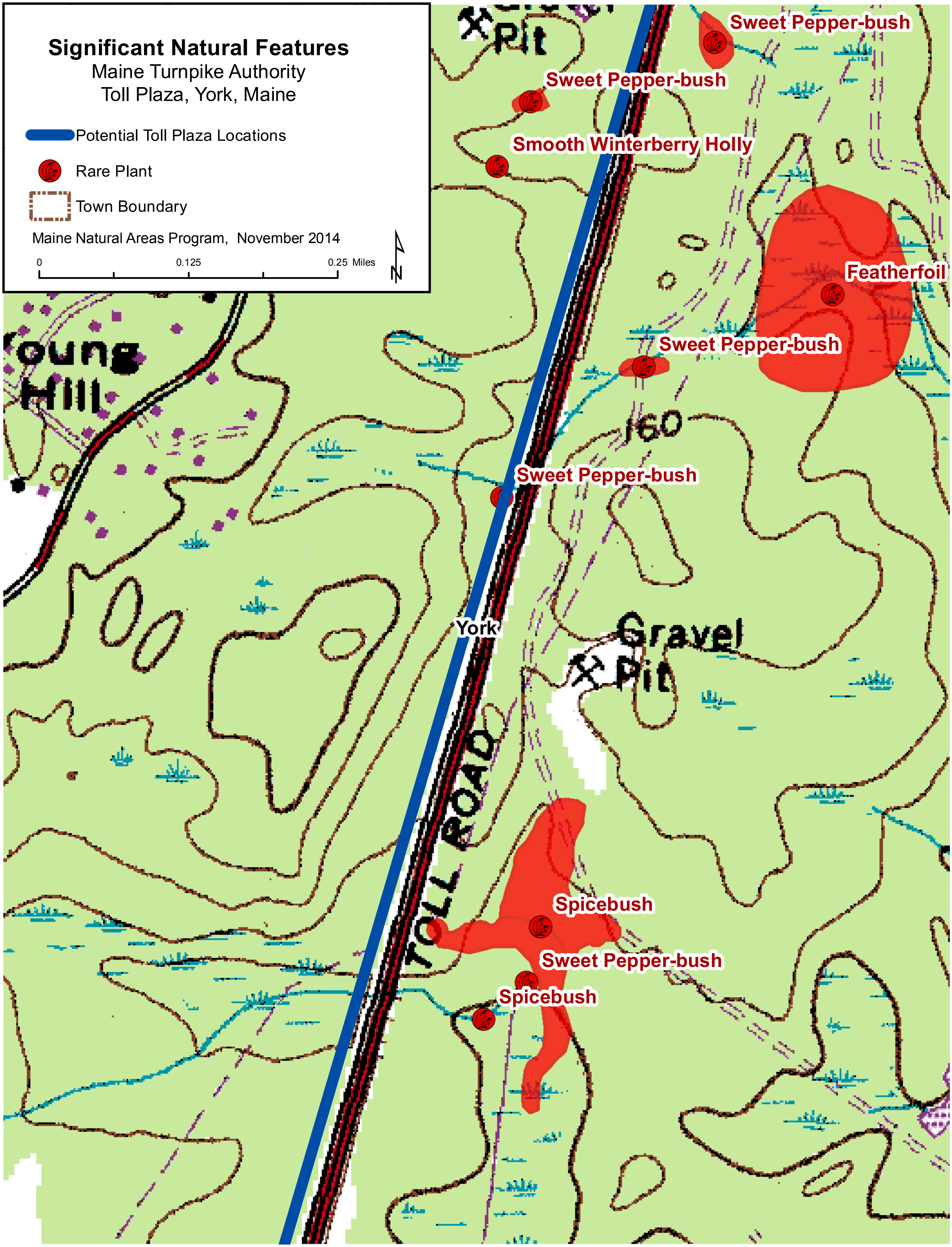
Maine Natural Areas Program, November 2014



Significant Natural Features

Maine Turnpike Authority
Toll Plaza, York, Maine

Maine Natural Areas Program, November 2014



Significant Natural Features

Maine Turnpike Authority
Toll Plaza, York, Maine

STATE RARITY RANKS

S1	Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.
S2	Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
S3	Rare in Maine (20-100 occurrences).
S4	Apparently secure in Maine.
S5	Demonstrably secure in Maine.
SU	Under consideration for assigning rarity status; more information needed on threats or distribution.
SNR	Not yet ranked.
SNA	Rank not applicable.
S#?	Current occurrence data suggests assigned rank, but lack of survey effort along with amount of potential habitat create uncertainty (e.g. S3?).

Note: **State Rarity Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines State Rarity Ranks for animals.

GLOBAL RARITY RANKS

G1	Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extinction.
G2	Globally imperiled because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
G3	Globally rare (20-100 occurrences).
G4	Apparently secure globally.
G5	Demonstrably secure globally.
GNR	Not yet ranked.

Note: **Global Ranks** are determined by NatureServe.

STATE LEGAL STATUS

Note: State legal status is according to 5 M.R.S.A. § 13076-13079, which mandates the Department of Conservation to produce and biennially update the official list of Maine's **Endangered** and **Threatened** plants. The list is derived by a technical advisory committee of botanists who use data in the Natural Areas Program's database to recommend status changes to the Department of Conservation.

E	ENDANGERED; Rare and in danger of being lost from the state in the foreseeable future; or federally listed as Endangered.
T	THREATENED; Rare and, with further decline, could become endangered; or federally listed as Threatened.

NON-LEGAL STATUS

SC	SPECIAL CONCERN; Rare in Maine, based on available information, but not sufficiently rare to be considered Threatened or Endangered.
PE	Potentially Extirpated; Species has not been documented in Maine in past 20 years or loss of last known occurrence has been documented.

Visit our website for more information on rare, threatened, and endangered species!
http://www.maine.gov/dacf/mnap

ELEMENT OCCURRENCE RANKS - EO RANKS

Element Occurrence ranks are used to describe the quality of a rare plant population or natural community based on three factors:

- **Size**: Size of community or population relative to other known examples in Maine. Community or population's viability, capability to maintain itself.
- **Condition**: For communities, condition includes presence of representative species, maturity of species, and evidence of human-caused disturbance. For plants, factors include species vigor and evidence of human-caused disturbance.
- **Landscape context**: Land uses and/or condition of natural communities surrounding the observed area. Ability of the observed community or population to be protected from effects of adjacent land uses.

These three factors are combined into an overall ranking of the feature of **A**, **B**, **C**, or **D**, where **A** indicates an **excellent** example of the community or population and **D** indicates a **poor** example of the community or population. A rank of **E** indicates that the community or population is **extant** but there is not enough data to assign a quality rank. The Maine Natural Areas Program tracks all occurrences of rare (S1-S3) plants and natural communities as well as A and B ranked common (S4-S5) natural communities.

Note: **Element Occurrence Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines Element Occurrence ranks for animals.

Visit our website for more information on rare, threatened, and endangered species!
http://www.maine.gov/dacf/mnap

SEBAGO
TECHNICS

February 18, 2016
14181

Ms. Lisa St. Hilaire
Maine Natural Areas Program
93 State House Station
Augusta, ME 04333-0933

Maine Natural Areas Program Review
Maine Turnpike Authority, Corridor Study for Toll Plaza

Dear Ms. St. Hilaire:

Sebago Technics, Inc. has been retained by the Maine Turnpike Authority (MTA) to assist with the environmental permitting for the proposed York Toll Plaza Relocation. The MTA has identified a new toll plaza location based upon the results of a comprehensive corridor study that was recently completed. The location selected is in the vicinity of mile 8.2 to mile 9.4 with the new toll plaza being located at mile 8.8.

We are in the process of preparing agency applications to include a MDEP Natural Resources Permit Application and US Army Corp of Engineers 404 permit application and would request an updated review of the project area for the identification rare and endangered plants, rare natural communities and ecosystems. If you have any questions, please do not hesitate to contact me.

Sincerely,

SEBAGO TECHNICS, INC.

Owen A. McCullough

Owens A. McCullough, P.E., LEED-AP
Vice President - Engineering & Project Development

OAM/llg
Enc.

cc: Ralph Norwood, P.E., PTOE – MTA
Sarah Zografos, Planner/Agency Liaison
Rod Emery, P.E – Jacobs Engineering

75 John Roberts Road – Suite 1A, South Portland, ME 04106-6963 • 207-200-2100 • Fax: 207-856-2206

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
93 STATE HOUSE STATION
AUGUSTA, MAINE 04333

PAUL R. LEPAGE
GOVERNOR

WALTER E. WHITCOMB
COMMISSIONER

March 7, 2016

Owens McCullough
Sebago Technics
75 John Roberts Road, Suite 1A
South Portland, ME 04106

Via email: omccullough@sebagotechnics.com

Re: Rare and exemplary botanical features in proximity to: Project 14181, Maine Turnpike Authority, Corridor Study for Toll Plaza, Mile 8.8, York, Maine

Dear Mr. McCullough:

I have searched the Natural Areas Program's Biological and Conservation Data System files in response to your request received February 23, 2016 for information on the presence of rare or unique botanical features documented from the vicinity of the project in York, Maine. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Our official response covers only botanical features. For authoritative information and official response for zoological features you must make a similar request to the Maine Department of Inland Fisheries and Wildlife, 284 State Street, Augusta, Maine 04333.

According to the information currently in our Biological and Conservation Data System files, the proposed project is near several mapped botanical features: Featherfoil, Smooth Winterberry Holly, Spicebush, and Sweet Pepper-bush. Provided the limit of disturbed area to either side of the proposed toll plaza is as shown in yellow and green on the map sent with the request for review, MNAP has no concerns. Should the footprint of the project change, or access be planned near any of the mapped features, please contact MNAP for further recommendations. Please refer to the table and map below.

Feature	**State Status**	**State Rank**	**Global Rank**	**Occurrence Rank**	**Site**
Featherfoil *Hottonia inflata*	T	S1	G4	H Historical	York Fish & Game Club Last obs 1994
Smooth Winterberry-holly *Ilex laevigata*	SC	S3	G5	D Poor	Chases Pond South
Spicebush *Lindera benzoin*	SC	S3	G5	B Good	Little River Tributary Swamp
Sweet Pepper-bush *Clethra alnifolia*	SC	S2	G5	BC Good to Fair	Chases Pond South

MOLLY DOCHERTY, DIRECTOR
MAINE NATURAL AREAS PROGRAM

PHONE: (207) 287-8044
FAX: (207) 287-8040
WWW.MAINE.GOV/DACF/MNAP

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all natural areas in Maine, and in the absence of a specific field investigation, the Maine Natural Areas Program cannot provide a definitive statement on the presence or absence of unusual natural features at this site.

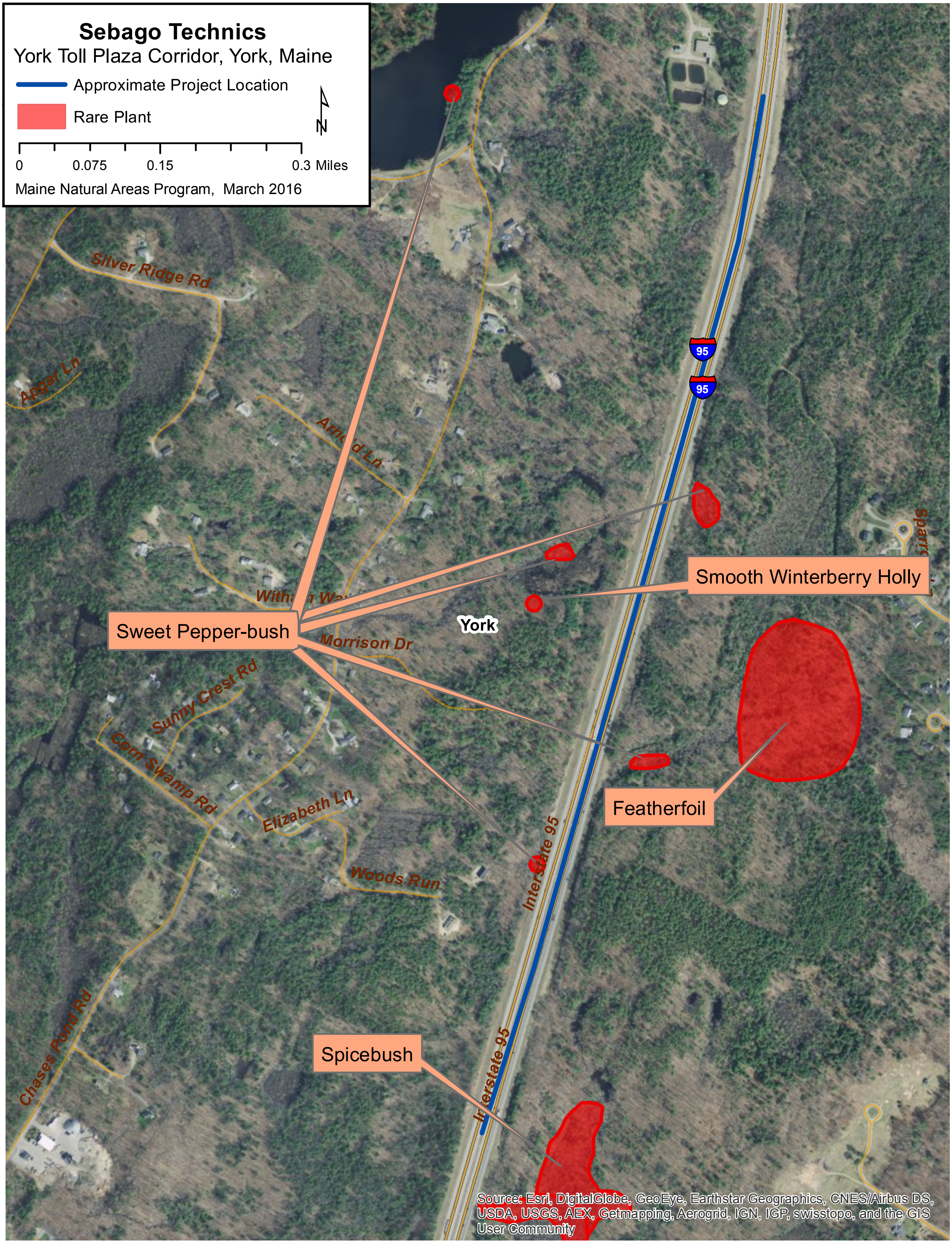
The Natural Areas Program is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We would appreciate the contribution of any information obtained should you decide to do field work. The Natural Areas Program welcomes coordination with individuals or organizations proposing environmental alteration, or conducting environmental assessments. If, however, data provided by the Natural Areas Program are to be published in any form, the Program should be informed at the outset and credited as the source.

The Natural Areas Program has instituted a fee structure of $75.00 an hour to recover the actual cost of processing your request for information. You will receive an invoice for $150.00 for our services.

Thank you for using the Natural Areas Program in the environmental review process. Please do not hesitate to contact me if you have further questions about the Natural Areas Program or about rare or unique botanical features on this site.

Sincerely,

Don Cameron | Ecologist | Maine Natural Areas Program
207-287-8041 | don.s.cameron@maine.gov



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

STATE RARITY RANKS

S1	Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.
S2	Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
S3	Rare in Maine (20-100 occurrences).
S4	Apparently secure in Maine.
S5	Demonstrably secure in Maine.
SU	Under consideration for assigning rarity status; more information needed on threats or distribution.
SNR	Not yet ranked.
SNA	Rank not applicable.
S#?	Current occurrence data suggests assigned rank, but lack of survey effort along with amount of potential habitat create uncertainty (e.g. S3?).

Note: **State Rarity Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines State Rarity Ranks for animals.

GLOBAL RARITY RANKS

G1	Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extinction.
G2	Globally imperiled because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
G3	Globally rare (20-100 occurrences).
G4	Apparently secure globally.
G5	Demonstrably secure globally.
GNR	Not yet ranked.

Note: **Global Ranks** are determined by NatureServe.

STATE LEGAL STATUS

Note: State legal status is according to 5 M.R.S.A. § 13076-13079, which mandates the Department of Conservation to produce and biennially update the official list of Maine's **Endangered** and **Threatened** plants. The list is derived by a technical advisory committee of botanists who use data in the Natural Areas Program's database to recommend status changes to the Department of Conservation.

E	ENDANGERED; Rare and in danger of being lost from the state in the foreseeable future; or federally listed as Endangered.
T	THREATENED; Rare and, with further decline, could become endangered; or federally listed as Threatened.

NON-LEGAL STATUS

SC	SPECIAL CONCERN; Rare in Maine, based on available information, but not sufficiently rare to be considered Threatened or Endangered.
PE	Potentially Extirpated; Species has not been documented in Maine in past 20 years or loss of last known occurrence has been documented.

Visit our website for more information on rare, threatened, and endangered species!
http://www.maine.gov/dacf/mnap

ELEMENT OCCURRENCE RANKS - EO RANKS

Element Occurrence ranks are used to describe the quality of a rare plant population or natural community based on three factors:

- **Size**: Size of community or population relative to other known examples in Maine. Community or population's viability, capability to maintain itself.
- **Condition**: For communities, condition includes presence of representative species, maturity of species, and evidence of human-caused disturbance. For plants, factors include species vigor and evidence of human-caused disturbance.
- **Landscape context**: Land uses and/or condition of natural communities surrounding the observed area. Ability of the observed community or population to be protected from effects of adjacent land uses.

These three factors are combined into an overall ranking of the feature of **A**, **B**, **C**, or **D**, where **A** indicates an **excellent** example of the community or population and **D** indicates a **poor** example of the community or population. A rank of **E** indicates that the community or population is **extant** but there is not enough data to assign a quality rank. The Maine Natural Areas Program tracks all occurrences of rare (S1-S3) plants and natural communities as well as A and B ranked common (S4-S5) natural communities.

Note: **Element Occurrence Ranks** are determined by the Maine Natural Areas Program for rare plants and rare and exemplary natural communities and ecosystems. The Maine Department of Inland Fisheries and Wildlife determines Element Occurrence ranks for animals.

Visit our website for more information on rare, threatened, and endangered species!
http://www.maine.gov/dacf/mnap

SEBAGO
TECHNICS

November 13, 2014
14181

Bethany Atkins
Maine Department of Inland Fisheries & Wildlife
41 State House Station
284 State Street
Augusta, ME 04333-0041

Maine Department of Inland Fisheries and Wildlife
Maine Turnpike Authority, Corridor Study for Toll Plaza

Dear Ms. Atkins:

Sebago Technics, Inc. has been retained by the Maine Turnpike Authority (MTA) to assist with an environmental corridor study for a section of the Maine Turnpike. The study is part of a larger planning assessment that Jacobs Engineering has recently undertaken for the Southern Maine Toll Plaza in York. The York Toll Plaza was constructed in 1969 and surpassed its useful design life due to traffic, operational and structural deficiencies.

During the past several years, the MTA has initiated a program to evaluate the feasibility for a new Toll Plaza within an identified corridor of the Turnpike that includes the existing Toll Plaza (mile marker 7.3) and an area extending northerly of the York Plaza to mile marker 10.4. In addition the area between mile marker 12.7 and 13.7 was also identified for a potential toll plaza.

As we conduct the planning study, we would appreciate IF&W's review of the study corridor for the identification of endangered or critical fisheries or wildlife habitats. If you have any questions, please do not hesitate to contact me.

Sincerely,

SEBAGO TECHNICS, INC.

Owen A.

Owens A. McCullough, P.E., LEED-AP
Vice President – Engineering & Project Development

OAM/llg
Enc.

cc: Ralph Norwood, P.E., PTOE - MTA
Rod Emery, P.E – Jacobs Engineering

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STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

PAUL R. LEPAGE
GOVERNOR

CHANDLER E. WOODCOCK
COMMISSIONER

December 18, 2014

Owens McCullough
Sebago Technics
75 John Roberts Road, Suite 1A
South Portland, ME 04106-6963

RE: Information Request - MTA York Plaza, York

Dear Owens:

Per your request received November 19, 2014, we have reviewed current Maine Department of Inland Fisheries and Wildlife (MDIFW) information for known locations of Endangered, Threatened, and Special Concern species; designated Essential and Significant Wildlife Habitats; and fisheries habitat concerns within the vicinity of the *MTA York Plaza Project* in York.

Our Department has not mapped any Essential Habitats that would be directly affected by your project.

Endangered, Threatened, and Special Concern Species

Several state-listed Endangered, Threatened, and Special Concern Species have been documented in the project search area. These species include one mammal (New England Cottontail, Endangered); four reptiles (Blanding's Turtle, Endangered; Spotted Turtle, Threatened; Wood Turtle, Special Concern; and Eastern Ribbon Snake, Special Concern); three fish species (Redfin Pickerel, Endangered; Swamp Darter, Threatened; and American eel, Special Concern); and one invertebrate (Spicebush Swallowtail, Special Concern). We strongly recommend that your project be designed to avoid habitats for these species. In addition, Endangered and Threatened species are protected under Maine's Endangered Species Act (MESA), and as such are afforded special protection by the State. Specifically, §12808 of the MESA prohibits any party from actions that Take (kill) or Harass (injure or disrupt normal behavioral patterns) a state Endangered or Threatened species. We strongly recommend that you work closely with MDIFW Region A wildlife biologists in Gray (207-657-2345), as well as MDIFW's species specialists in our Bangor office (Derek Yorks, 207-941-4475 and Phillip deMaynadier, 207- 941-4239).

Significant Wildlife Habitat

Inland Waterfowl and Wading Bird Habitats

This project intersects or appears to be immediately adjacent to Inland Waterfowl and Wading Bird Habitats (IWWHs). These habitats provide important breeding, feeding, migration, staging, and wintering habitat for waterfowl and wading bird species. High and moderate value IWWHs within the study area includes both the wetland complex and a 250-foot upland zone. We recommend that these resources be avoided, including no clearing within the 250-foot undisturbed buffer from the wetland edge. Please work closely with MDIFW Region A wildlife biologists in Gray (207-657-2345) to discuss avoidance and minimizations efforts during Project design.

Significant Vernal Pools

Significant Vernal Pools, Significant Wildlife Habitats under Maine's Natural Resources Protection Act, have been mapped within the project area. A comprehensive statewide inventory for Significant Vernal Pools, however, has not been completed. Surveys for vernal pools in the project boundary will need to be conducted prior to final project design to determine whether there are Significant Vernal Pools present. Once surveys are completed, our Department will need to verify vernal pool data sheets prior to final determination of significance.

Fisheries Habitat Concerns

Without details, it is difficult to know what impacts your project may have on the mapped streams within the search area, including the three fish species of concern (Redfin Pickerel, Endangered; Swamp Darter, Threatened; and American eel, Special Concern) that are also documented in the review area. That being said, MDIFW makes the following general recommendations as they pertain to streams.

We recommend that a 100-foot undisturbed vegetated buffer be maintained along these streams. Buffers should be measured from the edge of stream or associated fringe and floodplain wetlands. Maintaining buffers along coldwater fisheries is critical to the protection of water temperatures, water quality, and inputs of coarse woody debris necessary to support conditions required by brook trout. Any work on existing stream crossings should be designed to provide adequate fish passage. We encourage you to contact our Region A Fisheries staff (207-657-2345) for crossing design recommendations that best maintain fish passage. Construction Best Management Practices should be closely followed to avoid erosion, sedimentation, alteration of stream flow, and other impacts to stream habitat. In addition, we recommend that any necessary instream work or work within 100 feet of streams occur between July 15 and October 1. Finally, as previously stated the Redfin Pickerel and Swamp Darter are protected under MESA, and as such are afforded special protection by the State.

This consultation review has been conducted specifically for known MDIFW jurisdictional features and should not be interpreted as a comprehensive review for the presence of other regulated features that may occur in this area. Prior to the start of any future site disturbance we recommend additional consultation with the municipality, and other state resource agencies including the Maine Natural Areas Program and Maine Department of Environmental Protection in order to avoid unintended protected resource disturbance.

Please feel free to contact my office if you have any questions regarding this information, or if I can be of any further assistance.

Best regards,

John Perry
Environmental Review Coordinator

MTA Toll Plaza Mile 8.8 site Pre-Application Review

Township: York

Project: MTA Toll Plaza

Date: November 13, 2015

MDIFW Review Staff: Derek Yorks, Cory Stearns, Phillip deMaynadier, and John Perry

This letter provides initial comments and recommendations for pre-application review of the proposed Maine Turnpike Authority (MTA) toll plaza located at mile 8.8 in York.

Following a visit to the site where MDIFW biologists Cory Stearns (Region A) and Derek Yorks (Research and Assessment Section, Bangor) joined representatives from the MTA, DEP, and Sebago Technics, MDIFW has identified the following jurisdictional concerns and recommendations for priority species and habitats. State-listed species (Spotted Turtle) are protected under the Maine Endangered Species Act (MESA) from take (killing) and harassment (injury or significant disruption of normal behavioral patterns). MDIFW has the legal mandate to enforce MESA under 12 M.R.S. 12805. Significant Wildlife Habitats (Significant Vernal Pools and Inland Waterfowl and Wading Bird Habitats), and habitat for rare or endangered species are protected by the Natural Resources Protection Act (NRPA) and/or the State's Site Location Law (Chapter 375, Protection of Wildlife and Fisheries).

1) **Significant Vernal Pools (SVPs):** Three Potential SVPs eligible for protection under NRPA have been identified on site. The current project design should avoid most impacts to the two westernmost pools. A planned access road will lead to some fragmentation of these pools, but given that traffic on this access road will be limited to the vehicles of toll booth and facility maintenance workers it is MDIFW's opinion that wildlife movements among these pools will not be significantly impacted and thus no additional mitigation measures are recommended.

   The third potentially SVP is the closest of the three to the turnpike (located within the "Maine Turnpike Authority 7 Morrison Drive" lot where it borders the Turnpike ROW). It is MDIFW's opinion that this pool could be negatively impacted by additional loss of forested habitat within 250 ft. of the pool, as well as potential alteration to its hydrology should the ledge at the pools eastern side be disturbed and affect the water table.

2) **Spotted turtles and ribbon snakes**: A population of spotted turtles (Threatened) and a population of ribbon snakes (Special Concern) were previously documented at an emergent wetland immediately adjacent to the project area to the west of the turnpike. Both of these species likely travel to multiple wetlands on site and the vernal pool complex immediately north of this wetland is likely utilized by these populations. The

documented spotted turtle/ribbon snake wetland is hydrologically connected to the vernal pool complex by way of a seasonal outlet stream which has been channeled into a ditch where it parallels the turnpike (flowing north) and becomes a natural stream again (flowing west) and connects to the vernal pool complex. It is MDIFW's opinion that maintaining hydrologic connectivity is critical to the persistence of spotted turtles and ribbon snakes at this location. Maintaining connectivity is especially important given the proposed loss of some forested buffers around wetlands used by these populations, with additional noise and disturbance at the site potentially altering patterns of habitat use and migratory pathways between wetlands.

Additionally, new evidence of a breeding population of spotted turtles within the project area on the east side of the turnpike was documented during the 8/28/2015 site visit when a spotted turtle nest was discovered next to the 36-inch culvert on this side of the turnpike. The nest contained 2 eggs that had been destroyed by mowing equipment as well as 2 potentially viable eggs. MDIFW collected the 2 seemingly viable eggs for incubation and at the present time just one of these eggs has hatched (on 9/14/2015). The female turtle likely emerged to nest from the ditch at the culvert outlet and may inhabit any or all of the wetlands close to the culvert inlet on this side of the turnpike. A number of these wetlands will be directly impacted by the project, which in turn will have potential adverse impacts on the local spotted turtle population.

3) **New England Cottontail (NEC)**: NEC has not been documented at the site and no evidence of their presence was found during the site visit. However, review polygons occur about a mile to the north and to the south of the project site. NEC require early successional habitat, such as thick shrubs or young trees. Large highways (e.g., the turnpike) have been shown to inhibit NEC dispersal, but roadside habitat can facilitate dispersal across the landscape (i.e., they rarely successfully cross large highways, but more commonly move along them.) The project area on the western side has a very limited amount of early successional habitat. The edge of the SVP and the other wetlands does have some shrubby cover, but these areas will not be directly impacted by the project. On the eastern side there is some shrubby vegetation within the construction zone, primarily associated with the wetlands. Disturbance to the shrubby wetland adjacent to where the spotted turtle nest was found is the most likely place on site for an impact to NEC to occur (if they are present). MDIFW is planning to do snow-tracking surveys for New England and eastern cottontails (a non-native species that was recently detected a few miles away) in York this winter to determine the status of both species in the town. MDIFW recommends including this site as part of that effort to more definitively determine if NEC will be impacted by this project.

In summary, MDIFW finds that current project plans will likely adversely impact populations of spotted turtles and ribbon snakes because of a) direct impacts to suitable wetland habitat and forested buffers at the project site and b) indirect impacts by way of increased noise, lights, and vibration that may alter the use and functionality of available habitat.

More specifically, the emergent marsh where spotted turtle and ribbon snake have been documented will be impacted by the construction of the toll plaza because; 1) the forested buffer within 250 feet of the wetland will be further degraded; 2) the outlet stream (including the ditched portion) will be altered -- a stream that provides a hydrologic connection to wetlands that are likely spotted turtle habitat directly to the east of the wetland; and 3) additional noise, lights, and vibration from the toll plaza that likely will degrade habitat suitability for the resident spotted turtle population.

Several wetlands onsite that will be directly impacted by the project (filled entirely, partially, or altered) appear to be suitable spotted turtle and ribbon snake habitat, which includes wetlands on both the east and west sides of the turnpike. Several wetlands close to the newly documented spotted turtle nest will be filled either entirely or partially, wetlands that likely serve as habitat to the local spotted turtle population.

MDIFW recommends the following measures to mitigate negative impacts to spotted turtles, ribbon snakes, New England cottontail, and other vernal pool-associated wildlife at the site:

A) **Installation of a wildlife passage and exclusionary fencing at the north end of the site:** We recommend that the 36-inch concrete culvert that currently facilitates the flow of a small stream at the north end of the project area be replaced by a large box culvert or a bridge that will facilitate a more natural stream channel and provide stream bank habitat allowing rare turtles and snakes (and other aquatic and terrestrial species) to move safely beneath the turnpike. The general design of this structure should allow for high light levels which may ideally be achieved by the construction of two parallel bridges or box culverts (one for northbound and one for southbound). Importantly this design will allow light to enter an area in the median strip between the north and southbound lanes. Exclusionary fencing should be used on both sides of the turnpike in conjunction with the crossing structure to funnel wildlife and prevent additional road mortality. Currently, MDIFW recommends that this fencing be installed around the toll collection facility itself and extending northward roughly to the project boundary. Additional rare turtle and snake surveys in the Spring of 2016 by MDIFW are required to better inform whether the exclusionary fencing should be extended further south of the proposed toll collection facility.

B) **Reduced road salt application and maintenance of forested buffer for access road:** We recommend that the toll booth access road be a no-salt or low-salt road to maintain optimal water quality for pool breeding amphibians. Road salt has been shown to be detrimental to amphibian development where it collects in pools as runoff. Because the access road is a low-traffic roadway where vehicles will be travelling at low speeds it can be safely maintained in winter months using little or no road salt.

C) **NEC habitat mitigation:** Installing a large box culvert or bridge (as suggested to mitigate for turtle impacts) so that there is a dry zone for cottontails and other terrestrial wildlife to pass under the turnpike would facilitate dispersal across the landscape. This would have the benefit of increasing gene flow between populations on opposing sides of the turnpike, and increase the likelihood that dispersing NEC from one side of the turnpike colonize suitable habitat on the other side. Maintaining shrub habitat along the exclusionary fence and elsewhere in the turnpike ROW would facilitate NEC dispersal along the highway, and to the crossing structure.

MDIFW appreciates the efforts of Sebago Technics and the Maine Turnpike Authority to cooperate on this pre-application review. We are confident that with the recommended modifications and mitigation above the proposed development will not have significant adverse impacts to Maine's fish and wildlife resources. Please contact my office if you have any questions regarding this information, or if I can be of any further assistance.

Best regards,

John Perry

Environmental Review Coordinator

February 3, 2016

Dear Sara,

Thank you for the opportunity for meeting and the subsequent site visit to the MTA York Toll Plaza Project area this past December. It was very helpful for our staff to see the site and especially some of the conceptual mitigation and preservation options. We are pleased and encouraged by the open discussions that have taken place and hope to continue a productive relationship as your project moves forward.

Based on our staff's assessment of the possible mitigation opportunities following our observations and conversations during the site visit, MDIFW offers the following recommended mitigation and enhancement strategies, <u>in order of preference</u>, for the MTA York Toll Plaza Project:

I. Habitat Preservation and Connectivity Option 1:

As discussed during the meeting and site visit, while the Morrison Property could be suitable as a mitigation opportunity, we are more interested in identifying areas to preserve within the area of the "Corn Swamp" located between Chases Pond Road and Scituate Road. This is the largest (relatively) unfragmented block of habitat known to provide habitat for Spotted Turtles, Blanding's Turtles, and Ribbon Snakes in close proximity to the mile 8.8 Toll project. Additional land preservation in this area could complement existing conservation parcels held in the area by York Land Trust and York Water District and help to prevent further development from converting and fragmenting existing high value turtle habitat.

Along with the habitat preservation component, and as briefly discussed during our December field trip, MDIFW is interested in having MTA potentially cooperate in the implementation of exclusionary fencing and a wildlife crossing structure along Route 236 in Eliot (see attached map). MDIFW has identified a causeway along a stretch of Route 236 that is causing mortality for several species of turtles, including both State-listed Blanding's and Spotted Turtles, State Endangered New England Cottontail, Brown Snakes (Special Concern), and other more common species. MDIFW has been working with MaineDOT to 1) secure funding to eliminate the risk to listed species (i.e. exclusionary fencing) and 2) replace the existing drainage structure with a larger wildlife crossing structure, similar in nature to what was proposed for a crossing structure near the site of the proposed toll plaza. Based on several years of data, MDIFW believes this location is causing the highest mortality of listed turtles in Maine. MDIFW is still working on a detailed fencing and wildlife passage design in cooperation with MDOT, but a preliminary estimate of the cost for complete project implementation (materials and labor) is approximately $400,000.

II. Habitat Preservation and Connectivity Option 2:

Through researching the last round of grant proposals to the Maine Natural Resource Conservation Program (MNRCP; aka Maine's In-Lieu Fee Program) MDIFW has identified several unfunded high priority mitigation parcels located in the greater Mount Agamenticus ecological focus area (straddling the towns of York, Wells, and South Berwick). These parcels have willing sellers, completed market assessments, and motivated buyers in the form of the York land Trust and/or Great Works land Trust. Furthermore, the parcels contain suitable habitat, and in some cases documented use, by state-listed turtles and other species of conservation concern. It is MDIFW's opinion that the collective protection of three of these parcel projects (see attached maps) would achieve greater wildlife mitigation values than the Morrison parcel, and potentially at a significantly lower expense to MTA. The three projects collectively amount to approximately 119 acres with a combined (unfunded) request to MNRCP of approximately $508,000.

Alternatively, and of approximately equal mitigation value to the three parcel projects above (as regards rare turtles and potentially New England Cottontail), is a project known as the Rams Head Farm, a 220 acre unfragmented forested parcel that borders the Mount Agamenticus focus area, which is highly vulnerable to development with significant road frontage on Clay Hill Road (see attached map). This parcel is currently one of the York Land Trust's highest priorities for protection, and with an assessed value of $850,000 a mitigation contribution similar to that estimated above (approximately $500,000) would likely make the project a success for the YLT, which has only raised a small portion of the required funding.

III. Habitat Preservation and Connectivity Option 3:

This option includes using the Morrison Property as the preservation parcel as well as cooperation with MDIFW in funding and implementing the Route 236 causeway exclusionary fencing and crossing structure described above.

IV. Habitat Preservation and Connectivity Option 4:

This option includes using the Morrison Property as the preservation parcel as well as replacing the Chases Pond Road culvert (assuming full cooperation by the Town of York) with a wildlife crossing structure and exclusionary fencing, as discussed at the December meeting and site visit.

While MDIFW agrees that the Morrison Property offers some habitat mitigation value for priority wildlife species, the projects described in Options 1 and 2 above are considered much more valuable based on their known habitat value, location, risk of development, and documented use by listed species. Conceivably, as a previously permitted subdivision some or all of the lots in the Morrison Property could be sold and the funds used by MTA to purchase these other parcels at a potentially lower total cost than what the MTA paid for the Morrison property.

Please let us know when it is convenient to discuss the details of these options further. We look forward to working with you as your project develops and are encouraged with the MTA's willingness to discuss opportunities to both mitigate and enhance the priority wildlife habitat values potentially affected by the MTA Mile 8.8 Toll project.

January 25, 2016

To: John Perry, Maine Inland Fisheries and Wildlife
From: Sara Zografos, Maine Turnpike Authority

CC: Phillip deMaynadier, Maine Inland Fisheries and Wildlife
Derek Yorks, Maine Inland Fisheries and Wildlife
Cory Stearns, Maine Inland Fisheries and Wildlife
Robert Green, Maine Department of Environmental Protection
Peter Mills, Maine Turnpike Authority
Ralph Norwood, Maine Turnpike Authority
Kevin Slattery, HNTB

Subject: Inter-Agency Site Visit on December 17, 2015

On December 17, 2015, staff from Maine IF&W, DEP and the Turnpike met to discuss how to protect and enhance wildlife habitat near the York Toll. We began by examining mapped overviews of both sides of the turnpike in the range between Mile 7 and Mile 10 including areas well outside the Turnpike's right of way.

While the impetus for the review is to develop mitigations for construction of a toll plaza at Mile 8.8, the project in its entirety, including the recovery of land near the old plaza, presents broad opportunities to preserve and improve habitat. The common goal of all three agencies is to implement a series of practical measures to protect and enhance living conditions for endangered or threatened species, including New England cottontail, ribbon snake, and spotted turtle. From the Turnpike's perspective, protected habitat is an ideal use for land close to an Interstate highway.

One goal is to enhance connectivity among divided animal populations, for example, by up-grading existing culverts under the turnpike or other roadways to better accommodate animal passage. To replace the existing slant culvert at Mile 9.1 would be costly and not clearly effective. On the other hand, enhancing passage through the box culverts of the Cape Neddick River at Mile 9.5 would be relatively easy. It may be appropriate first to determine whether the habitat at either end of the passage has value for the species we are concerned about. A third opportunity is to replace the culvert under Chases Pond Road that discharges the outfall from Corn Swamp Bog into the subdivision land purchased by the Turnpike. Chases Pond Road itself is owned and controlled by the town of York.

The toll project creates substantial opportunities to reclaim and preserve habitat near the highway. When the old plaza is torn down, several acres of pavement will be removed adjacent to existing wetlands with possibilities for creating new permanent habitat. Also suitable for conservation is the Turnpike's 32.8 acre undeveloped subdivision containing vernal pools and wetlands. The Turnpike might sell some of the property or otherwise provide funds to purchase habitat in other locations with higher benefits for protected species. Off site connectivity enhancements are also possible.

After office discussion, we visited several sites including: the Cape Neddick River box culverts at Mile 9.5; the intended new toll site at Mile 8.8 on the west side; the Turnpike's eight-lot subdivision off Chases Pond Road; and the area of the existing toll facility near Mile 7.3.

All three agencies hope to collaborate in designing effective, practical enhancements for wildlife habitat in York.

Below is a bulleted list of discussion items followed by annotated photos taken during the site visit.

Existing plaza

- Discussed what form of habitat should be created in the area where pavement will be removed. Creating shrub cover for New England cottontail may be appropriate particularly since wetland based cover will survive longer without becoming forest.
- Inspected the culvert end at the Little River on the East side of the existing plaza. It appears impractical to excavate and replace the culvert and there is uncertainty about the value of habitat on either side.
- Discussed adding exclusionary fencing to block wildlife from attempting to cross up and over the turnpike and to channel wildlife to existing culvert crossings.

MTA subdivision

- Possibility of retaining the lots as undeveloped forested open space, vernal pools, and wetland.
- The possible access drive to the utility building appears OK. It is not planned for high use and will not likely cause adverse wildlife effects on vernal pool species during migrations.
- Minimize use of deicing salt to protect adjacent wetlands and vernal pools near access drive.
- Possibly sell off lots closer to Chases Pond Road to generate revenue for other preservation opportunities in the area.
- MTA could fund the purchase of larger, higher value, and more remote parcels for conservation.

Mainline connectivity

- A new wildlife crossing to provide a connection beneath the mainline is costly and uncertain of success. Funds for connection might better be used for other purposes.
- Possible retrofit of the nearby Cape Neddick double box culvert adding an upland shelf with exclusionary fencing-- after additional survey by IF&W.
- Exclusionary fencing and wildlife funneling possibly from new plaza location to Cape Neddick River box culvert. Fence design envisioned to be similar to that in Richmond--using hardware cloth attached to low height chain link fence with wing ends.

Vernal Pool at location mile 8.8

- Exclusionary and funneling fences
- Avoid under-draining the vernal pool by maintaining bedrock between the pool and the proposed plaza lanes.

Off-site connectivity

- Chases Pond Road culvert replacement to allow wildlife an under-road passage and eliminate the hanging downstream culvert end. Include funneling fences to direct wildlife to the culvert.

November 25, 2015

From: Peter Mills, Executive Director, Maine Turnpike
To: Commissioner Chandler Woodcock and John Perry, Environmental Review Coordinator

Thank you for meeting with us on November 13 and for sharing your conclusion that a toll plaza can be built at mile 8.8 with no significant impact to Maine wildlife if mitigations are adopted.

It is our sense that this project creates opportunities not just to mitigate but to enhance wildlife habitat – to make improvements for which we may need your guidance. For our site visit on December 17, we suggest the following agenda:

The larger environment

We should start with a brief overview of both sides of the Turnpike from mile 7 to mile 10. Much of the land adjacent to the Turnpike from the York traffic ramp north to the Cape Neddick River is wooded, open and undeveloped. Some of the owners of large tracts are the York Water District, the York Land Trust, the Maine Turnpike, and descendants of farmers who have retained family land as woodlots and open space.

There are significant opportunities in this area to preserve or enhance habitat for protected species. Habitat preservation is an ideal use for land in the vicinity of an interstate highway.

Reclamation of the existing toll site

$7M of this $40M toll replacement project will be used to decommission the old plaza at mile 7.3, remove approximately three acres of pavement, and reclaim the ground. The land could be re-constructed as wetland, as cottontail habitat, or as terrain for a variety of other purposes. This is a major opportunity for habitat reclamation.

The Morrison subdivision

In 2014, the Turnpike paid $975,000 to the Morrison family for a 32.8 acre subdivision on the west side of mile 8.7. Although the Turnpike needs only a sliver of the land, we were not able to buy at arms' length anything less than the entire eight-lot subdivision. The Turnpike now owns the property with a plan to sell off six or seven of the house lots after retaining a right of way and the small lot that we need next to the highway for a toll office and parking area.

The Morrison land contains significant wetlands that are part of the outfall from Corn Swamp Bog through a culvert that passes under Chase's Pond Road. Adjoining to the north is another wetland owned intact by the neighbor Karin Prichard.

It seems evident that housing starts are the biggest threat to the loss of wetland and animal habitat in York County. The Turnpike's purchase of the Morrison subdivision has so far curtailed such losses on this property. If a case can be made for preserving these wetlands and the adjoining woods, we are willing to discuss an option to retain the land in perpetuity as permanent wildlife habitat.

This will be costly to the Turnpike but we are willing to present a plan to the Turnpike Board if the environmental benefits outweigh the costs. A long term owner might be the York Land Trust with whom we have corresponded. The trust owns other easements in this vicinity on the east side of the highway.

The Third Vernal Pool

The vernal pool closest to the highway is potentially impacted by the preliminary design layout that we have used for site selection purposes. Although the design as sketched may not impinge directly on the pool itself, the pool sits behind a thick section of ledge that would need to be partially removed if the sketch plan were implemented. In final design, it may be possible to reduce or eliminate such an impact. A discussion with our engineering staff is called for.

Wildlife passage

You have suggested converting a 36" culvert at mile 9.1 to a wildlife passage suitable for turtles, snakes, small amphibians and possibly rabbits and other animals. The cost of such a passage would be on the order of $500,000 if it were constructed as a component of the larger project.

Because the culvert crosses the highway at an angle and ends on each side of the road at the toe of the highway slope, it is longer than is necessary to get from one side of the road to the other. If building a new passage perpendicular to the highway at an alternative site would be more beneficial, then we should discuss how to optimize its location and construction.

During our field inspection, we should also look at other crossings that already exist. There are several culverts in the area including two large box culverts at mile 9.5 for the Cape Neddick River which is the outflow for Chase's Pond. The Cape Neddick box culverts rarely have much water in them except during extreme flood conditions. The attached photo shows them during spring runoff with just a few inches of water. Installing a dry shelf would not be difficult.

Mapping and studies

Before our meeting on December 17, we will examine our files to see if we have any studies or reports in addition to the cottontail report from Normandeau that Sara recently sent you. If IF&W will share with us your studies and mapping for this region, it will be appreciated. This will assist us in determining how best to deal with wetland and habitat issues. To avoid disclosing information to poachers, we will keep all such material in confidence under such constraints as you may require.

Some proposals to mitigate, preserve or improve nearby habitat could be expensive. We need to make sure that whatever we do is reasonable and cost-effective.

Conclusion

This project may not be one that places the owner in the conventional posture of having to mitigate for material harm. On the contrary, it presents significant opportunities to reclaim, preserve and enhance wildlife habitat -- in essence, to make things better than we found them. As examples:

1. Removing three acres of impervious pavement at mile 7.3 and reclaiming the associated wetlands will create new habitat next to large wetlands that already exist.

2. The aggregate environmental benefits are substantial for converting to Open Road Tolling (ORT) and for re-locating to a drier site at mile 8.8 on a more level stretch of road. Although you have mentioned that "noise, lights and vibration" at the new toll plaza may degrade nearby habitat, Open Road Tolling eliminates most of these impacts. 85% of trucks and two-thirds of all traffic pay electronically and will simply continue along the existing highway at the new site as they do at present. Only cash payers need to stop.

At the old site near mile 7.3, where all traffic presently must stop or slow down to 10 mph, the noise, air emissions and lighting associated with the plaza itself will be eliminated. Southbound trucks will no longer need to Jake brake down a hill as they approach and northbound trucks will no longer be accelerating through the gears as they climb the hill after departure. This will benefit nearby home owners as well as any wildlife on the adjoining reclaimed and undeveloped land.

3. If the Turnpike board agrees to do so, taking the Morrison subdivision off the market and preserving 30 acres of land for wildlife habitat creates an environmental opportunity that would have been lost by now had the Turnpike not intervened.

4. Mobilizing for the upcoming construction allows us to consider either creating a new wildlife passage or improving existing corridors (e.g. the Cape Neddick box culverts) to link divided animal populations and enhance their range.

Peter Mills
207 858 6400 cell

Sara has sent you:

1. A map of the proposed plaza at mile 8.8 and the adjoining subdivision the Turnpike bought in 2014.
2. A survey done by Normandeau in 2010 that found no evidence of cottontail in the areas examined.

Attached with this memo are:

3. A tax map of the region from mile 7 to mile 10 showing tracts of open land.
4. A map showing the York Water District pipeline.
5. An exchange of emails with the York Land Trust.
6. A photo of box culverts for the Cape Neddick River at mile 9.5.

SEBAGO
TECHNICS

February 18, 2016
14181

Mr. Earle G. Shettleworth, Jr.
Maine Historic Preservation Commission
55 Capitol Street
State House Station 65
Augusta, ME 04333-0055

Maine Historic Preservation Commission Review
Maine Turnpike Authority, Corridor Study for Toll Plaza

Dear Mr. Shettleworth:

Sebago Technics, Inc. has been retained by the Maine Turnpike Authority (MTA) to assist with the environmental permitting for the proposed York Toll Plaza Relocation. The MTA has identified a new toll plaza location based upon the results of a comprehensive corridor study that was recently completed. The location selected is in the vicinity of mile 8.2 to mile 9.4 with the new toll plaza being located at mile 8.8.

We are in the process of preparing agency applications to include a MDEP Natural Resources Permit Application and US Army Corp of Engineers 404 permit application and would request an updated review of the project area for archaeological sites as well as historic buildings, objects and districts. We have enclosed a location map depicting the project location for your reference.

If you have any questions, please do not hesitate to contact me.

Sincerely,

SEBAGO TECHNICS, INC.

Owens A. McCullough, P.E.., LEED-AP
Vice President- Engineering & Project Development

OAM/llg
Enc.

cc: Ralph Norwood, P.E., PTOE – MTA
Sarah Zografos, Planner/Agency Liaison
Rod Emery, P.E – Jacobs Engineering

75 John Roberts Road – Suite 1A, South Portland, ME 04106-6963 • 207-200-2100 • Fax: 207-856-2206

From:	Aaron Hunter
Sent:	Wednesday, January 07, 2015 4:25 PM
To:	Owens McCullough
Subject:	FW: Maine Turnpike, corridor study for toll plaza
Attachments:	York Toll Plaza archaeology.pdf

FYI

From: Spiess, Arthur [mailto:Arthur.Spiess@maine.gov]
Sent: Wednesday, January 07, 2015 4:21 PM
To: Aaron Hunter
Cc: Smith, Leith
Subject: Maine Turnpike, corridor study for toll plaza

Hello Mr. Hunter:

Please pass this along to Owens McCullough as necessary. Dr. Leith Smith (MHPC historic archaeologist) and I have considered how best to respond to the Sebago Technics inquiry of November 13 (and your follow up map of December 29) for archaeological site information that might exist along the Turnpike corridor. In this case we think that the easiest thing is to send you a copy of our archaeological survey report on a recent previous round of planning for a new Turnpike toll plaza (pdf attached). The report provides background historic information and shows exactly where we dug archaeological testpits and/or did other archaeological fieldwork. We did not identify any significant archaeological sites in the limited areas where we worked. So, releasing the report in its entirety represents little risk that a significant site would be looted, if the details are made public. (We would prefer not, but understand that you may have to do so.) Our work was limited very tightly to the Turnpike right of way and several potential localized areas abutting the right of way.

When a new toll plaza location and work limit is chosen (or multiple locations), unless the new locations are identical in footprint with the several considered in this report, more archaeological fieldwork is likely to be necessary. Consequently, we would consider that further project review for archaeology at your request at any time in the planning process.

Sincerely, Arthur Spiess

Dr. Arthur Spiess
Senior Archaeologist, Maine Historic Preservation
State House Station 65
Augusta, ME 04333
desk phone: 207-287-2789

From: Reed, Robin K <robin.k.reed@maine.gov>
Sent: Tuesday, January 13, 2015 5:20 PM
To: Aaron Hunter
Cc: Owens McCullough
Subject: RE: MHPC# 1772-14 Maine Turnpike Authority; corridor study for toll plaza; York (mile markers 7.3 to 10.4)
Attachments: CARMA Trained Consultants.pdf

MHPC# 1772-14

Aaron:

In addition to Art Spiess' email to you dated January 7, 2015, please find our additional comments below regarding above ground architectural resources:

There are no National Register listed within the project site boundaries. There may be some prior architectural survey records in our files, but those properties have not been evaluated for National Register eligibility. Therefore, architectural survey will likely be necessary for this project.

Architectural survey identifies and records information on all resources within the APE that are 50 years old or older. The APE for architectural resources must be clearly outlined on a USGS topographical map in consultation with our office. Survey must be completed according to our "Revised Above Ground Cultural Resource Survey Manual Project Review Specific." All surveys must now be submitted electronically via our new on-line CARMA database. See http://www.maine.gov/mhpc/architectural_survey/survey_guidelines.html for more information. On that webpage, please also review our "Project Review Survey Procedures." Please contact Christi Mitchell, our survey coordinator, at 287-1453 or christi.mitchell@maine.gov to schedule an appointment to review our files.

Regarding conducting architectural survey, a list of historic preservation consultants is enclosed for your information and use. Our office encourages you to utilize consultants who meet the Secretary of the Interior's Professional Qualifications Standards (36 CFR Part 61, Appendix A), and who have a thorough understanding of the survey process and the National Register of Historic Places Criteria for eligibility. Generally these are architectural historians, but there are also professional standards for historians, architects and historic architects. While there certainly is some cross over between the categories, it is important to realize that having a broad and detailed knowledge of architectural styles, as represented in Maine, is crucial to completing a successful project efficiently. If you have questions about whether a particular firm has conducted survey for our office, please contact our survey coordinator, Ms. Mitchell.

In addition, an assessment of effects must be submitted to our office for historic properties that are identified, pursuant to the Section 106 regulations.

Let me know if you have any questions.

Robin K. Reed
Maine Historic Preservation Commission
55 Capitol Street
65 State House Station

Augusta, ME 04333
phone: 207-287-2132 ext. 1
fax: 207-287-2335
robin.k.reed@maine.gov
http://www.maine.gov/mhpc

From: Aaron Hunter [mailto:ahunter@sebagotechnics.com]
Sent: Monday, December 29, 2014 10:19 AM
To: Reed, Robin K
Cc: Owens McCullough
Subject: MHPC# 1772-14 Maine Turnpike Authority; corridor study for toll plaza; York (mile markers 7.3 to 10.4)

Good Morning Robin,

Attached you will find a USGS topo map that indicates the boundaries of this project. If you have any further questions please let me know.

Thank you,

Aaron Hunter
Civil Engineer

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Email: ahunter@sebagotechnics.com

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SEBAGO
TECHNICS

November 13, 2014
14181

Mr. Earle G. Shettleworth, Jr.
Maine Historic Preservation Commission
55 Capitol Street
State House Station 65
Augusta, ME 04333-0055

Maine Historic Preservation Commission Review
Maine Turnpike Authority, Corridor Study for Toll Plaza

Dear Mr. Shettleworth:

Sebago Technics, Inc. has been retained by the Maine Turnpike Authority (MTA) to assist with an environmental corridor study for a section of the Maine Turnpike. The study is part of a larger planning assessment that Jacobs Engineering has recently undertaken for the Southern Maine Toll Plaza in York. The York Toll Plaza was constructed in 1969 and surpassed its useful design life due to traffic, operational and structural deficiencies.

During the past several years, the MTA has initiated a program to evaluate the feasibility for a new Toll Plaza within an identified corridor of the Turnpike that includes the existing Toll Plaza (mile marker 7.3) and an area extending northerly of the York Plaza to mile marker 10.4. In addition the area between mile marker 12.7 and 13.7 was also identified for a potential toll plaza.

As we conduct the planning study, we would appreciate the MHPC's review of the study corridor for the identification of archaeological sites as well as historic buildings, objects and districts. We have enclosed a location map depicting the study area for your reference. If you have any questions, please do not hesitate to contact me.

Sincerely,

SEBAGO TECHNICS, INC.

Owens A. McCullough, P.E.., LEED-AP
Vice President- Engineering & Project Development

OAM/llg
Enc.

cc: Ralph Norwood, P.E., PTOE - MTA
Rod Emery, P.E – Jacobs Engineering

75 John Roberts Road – Suite 1A, South Portland, ME 04106-6963 • 207-200-2100 • Fax: 207-856-2206

Emmerald Irvin

From: Emmerald Irvin
Sent: Friday, September 02, 2016 3:14 PM
To: 14181
Subject: FW: York Toll Plaza Project
Attachments: MHPC Correspondence full.pdf

From: Emmerald Irvin
Sent: Friday, September 02, 2016 8:58 AM
To: 'Reed, Robin K' <robin.k.reed@maine.gov>
Subject: RE: York Toll Plaza Project

Robin,

I have attached our record of correspondence to this e-mail.

Thank you,
Emmy

From: Reed, Robin K [mailto:robin.k.reed@maine.gov]
Sent: Friday, September 02, 2016 8:49 AM
To: Emmerald Irvin <eirvin@sebagotechnics.com>
Subject: RE: York Toll Plaza Project

Emmy-

Do you have a copy of our previous correspondence? Did we issue a letter or email comments?

Robin K. Reed
Maine Historic Preservation Commission
55 Capitol Street
65 State House Station
Augusta, ME 04333
phone: 207-287-2132 ext. 1
fax: 207-287-2335
robin.k.reed@maine.gov
http://www.maine.gov/mhpc

From: Emmerald Irvin [mailto:eirvin@sebagotechnics.com]
Sent: Friday, September 02, 2016 8:24 AM
To: Reed, Robin K
Cc: Owens McCullough
Subject: York Toll Plaza Project

Good Morning Robin,

I would like to follow up once more to confirm the findings of the MHPC for the York Toll Plaza Relocation project before we submit the permit applications. According to previous correspondence there is no concern about this project, I have attached the project location map to this e-mail for reference. If there is any other materials you need please let me know.

Thank you,
Emmy

Emmy G. Irvin *Permitting Specialist/Project Coordinator*
Office: 207.200.2100 | Direct: 207.200.2096
75 John Roberts Rd., Suite 1A, South Portland, ME 04106
eirvin@sebagotechnics.com | www.sebagotechnics.com
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APPENDIX 3

JACOBS ENGINEERING GEOTECHNICAL REPORT

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JACOBS

YORK TOLL PLAZA, MILE 8.8

MAINE TURNPIKE AUTHORITY

PRELIMINARY GEOTECHNICAL REPORT

August 12, 2016

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Contents

1. Introduction

This report presents our geotechnical foundation recommendations for the construction of a new toll plaza and administration building to be located near Mile 8.8 on the Maine Turnpike I-95 in York, ME. We also present recommendations for demolition of the existing toll plaza at Mile 7.3. This report is subject to the limitations contained herein.

All elevations in this report are presented in feet and are referenced to the North American Vertical Datum of 1988 (NAVD88).

2. Existing Site Conditions

The proposed site is located near Mile 8.8 of the Maine Turnpike I-95 in York, ME. The existing ground surface elevations in the vicinity of the proposed toll plaza range from approximately 158 feet to 172 feet. Site grades are higher on the west and slope down to wetland areas on the east. Exposed bedrock outcrops are visible along both the northbound and southbound roadways. The area of the proposed access road between Chases Pond Road and the Turnpike is currently heavily wooded and moderately sloping, with occasional bedrock outcrops present. Refer to Figure 1 of Appendix A for a Site Locus Plan.

3. Proposed Construction

Proposed construction currently consists of a new toll plaza canopy, a service-access tunnel extending below the entire toll plaza, an administration building, parking lot, two gantries for open road tolling (ORT) lanes, and an access road from Chases Pond Road. The existing 6-lane roadway will be widened to 15 lanes; 8 in the southbound direction and 7 in the northbound direction. The proposed locations are shown on Figures 2 through 4 of Appendix A.

4. Local Geology

According to the USGS Geologic Map of Maine, the site is located in the Cretaceous alkali feldspar quartz syenite Formation. The rocks of this area are of Cretaceous age and consist mainly of quartz syenite. Nearby rock formations include the Cretaceous Granite Formation and Silurian-Precambrian Z Kittery Formation. At the York Toll Plaza site (Mile 8.8), borings indicated that bedrock on site is a very fine grained, gray metagraywacke and fine to coarse grained, light gray granite and is likely an extension of the Silurian – Precambrian Z Kittery Formation which is of Silurian – Precambrian Z age. Refer to the boring logs in Appendix B for detailed rock core sample descriptions.

5. Subsurface Exploration Program

Under the coordination of Jacobs, New England Boring Contractors (NEBC) of Derry, New Hampshire performed a total of 13 borings (B-1 through B-13) and 10 test pits (TP-4 through TP-13) in January 2016. Exploration locations are presented on Figures 2 and 3 located in Appendix A of this report.

Jacobs classified the soil samples in accordance with the Burmister Classification System and bedrock was classified in accordance with the International Society for Rock Mechanics rock classification system.

The borings were advanced using hollow-stem auger and rotary-wash techniques (3-inch and 4-inch casing) to depths ranging from approximately 6.3 to 23 feet below existing grade. SPTs were generally performed at 5 foot intervals using a 140-lb safety hammer with a rope and cathead unless otherwise noted on the logs (note that boring B-12 had continuous sampling in the top 6.9 feet). Rock cores were performed in all borings except borings B-1, B-2, B-4 and B-5, which all terminated on probable bedrock. Bedrock elevations ranged from approximately 163.6 to 146.5 feet. Refer to the boring logs in Appendix B for additional information.

Two two-inch-diameter groundwater observation wells were installed in borings B-3 and B-13 at respective depths of 6 feet and 12 feet below the ground surface; both wells were completed at the surface with standpipes. Installation records of the observation wells are included with the boring logs in Appendix B.

A 6.5-inch diameter pavement core was collected at boring B-10 to determine the existing asphalt thickness for at site. The pavement thickness was found to extend approximately 17 inches below the existing roadway grade.

Test Pits TP-4, TP-5, TP-6, TP-10, TP-11, TP-12 and TP-13 were performed along the northbound and southbound shoulders of the turnpike. Test Pits TP-7, TP-8 and TP-9 were performed along the proposed access road. All test pits were performed with a Kubota KX080-4 excavator to depths between 2.75 feet and 7 feet below the ground surface, where apparent bedrock was encountered. For additional details, refer to Table 5 and the test pit logs in Appendix B.

6. Laboratory Testing

6.1 Soil Testing

Laboratory tests were conducted by Thielsch Engineering in Cranston, RI and performed on representative soil samples to help evaluate the physical and engineering characteristics of selected split spoon samples. Grain size (ASTM D-422), natural moisture content (ASTM D-2216), and soil classification (in accordance to USCS and AASHTO) were determined for the samples. The laboratory results are summarized in Table 1 and complete laboratory data is presented in Appendix D.

Table 1: Summary of Laboratory Soil Classification Data

Boring No.	Sample No.	Depth (ft)	USCS Soil Classification	AASHTO Soil Classification	% Gravel	% Sand	% Fines	Water Content (%)
B-2	S-2A	7.4 - 9.4	SM	A-4(0)	20.9	42.9	36.2	8.3
B-2	S-2B	7.4 - 9.4	GM	A-1-a	66.1	20.1	13.8	2.9
B-3 (OW)	S-2A	2 - 3.6	SM	A-4(0)	17.8	45.2	37.0	45.6
B-3 (OW)	S-2B	2 - 3.6	GP	A-1-a	93.4	5.0	1.6	1.7
B-4	S-2B	5 - 7	GW-GM	A-1-a	57.4	33.3	9.3	11.5
B-7	S-1	0 - 2	SP-SM	A-1-b	39.9	49.4	10.7	7.1
B-8	S-2	5 - 5.7	SM	A-1-b	18.9	58.4	22.7	14.8
B-10	S-1	1.4 - 3.4	SP-SM	A-1-a	35.8	52.5	11.7	8.6
B-10	S-2	3.4 - 5.4	SM	A-1-b	37.7	47.4	14.9	10.4
B-11	S-2	4 - 6	GM	A-1-a	44.9	42.0	13.1	9.9
B-12	S-3A	4 - 6	SM	A-1-b	21.2	62.4	16.4	8.8
B-12	S-3B	4 - 6	GP	A-1-a	75.2	20.1	4.7	1.6

6.2 Rock Testing

Rock strength tests (unconfined compressive tests per ASTM D-2938) were performed on multiple rock core samples. Bedrock unconfined compressive strengths ranged from 6,848 to 51,278 psi. The rock testing results are summarized in Table 2 and complete laboratory data is presented in Appendix D.

Table 2: Summary of Laboratory Rock Strength Data

Boring No.	Sample No.	Depth (ft)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Bedrock Type[1]
B-3 (OW)	C2	10.2 - 10.6	188.9	12,842	Metagraywacke
B-6	C3	14.1 - 14.5	168.0	33,762	Metagraywacke
B-7	C1	5.1 - 5.5	186.4	13,681	Metagraywacke
B-7	C3	13.5 - 13.9	183.9	21,374	Metagraywacke
B-8	C1	6.4 - 6.8	172.0	27,242	Metagraywacke
B-9	C1	13.1 - 13.5	174.2	31,465	Granite
B-10	C1	20.6 - 21.0	166.5	6,848	Granite[2]
B-11	C3	20.1 - 20.5	184.0	51,278	Metagraywacke
B-12	C2	22.0 - 22.4	170.5	14,406	Metagraywacke
B-13 (OW)	C1	10.0 - 10.4	183.2	33,305	Metagraywacke

Notes:

1. Bedrock types determined by Jacobs.
2. Sample fractured along heated joint.

7. Subsurface Conditions

The following generalized subsurface conditions at the site were inferred from the exploration data, with some interpretations. Subsurface conditions near in the vicinity of the existing roadway generally consisted of loose to very dense fill overlying granite and metagraywacke bedrock. The subsurface conditions outside of the road area at borings B-1 through B-6 mostly consisted of medium dense to very dense natural sands overlying similar bedrock types. Table 3 presents a summary of the borings. For detailed soil sample descriptions and subsurface information, the boring logs are attached in Appendix B. Soil properties used in the foundation analyses are presented in Appendix F.

Table 3: Summary of Borings

Boring No.	Approx. Ground Surface Elev. (ft)	Approx. Fill Thickness (ft)	Top of Natural Soil Elev. (ft)	Approx. Top of Bedrock Elev. (ft)	Bottom of Boring Elev. (ft)	Approx. Groundwater Elev. During Drilling (ft)
B-1	163.5	NE	163.5	156.5[1]	156.3	162.0
B-2	172.6	NE	172.6	162.0[1]	161.8	NE
B-3 (OW)	168.7	NE	168.7	163.6	150.9	163.4
B-4	165.9	NE	165.9	156.7[1]	156.3	161.4
B-5	166.4	NE	166.4	160.3[1]	160.1	NE
B-6	164.1	NE	164.1	159.8	143.9	163.3
B-7	164.3	3.5	NE	160.8	149.3	160.3
B-8	164.5	6.2	NE	158.3	148.1	159.3
B-9	164.9	12.4	NE	152.5	141.9	155.4
B-10	165.9	13.0	NE	152.9	142.9	156.2
B-11	164.6	13.0	NE	151.6	141.6	156.6
B-12	164.5	18.0	NE	146.5	141.5	158.5
B-13 (OW)	158.1	10.0	NE	148.1	138.1	155.0

Notes:

1. Top of bedrock estimated based on drilling resistance.
2. NE = Not encountered.

7.1 Fill

A fill layer ranging from approx. 3.5 feet to 18 feet was encountered in borings B-7 through B-13. The fill layer mostly consisted of loose to very dense, brown, fine to coarse sand with varying amounts of gravel and silt. SPT N-values ranged from 8 blows per foot (bpf) to 95 bpf. Several samples reached refusal criteria (100 bpf) on probable cobbles within this layer.

7.2 Natural Soil

In borings B-1 through B-6, a natural soil layer ranging from 4.3 feet to 10.6 feet was encountered below existing grade. The natural soil layer consisted of mainly loose to dense, fine to coarse sand with varying amounts of gravel and silt. SPT N-values ranged from 4 bpf to 49 bpf (note that high blow counts over 60 bpf were likely due to the presence of cobbles and or/ boulders and refusal near the top of bedrock). The low blow counts were associated with the first sample from 0 to 2 feet where topsoil and subsoil were generally encountered.

7.3 Bedrock

Granite and metagraywacke bedrock was encountered at approximately 3.5 feet to 18 feet below existing ground surface with elevations ranging from 146.5 feet to 163.6 feet. The encountered bedrock was generally hard, slightly to moderately weathered, moderately to extremely fractured, very fine grained, gray metagraywacke and hard, slightly to moderately weathered, moderately to extremely fractured, fine to coarse grained, light gray granite. The recovered bedrock core samples had a recovery ranging between 40% and 100% and the Rock Quality Designation (RQD) for the bedrock varied between 0% to 94%.

7.4 Test Pits Data

Ten test pits were performed along the shoulders of both the northbound and southbound lanes and along the proposed access road to determine general soil characteristics and depth to bedrock. Test pits TP-7, TP-8 and TP-9 encountered a granular, natural sand and gravel layer with occasional cobbles and boulders along the proposed access road before encountering probable bedrock at approximately 3 to 7 feet below existing ground surface. Test pit TP-10, excavated beyond the existing tree line parallel to the southbound shoulder of I-95, encountered a similar natural layer and encountered probable bedrock at 4 feet below existing ground surface. The six remaining test pits (TP-4, TP-5, TP-6, TP-11, TP-12 and TP-13) were performed on the shoulders of the northbound and southbound lanes, and encountered a sand and gravel fill layer with occasional cobbles, boulders, and apparent blast rock; bedrock was encountered approximately 2.8 feet to 7 feet below existing ground surface at these locations. A summary of the test pit subsurface information is summarized in Table 4 below. Detailed test pit logs are included in Appendix B.

Table 4: Summary of Test Pit Explorations

Test Pit No.	Approx. Station	Offset (ft)	Approx. Ground Surface Elev. (ft)	Depth to Bedrock (ft)	Approx. Top of Bedrock Elev. (ft)	Bottom of Test Pit Elev. (ft)	Approx. Groundwater Elev. (ft)
TP-4	334+72.6	88.3 R	145.0	3.5	141.5	141.5	142.5
TP-5	337+03.6	87.4 L	148.0	3.0	145.0	145.0	145.0
TP-6	339+89.9	91.7 L	154.6	2.8	151.8	151.8	152.1
TP-7[1]	22+96	6’ R	182.2	7.0	175.2	175.2	179.2
TP-8[1]	26+77	13’ L	179.6	3.0	176.6	176.6	177.6
TP-9[1]	30+25	2’ R	179.3	6.0	173.3	173.3	NE
TP-10	347+81.8	194.2 L	165.6	4.0	161.6	161.6	NE
TP-11	349+96.2	95.7 L	159.9	7.0	152.9	152.9	153.9

Test Pit No.	Approx. Station	Offset (ft)	Approx. Ground Surface Elev. (ft)	Depth to Bedrock (ft)	Approx. Top of Bedrock Elev. (ft)	Bottom of Test Pit Elev. (ft)	Approx. Groundwater Elev. (ft)
TP-12	349+95.1	90.0 R	161.0	7.0	154.0	154.0	NE
TP-13	354+95.3	92.4 L	149.1	4.0	145.1	145.1	NE

Notes:

1. Access road stationing and offset.

7.5 Groundwater

Groundwater was encountered in the borings and test pits at approximately 1 foot to 9.7 feet below ground surface, generally ranging between elevations 142.5 feet to 163.4 feet in the roadway and shoulder areas. Groundwater was encountered at depths of 2 to 3 feet in the access road area, corresponding to elevations 177.6 to 179.2 feet. Groundwater was not encountered in borings B-2 and B-5 and test pits TP-9, TP-10, TP-12 and TP-13. Two observation wells were installed in borings B-3 and B-13; monitoring well installation logs are attached in Appendix B. The use of wash boring techniques may have altered the water level readings due to the introduction of water during the drilling process. Local or periodic variations of groundwater elevation should be expected as levels may be influenced by season, precipitation, construction activity and other factors. Therefore, groundwater elevations presented herein may not be representative of water levels encountered during construction. A summary of observation well readings collected by Sebago Technics is summarized in Table 5 below.

Table 5: Summary of Observation Well Readings

Observation Well	Top of Steel Standpipe Elev. (ft)	Ground Surface Elev. (ft)	Groundwater Elev. (ft)				
			1/28/2016	3/9/2016	3/18/2016	4/14/2016	5/5/2016
B-3 (OW)	171.9	168.7	NE	163.3	164.0	163.2	NE
B-13 (OW)	161.2	158.1	155.5	155.5	155.5	155.5	155.6

8. Seismic Design Parameters

8.1 International Building Code (IBC) 2015 Seismic Site Class

Jacobs performed seismic analyses to determine the appropriate site coefficient for structural design of the toll plaza and administration building. Per Chapter 20 of ASCE 7-10, we recommend the use of Site Class C for this site.

In accordance with Section 1613.3.4 of the 2015 IBC, for Site Class C we recommend the design response spectra for the toll plaza and administration building be developed using the following coefficients:

S_{DS}= 0.211 S_{D1}= 0.090

where:

- S_{DS} is the design spectral acceleration coefficient at 0.2-sec period
- S_{D1} is the design spectral acceleration coefficient at 1.0-sec period

Per the Structural Engineer, these structures are defined as Risk Category II (IBC Table 1604.5) and a resulting Seismic Design Category B (IBC Tables 1613.3.5(1) and 1613.3.5(2)). Refer to Appendix E for the Seismic Site Class calculations.

9. Liquefaction Potential

Based on the observed subsurface conditions including soil type and sample density and bedrock depth, the site is judged as not susceptible to liquefaction.

10. Geotechnical Recommendations

10.1 Shallow Foundations

10.1.1 Toll Plaza Canopy

Based on our review of the boring data, it is recommended that the proposed toll plaza canopy be supported on spread footings supported on either gravel borrow or existing granular fill material, overlying shallow bedrock. We conducted spread footing bearing resistance analyses in accordance with AASHTO 2014 procedures for the northbound and southbound toll plazas. In the analysis we assumed an 5 foot by 5 foot footing with maximum eccentricity (B/6), resulting in an effective footing width (B') of 3.33 feet. A resistance factor of 0.45 was used for all spread footing calculations.

For both toll plaza canopies, to limit settlement to about 0.5 inch we recommend an allowable bearing capacity of 5 ksf. Refer to Appendix G for the Bearing Resistance calculations.

10.1.2 Administration Building

The proposed basement floor elevation of the administration building is 154.5 feet. Based on the observed bedrock elevations in that area, we recommend that the building be supported on spread footings bearing on bedrock. We recommend an allowable vertical bearing pressure of 12,000 psf, per Table 1806.2 of the 2015 IBC.

To verify this recommendation, we performed bearing resistance calculations using the calculated Rock Mass Rating (RMR) in accordance with AASHTO 2010 procedures. We analyzed a 4 foot by 4 foot interior footing for the administration building bearing directly on rock. Strength limit values far exceeded the IBC recommendations, and expected settlement under the design loading will be negligible. Bearing resistance calculations are presented in Appendix G.

The rock beneath the footings may be overexcavated and replaced with 12 inches of gravel borrow or crushed stone. For compacted gravel borrow or crushed stone, we recommend an allowable bearing pressure of 5 ksf. We recommend the spread footings have a minimum width of three feet.

We recommend that an underdrain be installed around the perimeter of the foundation of the administration building. The bottom of the perimeter drain should be at the bottom of the footing elevation. The underdrain pipe should be minimum 4-inch diameter perforated pipe surrounded by 6 inches of ¾-inch crushed stone and wrapped in Mirafi 160N geotextile fabric or equal.

10.1.3 Shallow Foundation Recommendations

Friction along the base of the shallow foundations may be used to resist horizontal forces. A coefficient of friction of 0.7 is recommended for cast-in-place concrete placed directly against bedrock, and 0.35 for cast-in-place concrete against sandy soils (IBC Table 1806.2). The coefficient of friction is an ultimate value, and it is recommended that a factor of safety of 1.5 be applied when determining the available sliding resistance. We recommend that the passive resistance component of the sliding resistance be neglected in the design to account for temporary conditions, and potential excavation in front of the footing. It is also recommended that the maximum pressure at the bottom of the shallow foundations under eccentric loading not exceed the recommended allowable bearing pressure.

It is recommended that the spread footing foundations for each structure should bear entirely within the same bearing strata to minimize the potential for differential settlement. To accomplish uniform bearing we recommend two approaches:

a) Over-excavate overburden soil as needed to expose bedrock and construct the footing directly on the rock. The bedrock should be excavated to provide a horizontal bearing surface to prevent sliding. As an alternative to lowering the foundation elevation to meet bedrock, lean concrete fill may be placed over the bedrock up to the bottom of proposed foundation elevation following removal of the overburden soils.

b) Over-excavate a minimum of 12 inches of bedrock and backfill with gravel borrow or crushed stone to provide a cushion below the footing to avoid differential settlement between the hard bedrock and relatively softer subgrade soils which could cause cracking of the footing. Alternatively, the structural engineer may consider adding reinforcing for continuous footings to provide the transition needed to span across locations where the subgrade changes from soil to rock.

10.3 Service Access Tunnel

Employee access to the toll booths will be provided by a pedestrian tunnel originating at the basement of the proposed administration building. The total length of the tunnel will be approximately 360 feet. The tunnel is planned to be constructed from precast reinforced concrete elements, each element with approximate external dimensions of 10’-6” H x 9’-8” W x 7’-0” L.

Based on the observed bedrock elevations across the site and proposed invert elevations of the tunnel, the tunnel will be constructed through bedrock and soil conditions (Refer to subsurface profile on Figure 5 in Appendix A showing the proposed location of the tunnel and the subsurface conditions). We recommend the bedrock be over-excavated under the tunnel and replaced with a minimum of 2 feet of crushed stone. This will reduce potential stress increases on the tunnel section at the transition between bedrock and soil.

The bearing capacity of the tunnel section in soil was not a design concern as the weight of the soil removed for the installation of the tunnel will be greater than the weight of the tunnel section itself. In areas where additional fill will be placed above existing ground levels, the resulting increase in pressure on the supporting soils will be minimal. We also expect settlement of the tunnel section will be negligible provided the subbase of the tunnel is properly compacted.

Groundwater levels in the vicinity of the proposed tunnel vary from approximately elevation 155 to 163 feet, generally increasing from east to west. We understand an underdrain system will be installed on both sides of the exterior of the tunnel; this will drain by gravity to the western end where the drains will connect with the foundation drainage system for the administration building.

10.4 ORT Gantries

Based on the soil conditions encountered at the site, overall depth to bedrock and preliminary loading, and for phased construction, we recommend that the gantry structures be supported on three foot diameter drilled shafts. The drilled shafts should be installed to a depth of 15 feet below proposed ground surface, or 3 feet into bedrock, whichever occurs first with a minimum shaft length of 6 feet below the proposed ground surface. Proposed ground surface is at approximately elevation 167.7 feet. Based on discussions with the structural engineer, we understand that the jersey barriers will be continuous in the vicinity of the proposed drilled shafts to withstand any vehicle impact loads from impacting the drilled shafts.

The gantry structures could be supported on shallow foundations, however, based on expected construction sequencing, drilled shaft foundations will have less impact during construction and are the preferred alternative. If shallow foundations are selected, further analysis and design recommendations can be completed later in the design.

Please note that the borings were located in the field based on preliminary design assumptions, and borings were not drilled in all the proposed locations for the gantry foundation elements. Design assumptions were made for the analysis herein. Once additional borings are completed, this design will be updated if required.

10.4.1 Lateral Resistance

The lateral forces on the drilled shafts will govern the design, and we evaluated the required embedment using LPILE (v. 2013) software by Ensoft, Inc. Based on the analysis as indicated above, we recommend the drilled shafts extend a minimum of 15.0 feet below final grade, or at least 3 feet into bedrock, whichever occurs first. The analysis indicates pile head deflections less than about ½" under the design loads. Evaluated soil profiles and soil properties, along with LPILE output files are presented in the gantry foundation calculations in Appendix J.

10.4.2 Axial Capacity

Using conservative values for side friction and end bearing for the sandy soils and bedrock, we evaluated the axial capacity of the proposed drilled shaft foundations. Our analyses indicate that proposed three foot diameter drilled shafts will have sufficient axial capacity to carry the required vertical loads from the gantry foundations. Axial load calculations are presented in Appendix J.

10.5 Frost Protection

For frost protection, footings bearing on soil or weathered bedrock should be constructed a minimum of 76 inches below the final ground surface as measured from the ground to the bottom of footing, including consideration for sloping ground surfaces. In accordance with Section 1809.5 of the IBC, frost protection is not required for foundations installed entirely on solid unweathered rock. The exposed base should be kept free of standing water at all times. The site should be graded to carry any surface runoff away from the work areas.

10.6 Settlement

For shallow foundations, we anticipate a total settlement of about ½ inch, provided that topsoil, subsoil, and disturbed soils are removed and the foundation subgrades are prepared as described in Section 11 below.

For the drilled shafts socketed into bedrock, it is anticipated that settlements would be less than ¼ inch (generally equivalent to the elastic compression of the shaft, plus the inelastic compression within the bearing layer). For drilled shafts terminating in sandy soils, it is anticipated that settlement may generally be equivalent to the elastic compression of the shaft, plus inelastic compression within the bearing layer (approximately 0.5 inch).

10.7 Sign Foundations

We understand that new roadway signs will be constructed as part of the toll plaza project. Foundation design for the signs will be completed at a later date once supplemental borings are completed at these locations.

Standard drilled shaft foundations for highway signs are shown in Standard Detail 626 of the MaineDOT Standard Specifications.

10.8 ORT Slabs on Grade

The northbound and southbound ORT (Open Road Tolling) lanes will require a continuous 65’ by 58’-9” reinforced concrete slab on grade. We understand that the tolling equipment in these slabs is sensitive to settlement. To limit potential settlement of these slabs, we recommend a minimum subgrade modulus of 250 pci for the subgrade. We recommend 12 inches of gravel borrow compacted to 98 percent of maximum dry density (modified proctor) be placed beneath the ORT slabs. Preparation of the subgrade beneath these slabs should be completed in accordance with the recommendations in Sections 11.1 and 11.2 herein. We estimate the settlement of the ORT slabs will be less than ¼”. We recommend that plate load testing and compaction testing be conducted in the field before slab installation to verify the subgrade meets these requirements. Settlement calculations are presented in Appendix H.

10.8 Toll Plaza Slabs

It is our understanding that the toll plaza enclosures and crash barriers will be supported by a structural slab. We recommend 12 inches of compacted gravel borrow be placed beneath these slabs with a resilient modulus of 250 pci. The gravel borrow should be compacted to at least 95 percent of maximum dry density (modified proctor).

10.9 Pavement Design

Based on our review of the boring logs and laboratory data, we recommend using a resilient modulus of 6,000 psi in the highway pavement design. If required, this value can be evaluated by performing field California Bearing Ratio (CBR)/Plate Load Tests or by conducting Dynamic Cone Penetrometer Tests (DCPT).

10.9.1 Frost Susceptibility

Laboratory tests of the subgrade materials directly below the asphalt pavement (1.4 feet thick) at Boring B-10 indicate a fines content of 8.6% and 10.4% from depths of 1.4 to 3.4 feet and 3.4 to 5.4 feet, respectively. The current pavement design indicates subbase type D for the proposed pavement section. MaineDOT Specification 703.06 requires that all subbase material have less than 6% fines. Below all proposed new paved areas, we recommend non-frost susceptible materials for the sub-base and base course materials in accordance with MaineDOT standards and any material not meeting these requirements should be removed and replaced with suitable compacted material.

10.10 Rock Slopes

Based on the estimated depth to rock, rock slopes will be required to create the required grading for widening of the roadway and the proposed administration building. During the next phase of the geotechnical investigation program, Jacobs will evaluate the condition of the existing rock slopes, and provide an assessment to determine the potential for rock instability if the rock is cut back to 4V:1H (or steeper) slopes. We will also investigate the depth to bedrock in these areas were critical rock slopes will be created.

10.11 Original Toll Plaza Location (Mile 7.3)

The existing toll plaza and administration building at Mile 7.3 will be removed, and the roadway will be reconstructed with 4 northbound lanes and 3 southbound lanes. When the toll plaza is removed, the existing pedestrian tunnel will also be demolished, as shown in Figure 10.11-1 below. The tunnel roof, walls and bottom slab will be removed, with only the piles remaining. Due to the ongoing settlement in this area, removing the complete tunnel section will reduce the potential for differential settlement in this area. If a portion of the tunnel was left structurally connected to the piles, this could create a hard point and the roadway above the abandoned tunnel section could settle at a different rate from the surrounding area.

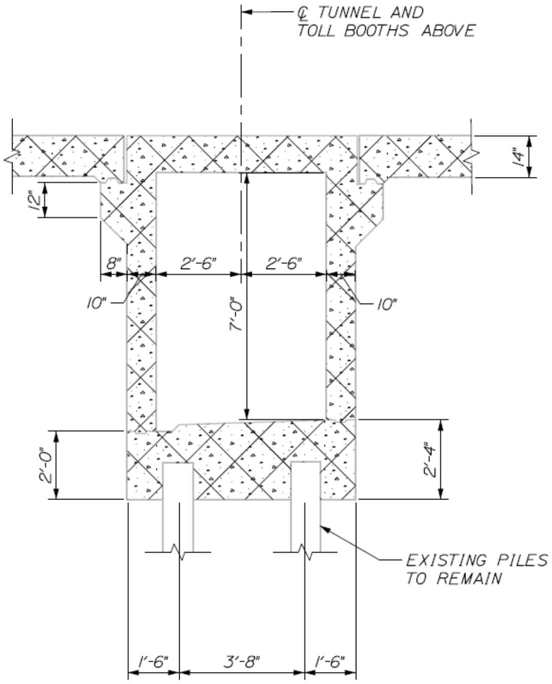

Figure 10.11-1: Demolition Plan of Existing Toll Plaza

The proposed grading through this area will result in up to approximately 1 feet of fill being placed to achieve required grading for the highway section. Jacobs previously submitted a geotechnical report in November 2014 titled “Geotechnical Conditions and Settlement Evaluation.” In this report, we evaluated the continued settlement of soft clays in the area around the existing toll plaza. In a supplemental memo, dated March 2015, we evaluated the possibility of moving the toll plaza approximately 400 north from the existing location. In our analysis, we presented settlement calculations based on various amount of proposed fill heights. We updated this calculation for the planned one foot of fill, and estimate settlement in the vicinity of the existing toll plaza to be up to 2.5 inches. The settlement calculation is presented in Appendix I.

We understand that the Maine Turnpike Authority would like to avoid using mitigation measures to limit settlement, and will plan to repave the areas in the future, if necessary.

11. Construction Considerations

11.1 Subgrade Preparation

Prior to performing any required grading operations and excavations within the proposed locations of the toll plaza, administration building, parking lot, and access road these areas should be stripped of any topsoil, subsoil, vegetation, stumps and/or boulders. Any areas that appear soft or unstable should be removed and replaced with properly compacted gravel borrow or crushed stone as described in Section 11.2.

Within the proposed footprint of the spread footings, unsuitable fill or soft soils, or soils that are too wet should be removed within the bearing zone of influence defined by a one horizontal to one vertical (1H:1V) line sloping down and out from one foot outside the bottom exterior edges of the footing to natural granular soils. The exposed subgrade soils should be proof-compacted with a minimum of 10 passes of a minimum 10,000-lb (static weight) heavy vibratory roller. Loose or soft zones observed during proof-compaction should be over-excavated to firm and stable soils (or weathered bedrock) and replaced with compacted gravel borrow. Where exposed soil subgrades are at or near the groundwater level, static proof-compaction methods should be used in lieu of vibratory methods if approved by the geotechnical engineer. Exposed subgrade soils should be protected from disturbance at all times. Fill should not be placed over frozen soil. Soil subgrades should be protected against frost both during and after construction. A qualified geotechnical engineer should evaluate foundation subgrades and observe fill placement.

Proper drainage of construction areas should be provided to protect the subgrades from the detrimental effects of weather conditions. The exposed base should be kept free of standing water at all times. The site should be graded to carry any surface runoff away from the work areas.

11.2 Earthwork and Compaction

Structural fill placement should consist of gravel borrow or crushed stone in accordance with Subsection 703 of the Maine DOT Standard Specifications. Fill should be placed in loose layers of not more than 12 inches in thickness, unless otherwise specified, and compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Gravel borrow beneath the ORT slabs should be compacted to at least 98 percent. In confined areas, place only 6-inch-thick layers and compact with manually operated, powered vibratory compaction equipment acceptable to the geotechnical engineer. Crushed stone should be placed in layers not more than 12 inches thick and compacted to an unyielding surface. Crushed stone should be wrapped in non-woven filter fabric equivalent to Mirafi 160N or better, with a minimum overlap of at least two feet. Reference is also made to the following table:

Table 6: Material Specifications

Borrow Material	MaineDOT Standard Spec. No.	Use
Common Borrow	703.18	General Fill
Granular Borrow	703.19	Embankment Fill
Gravel Borrow	703.20	Beneath Footings and Slabs
Rock Borrow	703.21	Embankment Fill
Crushed Stone	703.31	Beneath Footings and for Drainage

If foundations are not constructed immediately after grading and fill placement, the subgrade should be shaped so as to prevent ponding. If there is a substantial lapse in time between grading and foundation construction, or if the subgrade is severely disturbed, it should be proof-rolled with a large vibratory roller prior to construction. Soft spots observed during proof-rolling should be removed and replaced with compacted gravel borrow or crushed stone. Crushed stone should be wrapped in non-woven filter fabric.

11.3 Protection of Existing Structures

The depth of excavation for the new spread footing foundations and proposed access tunnel should be performed so as not to undermine or impact the adjacent roadway or structures. It is recommended that an imaginary 1.5H:1V line extending outward and upward from all edges of the proposed excavation bottom should be posted and checked on-site prior to any foundation excavation. Temporary excavation support will likely be required to protect the existing roadway during construction.

11.4 Temporary Excavation Support

Construction of the new administration building, toll plaza canopy foundations and access tunnel will require excavation of up to approximately 15 to 16 feet below the existing ground surface. Due to the depth of excavation, a temporary excavation support system will be required. The temporary earth support system should account for the excavation and removal of any suitable materials, as well as the installation of the new foundations and depth of undercut for foundation construction. We anticipate the feasible earth support alternatives may include soldier piles and lagging, but will be based on the means and methods. It may be necessary to predrill holes in areas of shallow bedrock to install the soldier piles.

The temporary earth support systems should be designed utilizing the following soil properties:

- Active earth pressure coefficient of 0.33
- At- rest earth pressure coefficient of 0.5
- Passive earth pressure coefficient of 3.0
- Saturated unit weight of 130 pcf (below the water table)
- Moist unit weight of 120 pcf (above the water table)

Temporary earth support systems should be selected by the Contractor and designed by an experienced Professional Engineer registered in the State of Maine, and retained by the Contractor. Where excavation sides are cut back and sloped, they should be in accordance with the Occupational Safety and Health Administration (OSHA) Construction Industry Standards.

11.5 Blasting/Rock Removal

Removal of bedrock will be required to construct the proposed foundation for the administration building, to install the access tunnel under the proposed toll plaza and to construct the access road. Due to the amount and depth of required rock cuts, and the hardness of the rock, it is unlikely that the rock can be excavated using mechanical means (rock hammers and splitter) and blasting will likely be required. All rock excavation and blasting should be performed in accordance with Section 203.042 of the Maine DOT Standard Specifications and Maine Turnpike Authority Special Provision Section 105.2.6.

11.6 Reuse of Excavated Materials

Based on the soils encountered, it is anticipated that some of the material may be suitable for reuse on site as gravel borrow. Soils not meeting the gravel borrow specification may still be reused for general backfill, provided that weather conditions are satisfactory, the moisture content can be controlled, and the materials can be compacted to the required density.

It may also be possible to reuse blasted rock as general backfill around the site. The rock must be broken down to various sizes in order to meet various material requirements as shown in Table 6.

Stockpiled soils may require installation of run-off protection for erosion control. Stockpiles of fill materials should be maintained to prevent material from fluctuating from the optimum moisture content, freezing, separating due to migration of fine grained soils, and collection of snow or ice within the stockpiles. Reuse of on-site soils should be at the acceptance of the geotechnical engineer prior to placement.

11.7 Dewatering

Groundwater level readings indicate that groundwater will be encountered as high as 4 to 5 feet below final grade and up to approximately 13 feet above the bottom of excavation for the tunnel and administration building. The Contractor should be prepared to manage and control groundwater during foundation excavation, and to control surface water from entering excavations to provide a dry and stable subgrade. The Contractor should be responsible for selecting the dewatering methods based on their proposed methods and equipment used for excavation. The method of dewatering will depend on the time of year that the work is performed, size and depth of the open excavation, and the length of time the excavation is left open. Prior to construction, the dewatering plan should be reviewed by a Jacobs Registered Professional Geotechnical Engineer, or Engineer appointed by the Owner. Dewatering efforts must satisfy requirements of local, state, and federal environmental and conservation authorities.

12. Limitations

This report and the recommendations contained herein have been prepared for the exclusive use of Jacobs and Maine Turnpike and their representatives for specific application to the design and construction of the proposed toll plaza and administration building for the Maine Turnpike in York, ME at Mile 8.8.

This report was prepared in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made. The analysis, design and recommendations submitted in this report are based in part upon the data obtained from subsurface explorations available at the time of this report. Subsurface stratification variations between explorations are anticipated. The reported groundwater levels were short-term observations and only represented the water levels at the time of drilling and as noted on the boring logs or as otherwise described herein. The nature and extent of variations between these explorations may not become evident until construction. If significant variations then appear, or if there are changes in the nature, design or location of the proposed structures, it may be necessary to reevaluate the recommendations of this report.

We appreciate the opportunity to be of service to you on this project. Please contact us if you have any questions regarding this report.

Very truly yours,

Jacobs Engineering Group

Phillip Lanergan

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Geotechnical Engineer

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Appendix A. **Figures**

Date:8/1/2016

PROPOSED YORK PLAZA TOLL BOOTHS

EXISTING YORK PLAZA TOLL BOOTHS

Filename: ...\d0259628\001_Geoplan 1.dgn

Scale:

1000 0 1000 2000

Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS®

CONSULTANT PROJECT MANAGER: $PROJMANAGER$

	By	Date		By	Date
Designed	PL	08/16	Checked	---	--/--
Drawn	EFG	08/16	In Charge of	---	--/--

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 1
LOCUS PLAN

SHEET NUMBER: 1

CONTRACT:WIN 2017.XX

1OF 5

Date:8/1/2016

NOTES:
1. EXPLORATIONS PERFORMED BY NEW ENGLAND BORING CONTRACTORS. EXPLORATIONS WERE OBSERVED AND LOGGED BY JACOBS IN JANUARY, 2016.

2. EXPLORATION LOCATIONS WERE SURVEYED BY INSTRUMENT SURVEY BY SEBAGO TECHNICS.

3. FOR EXPLORATION LOGS SEE GEOTECHNICAL REPORT DATED AUGUST 2016.

4. CONTOURS AND ELEVATION SHOWN HEREIN ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

LEGEND:
B-10 BORING
TP-12 TESTPIT
OW OBSERVATION WELL

Filename: ...\d0259628\002_Geoplan2.dgn

Scale:
100 0 100 200
Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS

	By	Date		By	Date
Designed	PL	08/16	Checked	---	--/--
Drawn	EFG	08/16	In Charge of	---	--/--

JACOBS ENGINEERING GROUP
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BOSTON, MA 02210
TEL (617) 242-9222
FAX (617) 242-9824

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 2
SUBSURFACE EXPLORATION PLAN 1

SHEET NUMBER: 2

CONTRACT:WIN 2017.XX

2 OF 5

NOTES:
1. FOR NOTES SEE FIGURE 2.

Date:8/1/2016

Filename: ...\d0259628\003_Geoplan3.dgn

Scale:
100 0 100 200
Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS®

	By	Date		By	Date
Designed	PL	08/16	Checked	---	--/--
Drawn	EFG	08/16	In Charge of	---	--/--

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 3
SUBSURFACE EXPLORATION PLAN 2

SHEET NUMBER: 3

CONTRACT:WIN 2017.XX

3 OF 5

Date:8/1/2016

NOTES:
1. FOR NOTES SEE FIGURE 2.

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:

JACOBS

	By	Date	Checked	By	Date
Designed	PL	08/16	Checked	---	--/--
Drawn	EFG	08/16	In Charge of	---	--/--

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 4

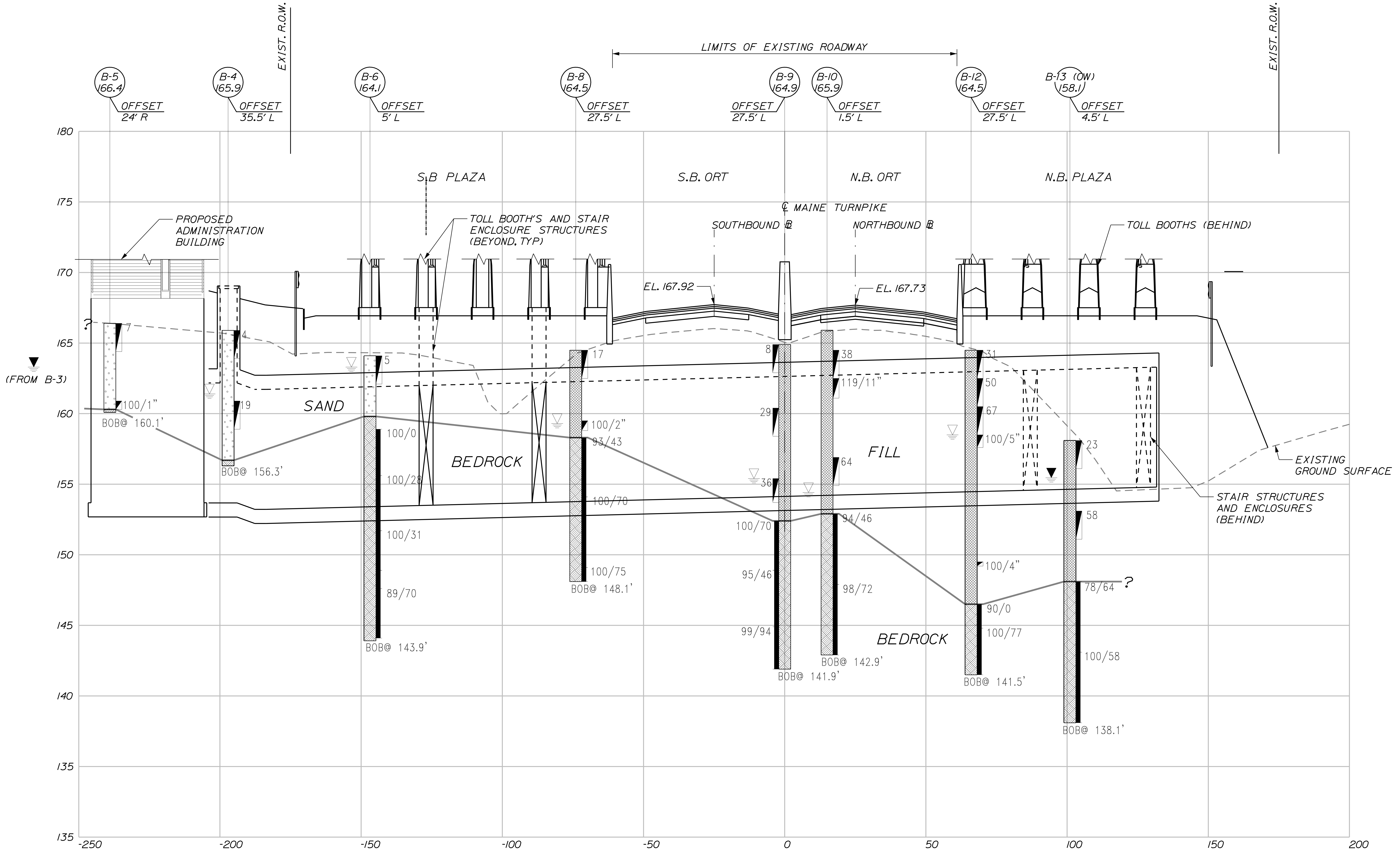
SHEET NUMBER: 4

CONTRACT:WIN 2017.XX

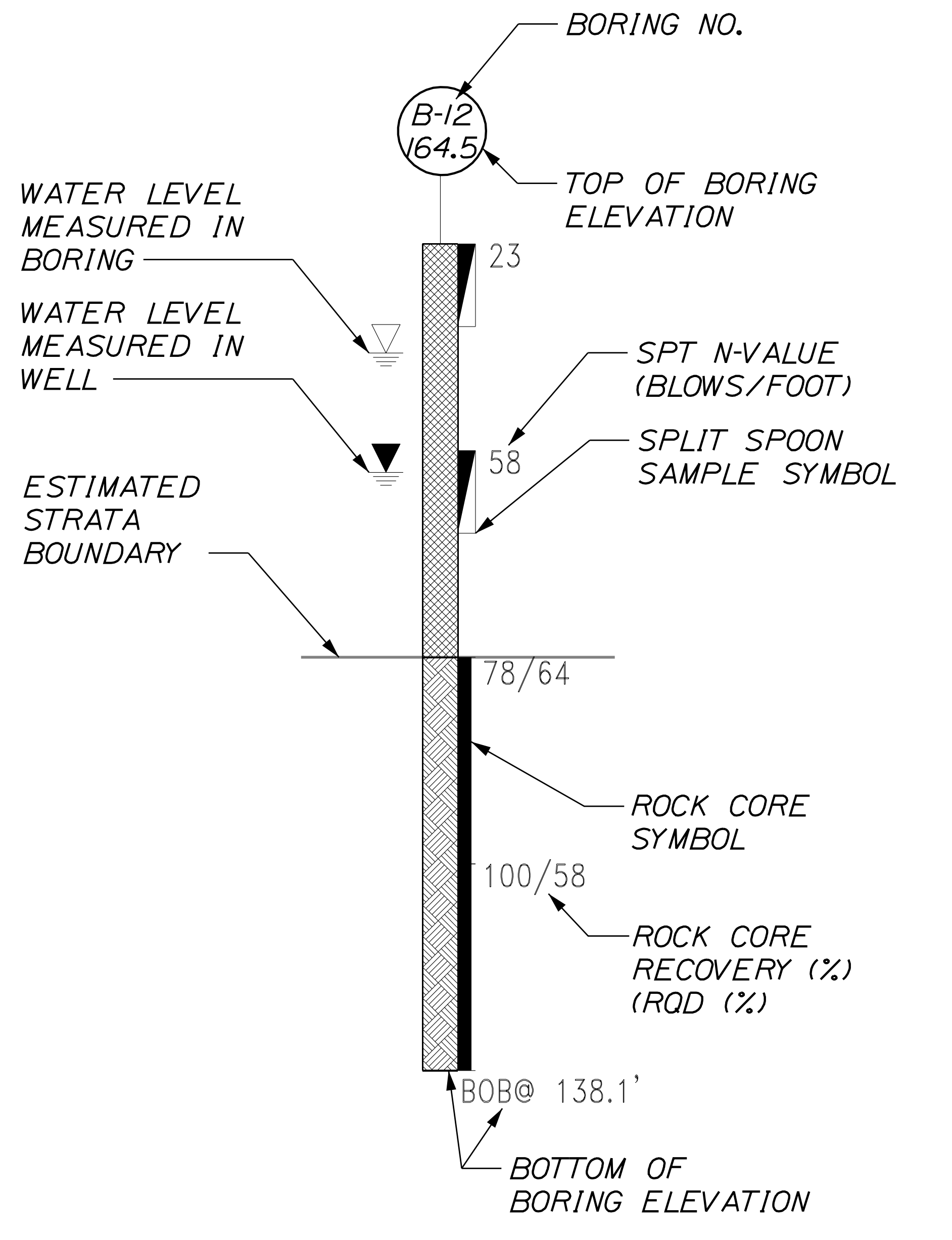
4 OF 5

Filename: ...\d0259628\004_Geoplan 4.dgn

Date:7/28/2016



SECTION A-A



LEGEND

NOTES:

1. THE STRATIFICATION LINES ARE BASED UPON INTERPRETATIONS BETWEEN WIDELY SPACED BORING LOCATIONS AND THUS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEEN SOIL TYPES AND TOP OF ROCK. REFER TO BORING LOGS FOR SPECIFIC CONDITIONS ENCOUNTERED IN EACH BORING.
2. THE STRATA DESCRIPTIONS SHOWN ON THIS PROFILE ARE HIGHLY GENERALIZED.
3. REFER TO FIGURE 4 FOR THE LOCATION OF THE SUBSURFACE PROFILE.
4. SEE FIGURE 2 FOR ADDITIONAL NOTES.

Filename: ...\005_GeotechnicalProfile.dgn

Scale:
Horiz. 25 0 25
Vert. 5 0 5
Scale of Feet

No.	Revision	By	Date

Designed by:

	By	Date		By	Date
Designed	PL	08/16	Checked	---	--/--
Drawn	EFG	08/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 5
GEOTECHNICAL PROFILE

SHEET NUMBER: 5

CONTRACT:WIN 2017.XX

5 OF 5

Appendix B. **Subsurface Exploration Logs**

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LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-1
	LOCATION	Maine Turnpike Mile 8.8		
	OWNER	Maine Turnpike Authority		
	JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION		163.5
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126714
7.2	Terminated	01-22-2016 / 9:42 AM	1.5	Upon Completion (Augers pulled)			COORD	E	2823935.9
							DATE START		1/22/16
							DATE END		1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		2 3 6 9	9	S1	0 - 2	24/8		SAND	S1A (Top 6"): Moist, dark brown, fine to medium SAND, little(+) Silt, little organic material (roots, root fibers, leaves), trace Gravel (TOPSOIL). S1B (Bottom 2"): Wet, brown, fine to coarse SAND, little(+) Gravel, trace Silt.	
160										
	5	13 100/5"	100/5"	S2	4.5 - 5.4	11/8			S2: Wet, very dense, dark brown, fine to medium SAND, some fine Gravel, little Silt (fine gravel in spoon tip, possible rock fragments).	1
								7	Probable Bedrock at 7 ft.	
								7.2	Bottom of Borehole at 7.2 feet.	2 3
155										
	10									
150										
	15									
145										
	20									
140										
	25									
135										
	30									
130										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Auger advancing slowly at 5.4 feet. Broke through at approx. 5.7 feet, possible cobble.
2. Hard drilling at 7 feet, probable top of bedrock. Auger to 7.2 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-2
	LOCATION	Maine Turnpike Mile 8.8		
	OWNER	Maine Turnpike Authority		
	JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay
CONTRACTOR	New England Boring Contractors
DRILLER	M. Porter
DRILL RIG	B-53 Mobile Drill
SPT HAMMER	140 lb Safety
ELEVATION	172.6
DATUM	NAVD88
GRID COORD N	126774.5
E	2823893.3
DATE START	1/22/16
DATE END	1/22/16

METHOD OF DRILLING	
0.0	Hollow Stem Auger
10.8	Terminated

GROUNDWATER READINGS		
DATE/TIME	DEPTH(ft)	REMARKS
01-22-2016 /		None Encountered

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		1 2 3 6	5	S1	0 - 2	24/7		SAND	S1A (Top 2"): Moist, dark brown, fine to coarse SAND, little organic material (roots, root fibers, leaves), little Silt (TOPSOIL). S1B (Bottom 5"): Moist, brown, fine to coarse SAND, some fine to coarse Gravel, little organic material (roots, root fibers), trace Silt (SUBSOIL).	1
170										
	5									2
165		42 60 34 33	94	S2	7.4 - 9.4	24/15			S2A (Top 8"): Moist, dark brown, fine to coarse SAND and Silt, some(-) fine to coarse Gravel (USCS: SM, Fines: 36.2%). S2B (Bottom 7"): Moist, grayish brown, fine to coarse GRAVEL, some(-) fine to coarse Sand, little Silt (USCS: GM, Fines: 13.8%).	
	10	13 100/1"	100/1"	S3	10 - 10.6	7/1		10.6 10.8	S3: Moist, very dense, dark brown, fine to coarse SAND, little Gravel, trace Silt. Probable Bedrock at 10.6 ft. Bottom of Borehole at 10.8 feet.	3 4 5
160										
	15									
155										
	20									
150										
	25									
145										
	30									
140										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling from 5 to 5.8 feet, probable cobble.
3. Spoon bouncing at 10.6 feet; top of probable bedrock.
4. Advanced auger to 10.8 feet.
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-3 (OW)
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	168.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
		DATE/TIME	DEPTH(ft) / REMARKS	SPT HAMMER	140 lb Safety	GRID COORD N	126823.7
0.0	Hollow Stem Auger	03-09-2016 / -	5.4 / Monitoring Well Reading			GRID COORD E	2823948.6
5.1	NX Rock Core					DATE START	1/21/16
17.8	Terminated					DATE END	1/21/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		1 2 2 3	4	S1	0 - 2	24/4		SAND	S1: Moist, loose, dark brown, fine to coarse SAND, little fine Gravel, little Silt, trace organic material (roots, root fibers, leaves) (TOPOSIL).	1
		8 17 32 100/1"	49	S2	2 - 3.58	19/4			S2A (Top 1"): Moist, red/brown, fine to coarse SAND and Silt, little fine Gravel, trace organic material (roots, root fibers) (USCS: SM, Fines: 37%). S2B (Bottom 3"): Moist, gray/brown, fine to coarse GRAVEL, trace Sand, trace Silt (rock fragments) (USCS: GP, Fines: 1.6%).	2
165										
								5.1		3
		RQD=51		C1	5.1 - 9.5	53/44		BEDROCK	C1: Hard, moderately weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 2 - 1/4.8"	4
160										
	10	RQD=49		C2	9.5 - 11.3	22/22			C2: Hard, slightly to moderately weathered, moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures (UCS: 12,842 psi). Coring Times (min/ft): 2 - 1/9.6"	
				C3	11.3 - 15.1	46/42.5			C3: Hard, slightly to moderately weathered, extremely to moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2- 1/9.6"	
155		RQD=30								
	15	RQD=42		C4	15.1 - 17.8	32/28.5			C4: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures (coarse grained, dark gray Granite intrusions at 12" and bottom 10" of core). Coring Times (min/ft): 2 - 2- 1/8.4"	5
								17.8	Bottom of Borehole at 17.8 feet.	
150	20									
145	25									
140	30									
135	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Borehole drilled approx. 8 feet east of marked location.
2. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
3. Auger refusal at 5.1 feet. Switched to rotary drilling techniques with 4" casing. Washed out hole and began rock core at 5.1 feet.
4. Complete water loss during core C1.
5. Upon completion of drilling, an observation well was installed with standpipe. Well screen set from 2' to 6' below surface. Refer to Monitoring Well log.

LOG OF MONITORING WELL

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

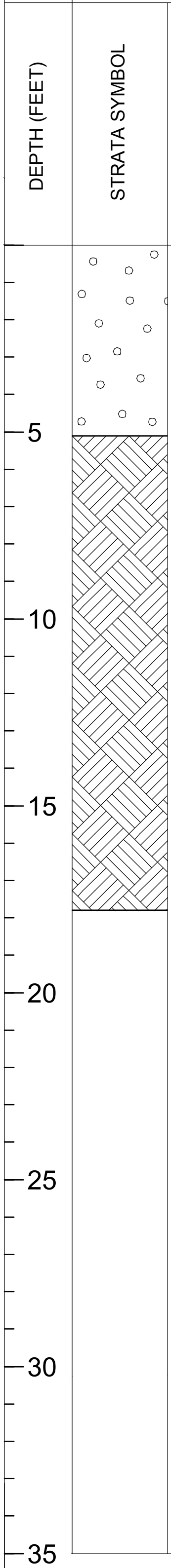
BORING NO. B-3 (OW)

SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION		168.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
				SPT HAMMER	140 lb Safety	GRID	N	126823.7
						COORD	E	2823948.6
						DATE START		1/21/16
						DATE END		1/21/16

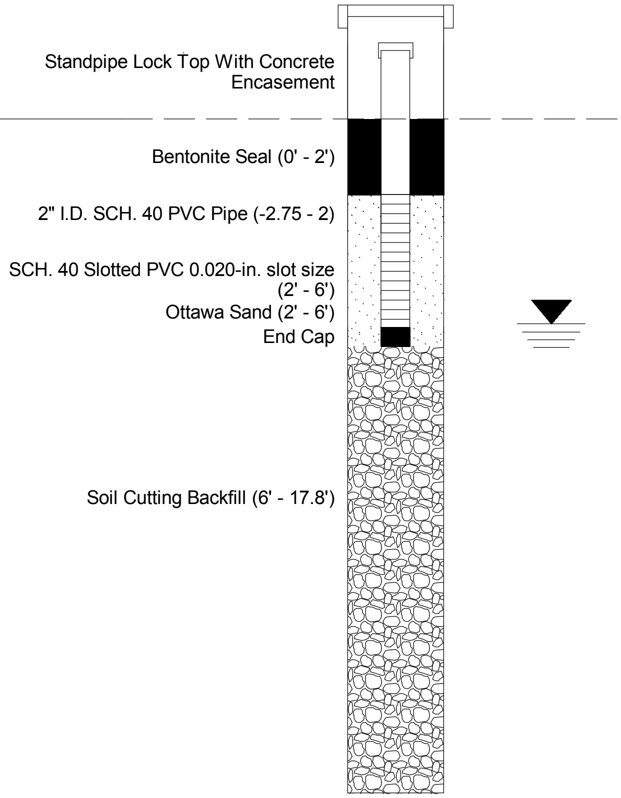
METHOD OF DRILLING	
0.0	Hollow Stem Auger
5.1	NX Rock Core
17.8	Terminated

DATE/TIME	DEPTH(ft)	REMARKS
03-09-2016 / -	5.4	Monitoring Well Reading



ELEVATION (FEET)	MATERIAL DESCRIPTION
	SAND
163.60	BEDROCK
150.90	

WELL DIAGRAM



LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-4
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION	165.9
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID N	126819.3
9.6	Terminated	01-22-2016 / 10:30 AM	4.5	Upon Completion (Augers pulled)			COORD E	2823992.7
							DATE START	1/22/16
							DATE END	1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165		1 2 2 15	4	S1	0 - 2	24/7		SAND	S1A (Top 2"): Moist, dark brown, fine to medium SAND, some organic material (roots, root fibers, twigs), trace Gravel (TOPSOIL). S1B (Bottom 5"): Moist, reddish/brown, fine to medium SAND, little Silt (SUBSOIL).	1
160	5	10 9 10 17	19	S2	5 - 7	24/14			S2A (Top 5"): Wet, brown, fine to medium SAND, little Silt. S2B (Bottom 9"): Wet, dark brown, fine to coarse GRAVEL, some(+) fine to coarse Sand, trace(+) Silt (possible rock fragments) (USCS: GW-GM, Fines: 9.3%).	
								9.2	Possible Bedrock at 9.2 ft.	
	10							9.6	Bottom of Borehole at 9.6 feet.	2 3
155										
	15									
150										
	20									
145										
	25									
140										
	30									
135										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Hard drilling at 9.2 feet; top of possible bedrock. Advanced auger to 9.6 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-5
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION		166.4
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126887.5
6.3	Terminated	01-22-2016 / 11:30 AM		None Encountered			COORD	E	2823968
							DATE START		1/22/16
							DATE END		1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		2 4 3 2	7	S1	0 - 2	24/4		SAND	S1: Moist, loose, dark brown, fine to medium SAND, trace Gravel, trace Silt, little organic material (roots, leaves) (coarse piece of gravel in spoon tip) (TOPSOIL).	
165										
	5									
		59 100/1"	100/1"	S2	5.5 - 6.1	7/7		6.1 6.3	S2: Wet, very dense, brown, fine to coarse SAND and fine to coarse Gravel, little(+) Silt (rock fragments in spoon tip). Possible Bedrock at 6.1 ft. Bottom of Borehole at 6.3 feet.	1 2
160										
	10									
155										
	15									
150										
	20									
145										
	25									
140										
	30									
135										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling at 6.1 feet. Advanced auger to 6.3 feet.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-6
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	164.1
				DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
				SPT HAMMER	140 lb Safety	GRID COORD N	126836.8
						GRID COORD E	2824049.6
						DATE START	1/21/16
						DATE END	1/21/16

METHOD OF DRILLING	
0.0	Hollow Stem Auger
5.2	NX Rock Core
20.2	Terminated

GROUNDWATER READINGS

DATE/TIME	DEPTH(ft)	REMARKS
01-21-2016 / 4:00 PM	8	Upon Completion (In Casing)
01-22-2016 / 7:30 AM	0.8	Casing Removed (14 hours stabilized)

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		1 3 2 8	5	S1	0 - 2	12/5		SAND	S1A (Top 2.5"): Wet, dark brown, fine to coarse SAND, little Silt, little organic material (roots), trace Gravel (TOPSOIL). S1B (Bottom 2.5"): Wet, light brown, fine to coarse SAND, some Silt, little fine Gravel, trace organic material (roots, root fibers).	1
160								4.3		2 3
	5			C1	5.2 - 8.5	40/40		BEDROCK	C1: Hard, moderately weathered, extremely fractured, coarse grained, light gray/brown GRANITE with very close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 1/3.6"	
		RQD=0								
155	10			C2	8.5 - 12.4	47/47			C2: Hard, slightly to moderately weathered, extremely fractured, coarse grained, light gray/brown GRANITE with close to very close, horizontal to moderately dipping, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 1.5/10.8"	4
		RQD=28								
				C3	12.4 - 15.2	34/34			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, horizontal to moderately dipping fractures (coarse grained, dark gray, granite intrusion from 25" to 30") (UCS: 33,762 psi). Coring Times (min/ft): 2 - 2 - 1/9.6"	5
150	15	RQD=31								
		RQD=44		C4	15.2 - 16.7	18/16			C4: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal fractures. Coring Times (min/ft): 2- 1/4"	6
				C5	16.7 - 20.2	42/42			C5 (0 to 26"): Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal fractures. (26" to 42"): Hard, slightly weathered, moderately to extremely fractured, coarse grained, white/pink GRANITE with horizontal to sub-vertical fractures. Coring Times (min/ft): 2 - 2 - 2 - 1/6"	7
145	20	RQD=70						20.2	Bottom of Borehole at 20.2 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
2. Harder drilling at 3.7 feet. Advanced auger to 5.2 feet.
3. 4" casing installed to 4.3 feet. Roller bit to 5.1 feet, then begin rock core at 5.1 feet.
4. Wash color change from light brown to white/brown at 8.5 feet. White/brown to pink/ brown at 12 feet.
5. Core barrel jammed at 8.5 feet, 12.4 feet, 15.2 feet and 16.7 feet.
6. Slight to moderate water loss at 6 and 9 feet.
7. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-7
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	G. Leavitt	ELEVATION	164.3
				DRILL RIG	Strata Star 15	DATUM	NAVD88
				SPT HAMMER	140 lb Safety	GRID COORD N	126765.5
						GRID COORD E	2824105.5
						DATE START	1/14/16
						DATE END	1/14/16

METHOD OF DRILLING

0.0	Wash Boring w/ 4" Casing
5.0	NX Rock Core
15.0	Terminated

GROUNDWATER READINGS

DATE/TIME	DEPTH(ft)	REMARKS
01-14-2016 / 2:25 PM	4	Upon Completion (In Casing)

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		17 20 21 17	41	S1	0 - 2	24/9		FILL	S1: Dry, dense, brown, fine to coarse SAND and fine to coarse Gravel, little(-) Silt (USCS: SP-SM, Fines: 10.7%).	1
								3.5		2
		RQD=14		C1	5 - 8.5	42/17		BEDROCK	C1: Hard, slight to moderately weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, moderately dipping to sub-horizontal fractures (UCS: 13,681 psi). Coring Times (min/ft): 5 - 3 - 3 - 2/6"	3
		RQD=25		C2	8.5 - 12.5	48/45.5			C2: Hard, slightly to moderately weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to moderately dipping fractures (coarse grained granite intrusion from 14" to 30"). Coring Times (min/ft): 4 - 8 - 6 - 6	4
		RQD=75		C3	12.5 - 15	30/30		15	C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to moderately dipping fractures (UCS: 21,374 psi). Coring Times (min/ft): 4 - 4 - 3/6" Bottom of Borehole at 15 feet.	5

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 3.5 feet. Black rock fragments in wash. Roller bit to 5 feet and begin core.
3. Water loss from 6 to 8.5 feet, possible weathered/fractured section
4. Wash color change from brown to gray at 10 feet
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-8
	LOCATION	Maine Turnpike Mile 8.8		
	OWNER	Maine Turnpike Authority		
	JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION		164.5
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126794.4
6.2	NX Rock Core	01-20-2016 / 10:15 AM	5.2	Upon Completion (In Casing)			COORD	E	2824113.5
16.4	Terminated						DATE START		1/19/16
							DATE END		1/20/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		9 9 8 10	17	S1	0 - 2	24/14		FILL	S1A (Top 9"): Dry, dark brown, fine to coarse SAND, little fine Gravel, little Silt, trace organic material (roots, root fibers) (TOPSOIL).	1
									S1B (Bottom 5"): Moist, light brown, fine to medium SAND, trace Gravel, trace Silt.	2
160										
		27 100/2"	100/2"	S2	5 - 5.7	8/4		6.2	S2: Wet, very dense, dark brown, fine to coarse SAND, some(-) Silt, little(+) fine Gravel, (piece of gravel in spoon tip) (USCS: SM, Fines: 22.7%)	3
		RQD=43		C1	6.2 - 10.4	50/46.5		BEDROCK	C1: Hard, moderately weathered, extremely to moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal to moderately dipping, iron-oxide stained fractures (coarse grained granite intrusion from 20" to 24", quartz in bottom 12") (UCS: 27,242 psi). Coring Times (min/ft): 2 - 2 - 2 - 2 - 0.5/2"	4
155	10									
		RQD=70		C2	10.4 - 15.4	60/60			C2: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE, with close to very close, sub-vertical to moderately dipping fractures. Coring Times (min/ft): 3 - 3 - 2 - 3 - 3	5
150	15									
		RQD=75		C3	15.4 - 16.4	12/12		16.4	C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE, with horizontal to moderately dipping fractures. Coring Times (min/ft): 2.5 Bottom of Borehole at 16.4 feet.	6
145	20									
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 3.3 feet
3. 4" casing driven to 5.7 feet. Hard drilling as roller bit was advanced through probable rock to 6.2 feet. Begin rock core.
4. Gray wash at 6.2 feet
5. Core barrel jammed at 10.4 feet. Slight water loss at 8 feet. No water loss observed during remaining cores.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-9
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	G. Leavitt	ELEVATION	164.9
				DRILL RIG	Strata Star 15	DATUM	NAVD88
				SPT HAMMER	140 lb Safety	GRID COORD N	126775.8
						GRID COORD E	2824181
						DATE START	1/11/16
						DATE END	1/12/16

METHOD OF DRILLING	
0.0	Wash Boring w/ 4" Casing
12.5	NX Rock Core
23.0	Terminated

GROUNDWATER READINGS

DATE/TIME	DEPTH(ft)	REMARKS
01-12-2016 / 9:30 AM	9.5	Before Drilling (In Casing)

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		3 3 5 4	8	S1	0 - 2	24/11		FILL	S1A (Top 4"): Moist, dark brown, fine to coarse SAND, some Silt, little fine Gravel, trace organic material (roots, root fibers) (TOPSOIL).	1
									S1B (Bottom 7"): Moist, light brown, fine to medium SAND, little Silt, trace Gravel.	2
160	5	15 13 16 17	29	S2	4.5 - 6.5	24/10			S2: Wet, medium dense, brown, fine SAND, little Silt, trace Gravel (coarse piece of gravel in spoon tip).	
										3
155	10 ▼	16 23 13 100/2"	36	S3	9.5 - 11.2	20/9			S3: Wet, dense, brown, fine SAND, little(-) Silt, trace Gravel (1" piece of gravel in top of recovered sample).	4
								12.4		
				C1	12.4 - 16	43/43		BEDROCK	C1: Hard, slightly weathered, moderately fractured, fine to medium grained, gray GRANITE with close, vertical to sub-vertical fractures (UCS: 31,465 psi). Coring Times (min/ft): 11 - 10 - 10 - 6/7"	
150	15	RQD=70								
				C2	16 - 20	48/45.6			C2: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to sub-vertical fractures (coarse grained, dark gray, granite intrusions from 9" to 11" and 28" to 36"). Coring Times (min/ft): 5 - 5 - 5 - 5	5
		RQD=46								
145	20			C3	20 - 23	36/35.5			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, moderately dipping fractures (coarse grained granite intrusions from 12" to 14"). Coring Times (min/ft): 6 - 5 - 6	6
		RQD=94						23	Bottom of Borehole at 23 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
2. Brown wash from 2 ft to 11 ft. Gray wash from 11 ft to bottom of boring.
3. Occasional cobbles from 7 ft to 9 ft. Rig chatter and gravel in wash.
4. Advance casing to 11 feet. Roller bit to 12.4 feet and begin rock core.
5. Ran out of drilling water at 16 feet. Newer core barrel bit was used for remaining 7 feet.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-10
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	G. Leavitt	ELEVATION	165.9
				DRILL RIG	Strata Star 15	DATUM	NAVD88
				SPT HAMMER	140 lb Safety	GRID N	126795.8
						COORD E	2824206.2
						DATE START	1/12/16
						DATE END	1/14/16

METHOD OF DRILLING	
0.0	Wash Boring w/ 4" Casing
13.0	NX Rock Core
23.0	Terminated

GROUNDWATER READINGS DATE/TIME	DEPTH(ft)	REMARKS
01-14-2016 / 7:55 AM	9.7	Before Drilling (In Casing)

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
								FILL	0 FT to 1.4 FT Asphalt	1
		10 18 20 17	38	S1	1.4 - 3.4	24/11			S1: Wet, dense, brown, fine to coarse SAND and fine Gravel, little(-) Silt (USCS: SP-SM, Fines: 11.7%).	2
		11 19 100/5"	119/11"	S2	3.4 - 4.8	17/9			S2: Wet, very dense, brown, fine to coarse SAND and fine to coarse Gravel, little Silt (coarse piece of gravel in spoon tip) (USCS: SM, Fines: 14.9%).	
										3
										4
	10	15 24 40 32	64	S3	9 - 11	24/9			S3: Wet, very dense, reddish brown, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	
								13		5
				C1	13 - 18	60/56.5		BEDROCK	C1: Hard, slightly weathered, moderately fractured, coarse grained, white/gray GRANITE with very close to close, vertical to moderately dipping fractures (UCS: 6,848 psi). Coring Times (min/ft): 9 - 10 - 10 - 9 - 10	6
150		RQD=46								
				C2	18 - 23	60/59			C2: Hard, slightly weathered, moderately fractured, coarse grained, white/ dark gray GRANITE with close, vertical to sub-vertical fractures. Coring Times (min/ft): 7 - 6 - 7 - 7 - 8	
145		RQD=72								7
								23	Bottom of Borehole at 23 feet.	8

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Collected pavement core sample from 0 ft to 1.4 ft.
2. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
3. Rig chatter at 7 feet, probable cobble.
4. Wash color chance from dark brown to red/brown at approx. 8.5 feet. Gravel in wash.
5. Harder drilling at 12 feet. Advance casing to 12.5 feet. Roller bit to 13 feet through probable bedrock and begin core.
6. Wash color change to gray at approx. 14 feet.
7. Water loss from 21 to 23 feet.
8. Hole backfilled with bentonite clay and cold patch at surface.

LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-11
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	G. Leavitt	ELEVATION	164.6
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Strata Star 15	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID N 126728.4
13.0	NX Rock Core	11-15-2016 / 12:00 PM	8	Upon Completion (In Casing)			COORD E 2824240.7
23.0	Terminated					DATE START	1/15/16
						DATE END	1/15/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		23 15 20 36	35	S1	0 - 2	24/12		FILL	S1A (Top 4"): Dry, dark brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (roots, root fibers) (TOPSOIL). S1B (Bottom 8"): Dry, brown, fine to coarse SAND, little fine Gravel, trace Silt (coarse piece of gravel in spoon tip).	1
		22 40 55 36	95	S2	4 - 6	24/10			S2: Wet, very dense, gray/ dark brown, fine to coarse GRAVEL and fine to coarse Sand, little Silt (USCS: GM, Fines: 13.1%)	
		16 15 20 20	35	S3	9 - 11	24/13		13	S3 (Top 3"): Wet, dark brown/ black, fine to medium SAND and Silt, little organic material (roots, root fibers) S3B (Bottom 10"): Wet, brown, fine to coarse SAND, some(-) fine to coarse Gravel, little Silt.	2
		RQD=10		C1	13 - 16.5	42/38		BEDROCK	C1: Hard, slight to moderately weathered, moderately to extremely fractured, very fine grained, blue/gray, METAWACKE with very close to close, sub-vertical to sub-horizontal, iron-oxide stained fractures. Coring Times (min/ft): 8 - 8 - 7 - 6/6"	3
		RQD=11		C2	16.5 - 20	42/42			C2: Hard, slight to moderately weathered, extremely fractured, very fine grained, blue/gray, METAWACKE with very close, sub-vertical to sub-horizontal fractures (first 12" iron-oxide stained). Coring Times (min/ft): 5/6" - 6 - 7 - 8	
		RQD=57		C3	20 - 23	36/36		23	C3: Hard, fresh, moderately fractured, very fine grained, blue/gray, METAWACKE with close, sub-vertical fractures (UCS: 51,278 psi). Coring Times (min/ft): 8 - 8 - 8 Bottom of Borehole at 23 feet.	4

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 11.5 feet. Advance casing to 12.5 feet. Roller bit to 13 feet and begin core.
3. Wash color change from brown to gray at approx. 13 feet.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-12
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	164.5

METHOD OF DRILLING		GROUNDWATER READINGS							
		DATE/TIME	DEPTH(ft)	REMARKS	DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger				SPT HAMMER	140 lb Safety	GRID	N	126757.4
6.9	Wash Boring w/ 4" Casing	01-25-2016 / 10:00 AM	6	Sample S4 Wet			COORD	E	2824248.7
18.0	NX Rock Core						DATE START		1/25/16
23.0	Terminated						DATE END		1/26/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		10 12 19 18	31	S1	0 - 2	24/8		FILL	S1A (Top 4"): Moist, dark brown, fine SAND, little fine Gravel, trace Silt, trace organic material (roots, root fibers) (TOPSOIL). S1B (Bottom 4"): Moist, brown, fine to medium SAND, little fine Gravel, trace Silt.	1
		12 21 29 32	50	S2	2 - 4	24/10			S2: Dry, very dense, light brown, fine to coarse SAND, trace Gravel, trace Silt.	
160	5	17 29 38 53	67	S3	4 - 6	24/14			S3A (Top 12"): Moist, dark brown, fine to coarse SAND, some(-) fine Gravel, little Silt (USCS: SM, Fines: 16.4%) S3B (Bottom 2"): Dry, gray/ brown, fine to coarse GRAVEL, some(-) fine to medium Sand, trace Silt (USCS: GP, Fines: 4.7%)	2 3
		36 100/5"	100/5"	S4	6 - 6.9	11/7			S4: Wet, very dense, brown, fine to coarse SAND, some(+) fine to coarse Gravel, little Silt (fine gravel in spoon tip).	
155	10									
150	15									4 5
		100/4"	100/4"	S5	15 - 15.3	4/0			S5: No recovery (coarse gravel fragments in wash).	6
								18		
		RQD=0		C1	18 - 19.7	20/18		BEDROCK	C1: Hard, moderately weathered, extremely fractured, very fine grained, dark gray METAWACKE with very close to close, sub-vertical fractures. Coring Times (min/ft): 3 - 3/8.4"	
145	20	RQD=77		C2	19.7 - 23	40/40			C2: Hard, slightly weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to moderately dipping fractures (UCS: 14,406 psi). Coring Times (min/ft): 3 - 3 - 3 - 1/3.6"	7
								23	Bottom of Borehole at 23 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Advanced augers to 6.9 feet. Rollerbit ahead to approx. 15 feet. Harder drilling from 6.9 feet to 8.5 feet and 13 feet to 13.5 feet, probable cobbles.
3. Augers removed from hole. Switched to rotary drilling techniques and washed out hole to 15 feet.
4. Piece of plastic material found in wash at 13 feet, probable fill material.
5. Fine to coarse sand in wash at 13.5 feet, probable fill.
6. 4" casing driven to 15.3 feet. Rollerbit ahead to 18 feet and begin rock core.
7. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

PROJECT	York Toll Plaza	BORING NO.	B-13 (OW)	
LOCATION	Maine Turnpike Mile 8.8			
OWNER	Maine Turnpike Authority			
JOB NUMBER	E2X71602		SHEET 1 OF 1	

INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION		158.1
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126770.5
10.0	NX Rock Core	01-25-2016 / 2:45 PM	3.1	Upon Completion (In Casing)			COORD	E	2824288.3
20.0	Terminated	01-28-2016 / 2:00 PM	2.64	Monitoring Well Reading			DATE START		1/25/16
							DATE END		1/25/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		2 11 12 14	23	S1	0 - 2	24/7		FILL	S1: Dry, medium dense, brown, fine to coarse SAND, some organic root material, little Silt, trace Gravel, organic odor (TOPSOIL).	1
155										
	5	15 28 30 30	58	S2	5 - 7	24/7			S2: Wet, very dense, dark brown, fine to coarse SAND, some(+) fine to coarse Gravel, little Silt (pieces of coarse gravel in spoon tip).	2
150										
										3 4
	10			C1	10 - 15	60/47		10 BEDROCK	C1: Hard, very slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, horizontal to sub-vertical fractures (UCS: 33,305 psi). Coring Times (min/ft): 2 - 1 - 2 - 2 - 2	5
145		RQD=64								
	15			C2	15 - 20	60/60			C2 (0" to 6"): Hard, slightly weathered, very fine grained, dark gray METAWACKE. (6" to 18"): Hard, slightly weathered, moderately fractured, coarse grained, white GRANITE intrusion. (18" to 60"): Hard, very slightly weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE, close to very close, sub-horizontal to vertical fractures. Coring Times (min/ft): 2 - 2 - 2 - 2 - 2 Bottom of Borehole at 20 feet.	6 7
140		RQD=58								
	20							20		
135										
	25									
130										
	30									
125										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Borehole drilled approx. 46 feet west of marked location.
2. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
3. Harder drilling at 8.4 feet, probable cobble.
4. Rig chatter at 9 feet.
5. Wash color change from gray to brown to gray at approx. 11 feet, possible gravel seam. Slight water loss.
6. Slight water loss from 17 to 20 feet.
7. Upon completion of drilling, an observation well was installed with standpipe. Well screen set from 2' to 12' below surface. Refer to Monitoring Well log.

LOG OF MONITORING WELL

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-13 (OW)
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

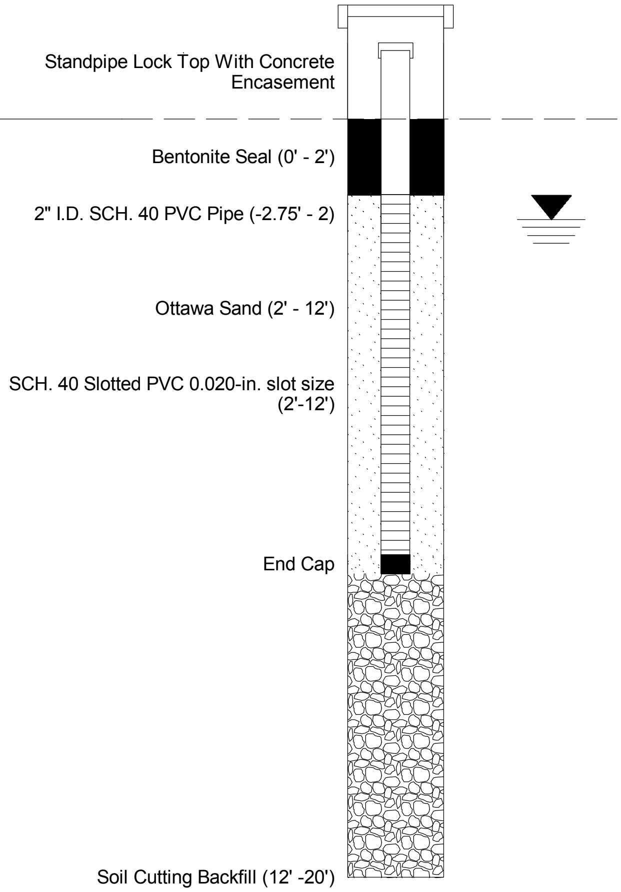
INSPECTOR	G. Shay	CONTRACTOR	New England Boring Contractors
DRILLER	M. Porter	ELEVATION	158.1
DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
SPT HAMMER	140 lb Safety	GRID COORD N	126770.5
		GRID COORD E	2824288.3
		DATE START	1/25/16
		DATE END	1/25/16

METHOD OF DRILLING	
0.0	Wash Boring w/ 4" Casing
10.0	NX Rock Core
20.0	Terminated

GROUNDWATER READINGS		
DATE/TIME	DEPTH(ft)	REMARKS
01-25-2016 / 2:45 PM	3.1	Upon Completion (In Casing)
01-28-2016 / 2:00 PM	2.64	Monitoring Well Reading

DEPTH (FEET)	STRATA SYMBOL	ELEVATION (FEET)	MATERIAL DESCRIPTION
0	▩		FILL
5	▩		
10	▨	148.10	BEDROCK
15	▨		
20		138.10	
25			
30			
35			

WELL DIAGRAM



BORING NO. B-13 (OW)

LOG OF TEST PIT

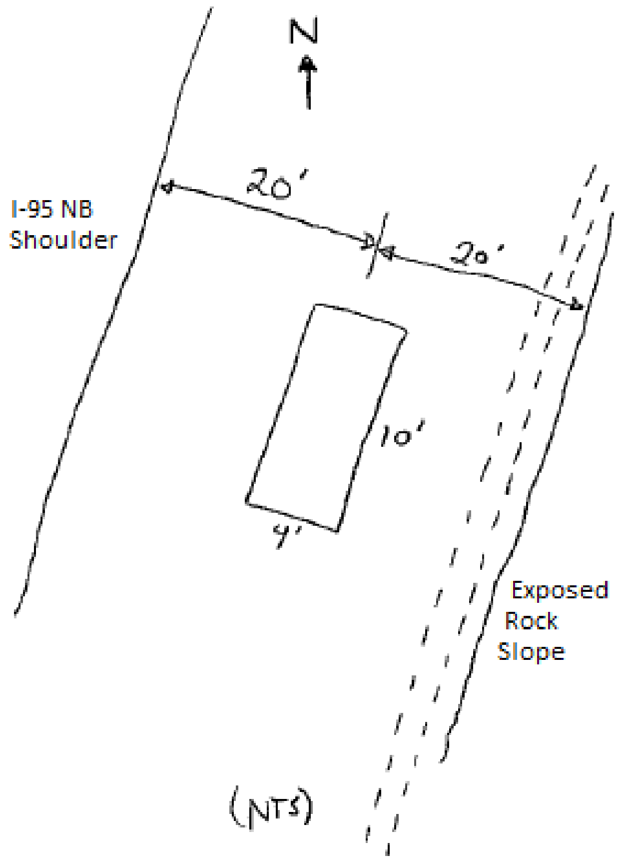
JACOBS

PROJECT	York Toll Plaza	TEST PIT NO.	TP-4
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

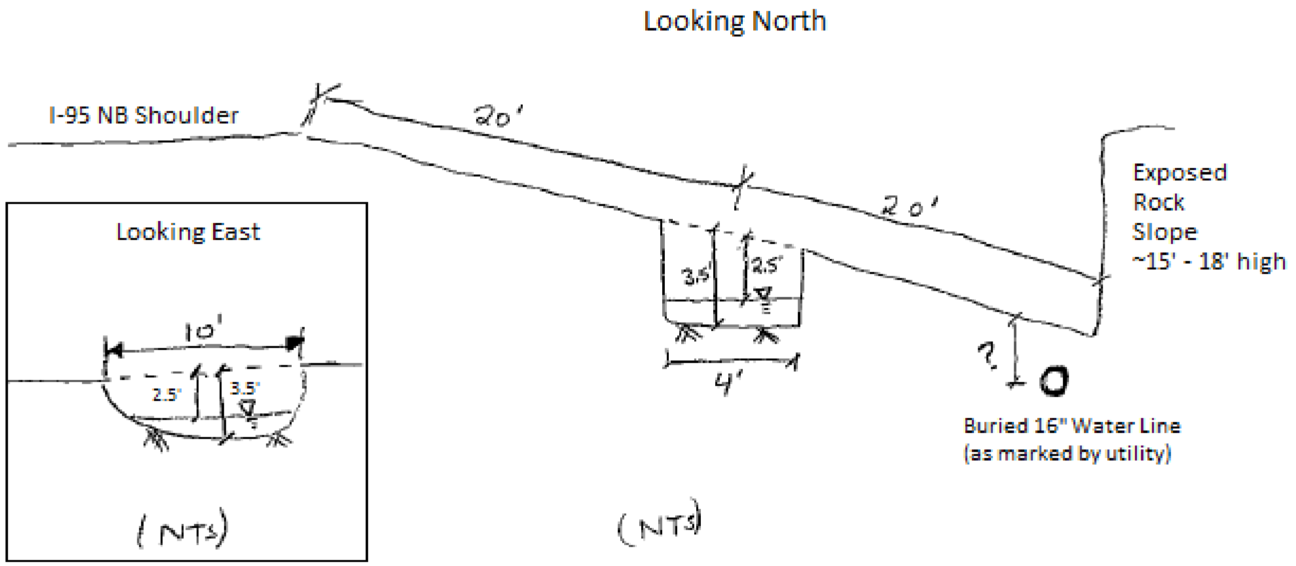
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		145.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1215	2.5	Observed	DATE START	1/14/2016	GRID	N	125783.4
					DATE END	1/14/2016	COORD	E	2824000.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		144.50	Top 6" Topsoil
			Brown, medium to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders (blast rock). (FILL)
		141.50	Bedrock at 3.5'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 3.5' deep. Mostly blasted rock (FILL) on top of bedrock.
2. Water encountered at 2.5' deep.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ☒ BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-4

LOG OF TEST PIT

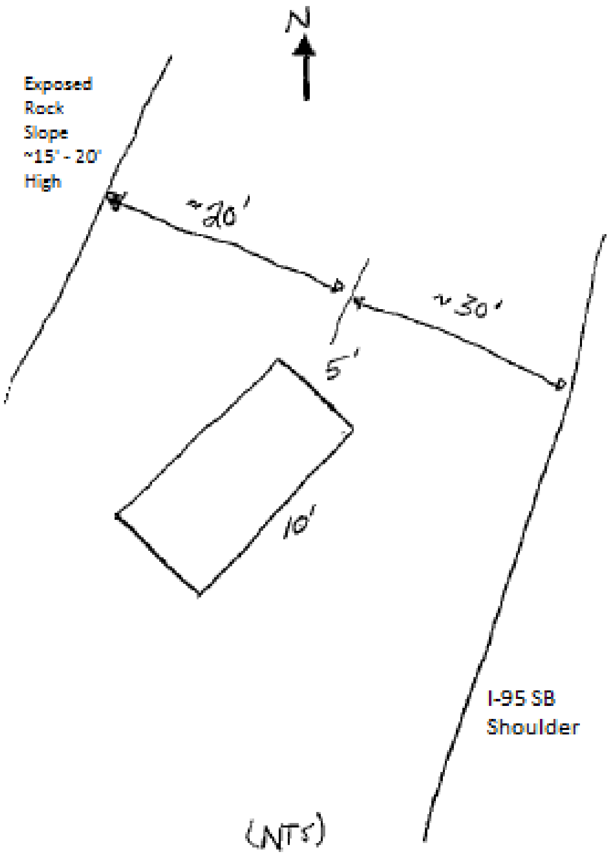
PROJECT	York Toll Plaza	TEST PIT NO.	TP-5
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING		
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS
BUCKET	1/3 cu. yd	01-14-2016 / 1030	3	Observed

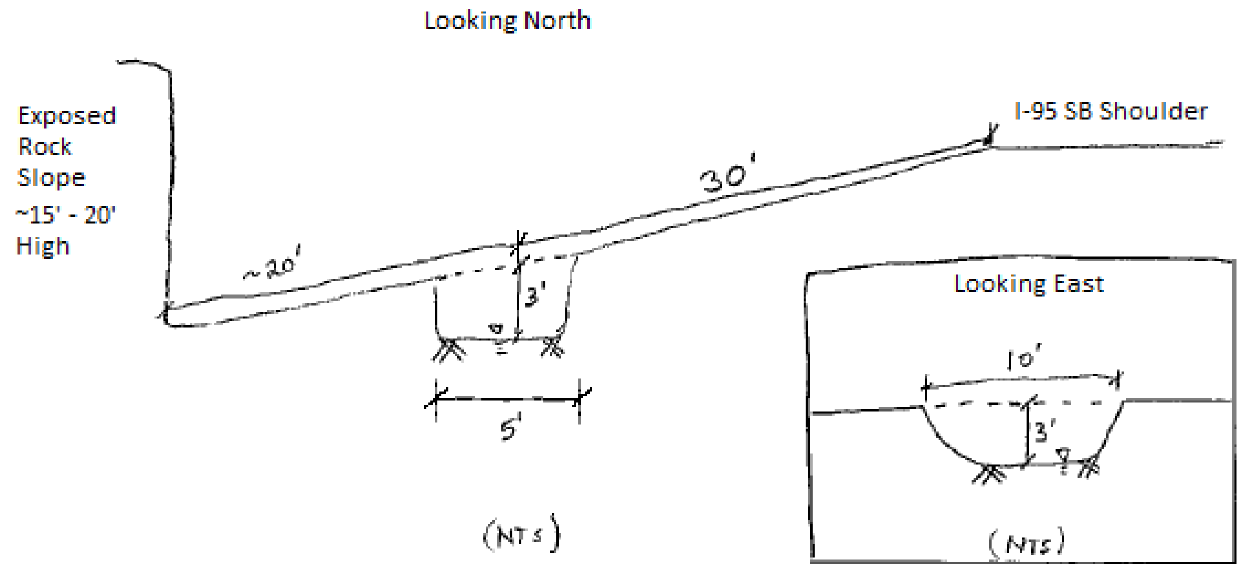
OPERATOR	D. Thompson	ELEVATION		148.0
INSPECTOR	K. Toombs	DATUM		NAVD88
DATE START	1/14/2016	GRID	N	126052.5
DATE END	1/14/2016	COORD	E	2823892.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		147.50	Top 6" Topsoil
			Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles, occasional boulders and blast rock. (FILL)
		145.00	Bedrock at 3'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 3' deep.
2. Water encountered at 3' deep.

LEGEND

▼ WATER LEVEL	⧗ JAR SAMPLE	⊠ BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-5

LOG OF TEST PIT

JACOBS

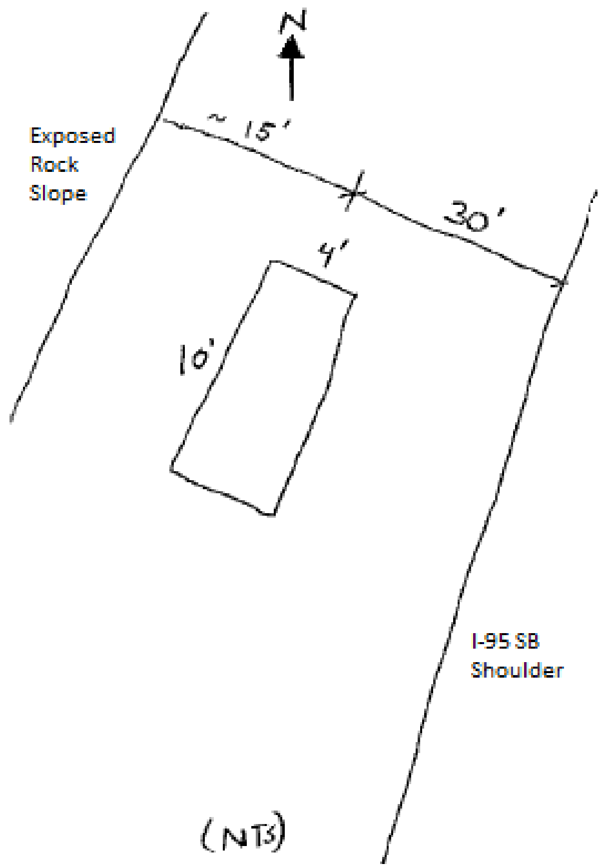
PROJECT	York Toll Plaza	TEST PIT NO.	TP-6
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING		
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS
BUCKET	1/3 cu. yd	01-14-2016 / 1045	2.5	Observed

OPERATOR	D. Thompson	ELEVATION		154.6
INSPECTOR	K. Toombs	DATUM		NAVD88
DATE START	1/14/2016	GRID	N	126329.8
DATE END	1/14/2016	COORD	E	2823963.8

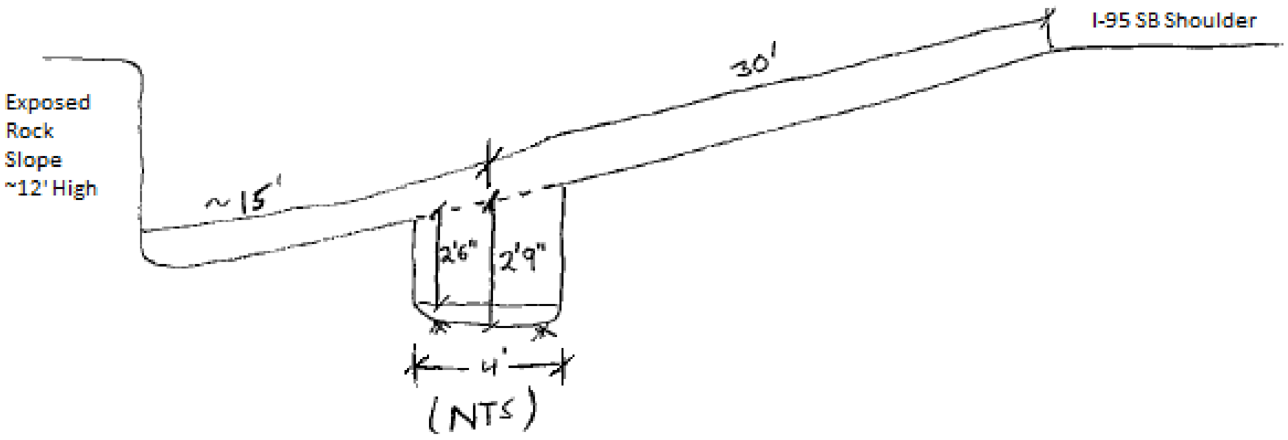
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		154.10	Top 6" Topsoil
		▼	Brown, medium to coarse SAND, some Gravel, trace Silt, with some cobbles and occasional boulders (blast rock). (FILL)
		151.85	Bedrock at 2.75'
5			
10			
15			
20			

PLAN VIEW



SKETCHES

Looking North



REMARKS:

1. Bedrock encountered at 2' 9" deep.
2. Water encountered at 2' 6" deep.

LEGEND

▼ WATER LEVEL | JAR SAMPLE | ☒ BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-6

LOG OF TEST PIT

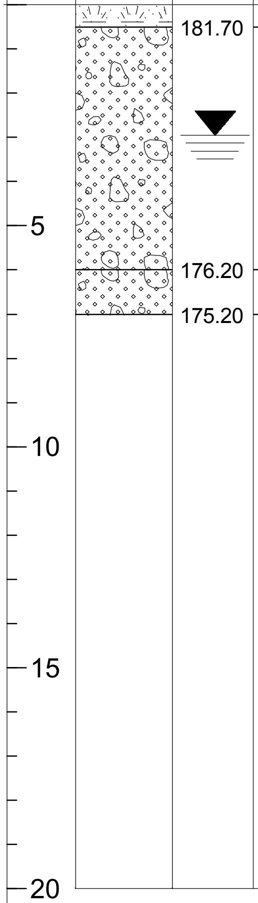
PROJECT	York Toll Plaza	TEST PIT NO.	TP-7
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

CONTRACTOR	New England Boring	OPERATOR	D. Thompson	ELEVATION	182.2
EXCAVATOR	Kubota KX080-4	INSPECTOR	K. Toombs	DATUM	NAVD88
BUCKET	1/3 cu. yd	DATE START	1/15/2016	GRID COORD N	126923.4
		DATE END	1/15/2016	GRID COORD E	2822927.8

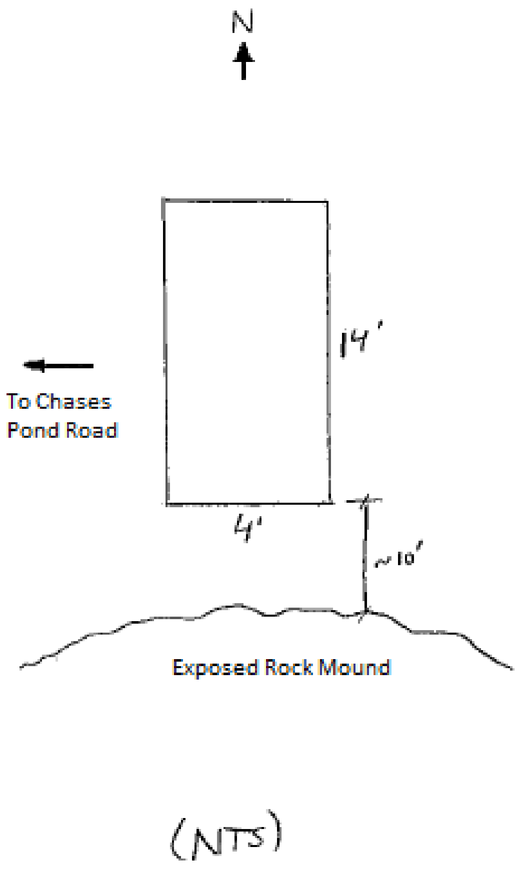
GROUNDWATER READING

DATE/TIME	DEPTH(ft)	REMARKS
01-15-2016 / 1200	3	Estimate (Seepage)

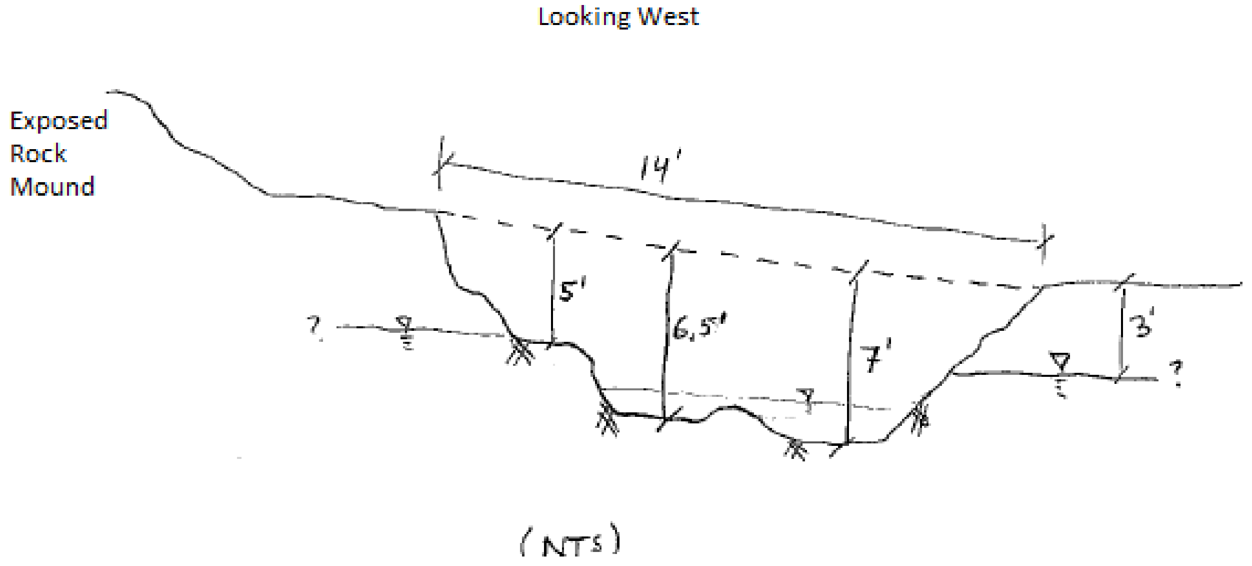
DEPTH (ft)	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		Top 6" Topsoil
	181.70	Top 12" Roots
3	▼	Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles and occasional boulders.
	176.20	Brown, fine to coarse SAND, some Gravel, some Silt, with little cobbles.
	175.20	Bedrock at 7'



PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at different shelf depths ranging from 5' - 7' deep.
2. Seeping water observed 3' below grade during excavation. Approximately 1" of water visible at bottom of excavation before backfilling.
3. Test pit performed along proposed Access Road.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ☒ BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-7

LOG OF TEST PIT

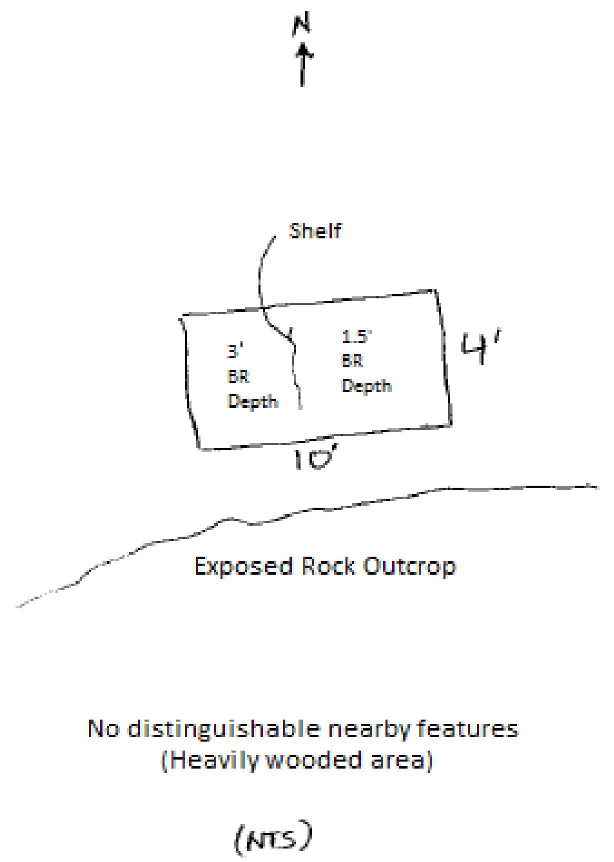
JACOBS

PROJECT	York Toll Plaza	TEST PIT NO.	TP-8
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

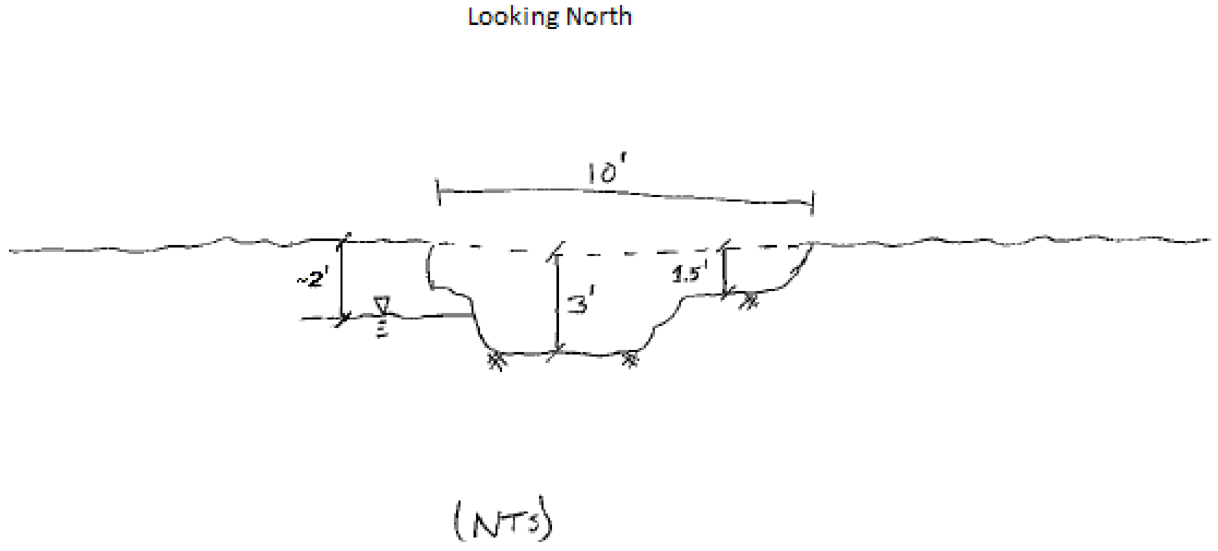
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		179.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 1115	2	Estimate (Seepage)	DATE START	1/15/2016	GRID	N	126797.1
					DATE END	1/15/2016	COORD	E	2823281.4

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
			Top 12" Topsoil
		178.60	Brown, fine to coarse SAND, some Gravel, trace Silt, with some cobbles and one 2.5' diameter boulder.
		176.60	Bedrock at 3'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 3' deep on western side of the test pit with a shelf to 1.5' deep on the eastern side.
2. Seeping water observed 2' below grade during excavation. However, no standing water visible before backfilling.
3. Test pit performed along proposed Access Road.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ⊠ BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

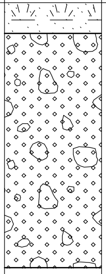
TEST PIT NO. TP-8

LOG OF TEST PIT

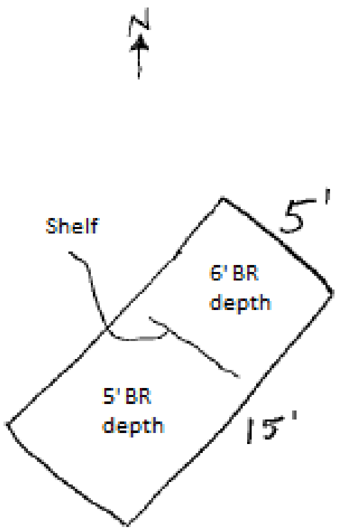
JACOBS

PROJECT	York Toll Plaza	TEST PIT NO.	TP-9
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		179.3
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 1030		None Encountered	DATE START	1/15/2016	GRID	N	126558.8
					DATE END	1/15/2016	COORD	E	2823596.8

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
			Top 8" Topsoil and roots
		178.60	Reddish brown, medium to coarse SAND, little Gravel, trace Silt, with little cobbles.
			Brown, medium to coarse SAND and GRAVEL, trace Silt, with few cobbles and occasional boulders.
5			
		173.30	Bedrock at 6'
10			
15			
20			

PLAN VIEW

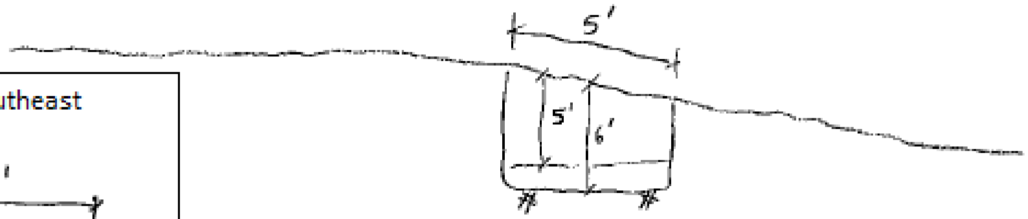


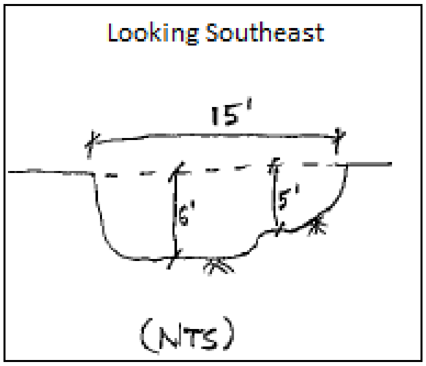
No distinguishable nearby features
(Heavily wooded area)

(NTS)

SKETCHES

Looking Northeast





(NTS)

REMARKS:

1. Bedrock encountered at 5' deep and dropping off a shelf to 6' deep on the north portion of the test pit.
2. No water observed. However, soil was observed to be slightly moist 5' below grade.
3. Test pit performed along proposed Access Road.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ⌧ BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-9

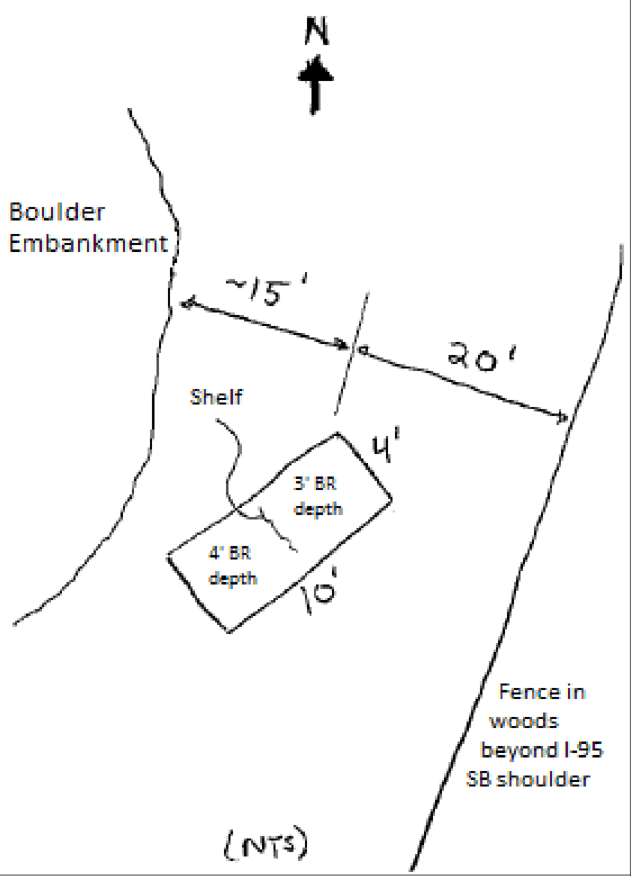
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO.	TP-10
	LOCATION	Maine Turnpike Mile 8.8		
	OWNER	Maine Turnpike Authority		
	JOB NUMBER	E2X71602		SHEET 1 OF 1

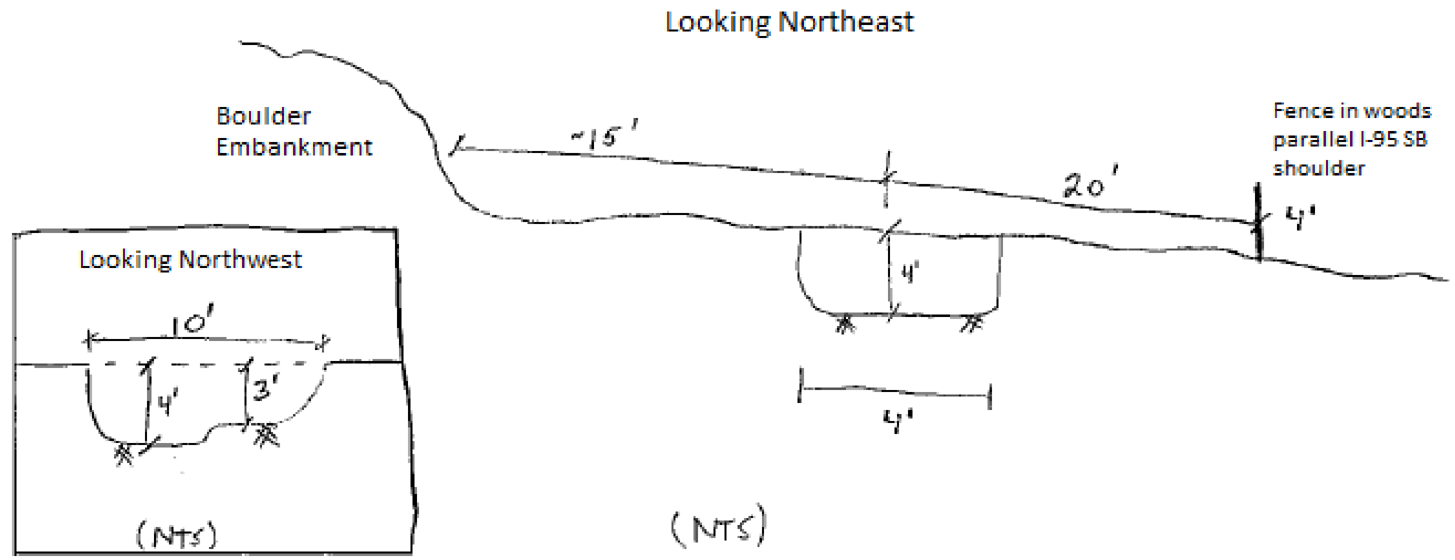
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		165.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 0850		None Encountered	DATE START	1/15/2016	GRID	N	127120.6
					DATE END	1/15/2016	COORD	E	2824074.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
			Top 12" Topsoil and roots
		164.60	Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles and several boulders.
		161.60	Bedrock at 4'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 4' deep and rising to 3' deep on a shelf at the north end of the test pit.
2. No water was observed, but the bottom of the excavation was very moist.
3. Test pit performed along proposed Access Road.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ☒ BAG SAMPLE

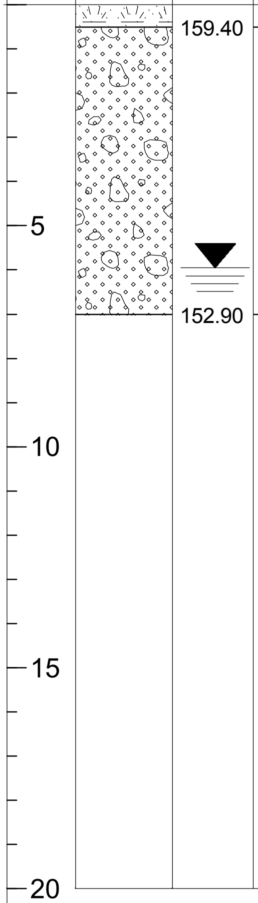
RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-10

LOG OF TEST PIT

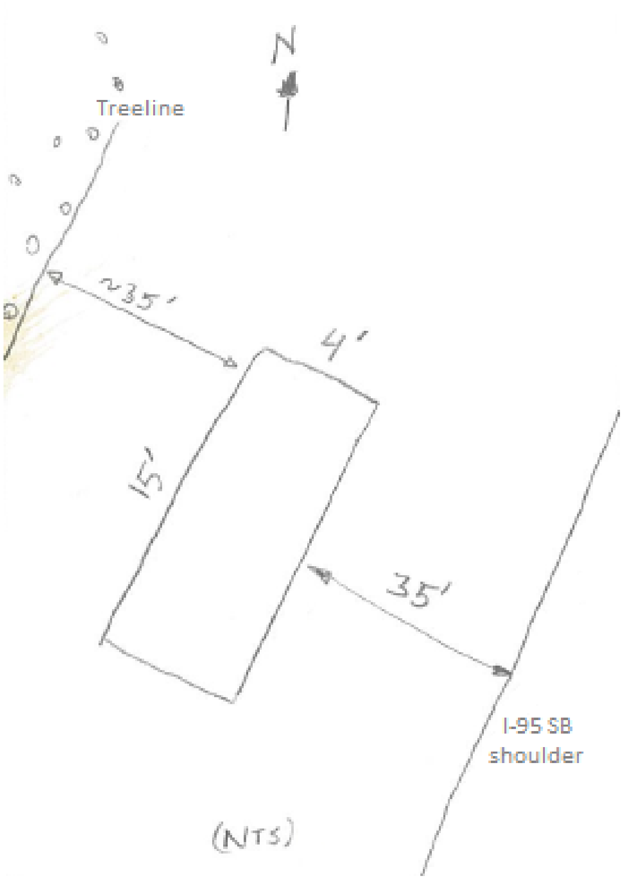
JACOBS	PROJECT	York Toll Plaza	TEST PIT NO.	TP-11
	LOCATION	Maine Turnpike Mile 8.8		
	OWNER	Maine Turnpike Authority		
	JOB NUMBER	E2X71602		SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		159.9
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 0930	6	Observed	DATE START	1/14/2016	GRID	N	127301.4
					DATE END	1/14/2016	COORD	E	2824225.7

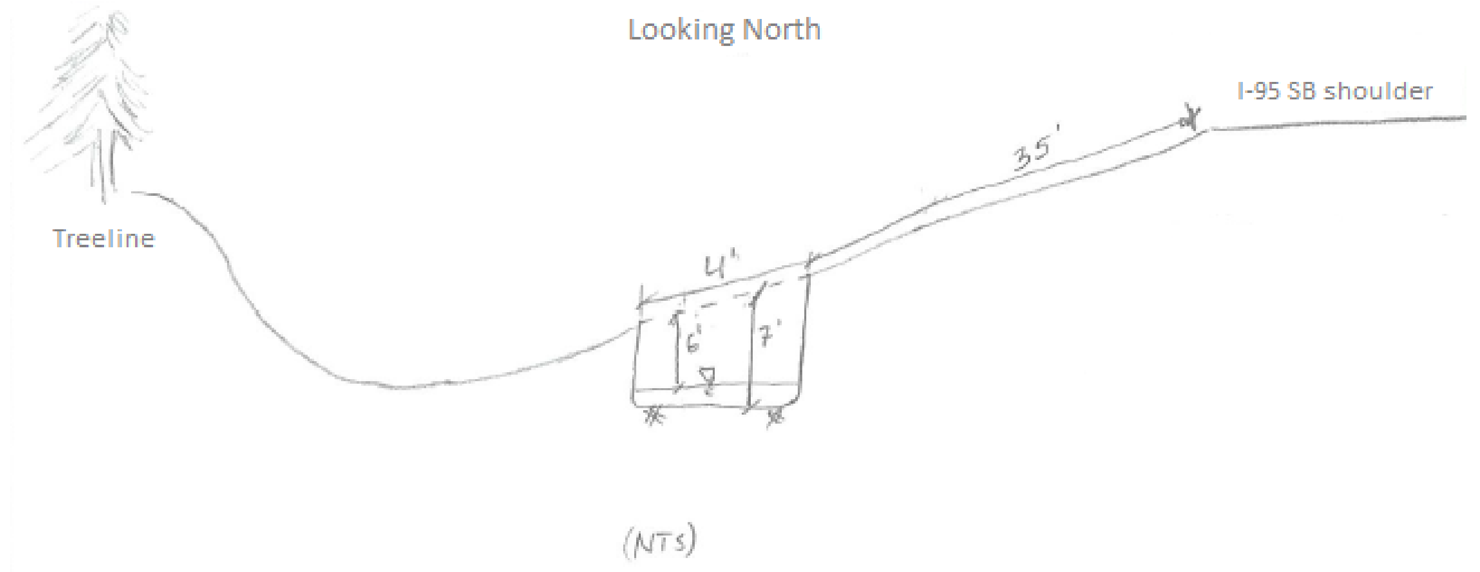


DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		159.40	Top 6" Topsoil
			Brown, fine to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders. (FILL)
			Occasional large boulders (2' - 3' diameter) starting at 5' below grade.
		152.90	Bedrock at 7'

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 7' deep.
2. Water encountered at 6' deep.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ⧖ BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-11

LOG OF TEST PIT

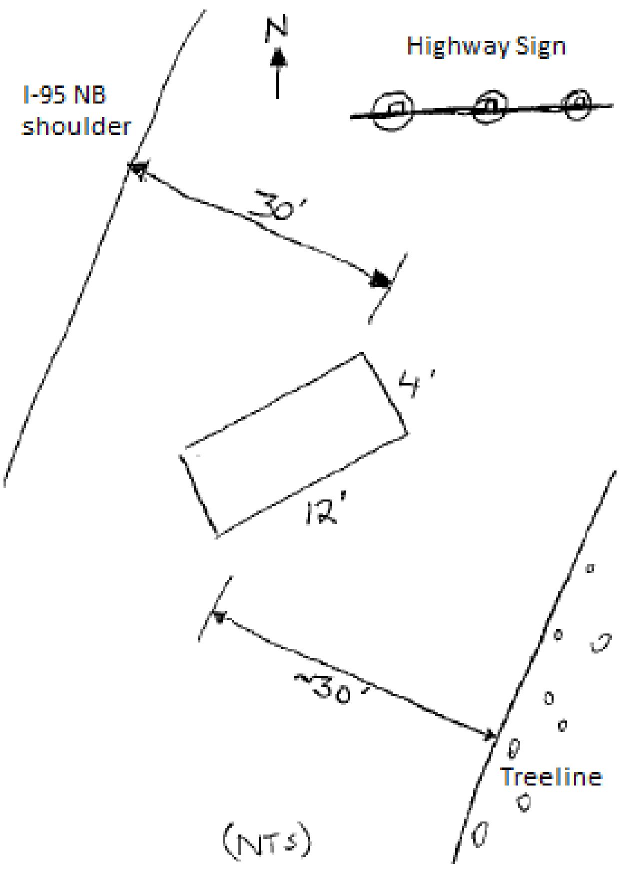
JACOBS

PROJECT	York Toll Plaza	TEST PIT NO.	TP-12
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

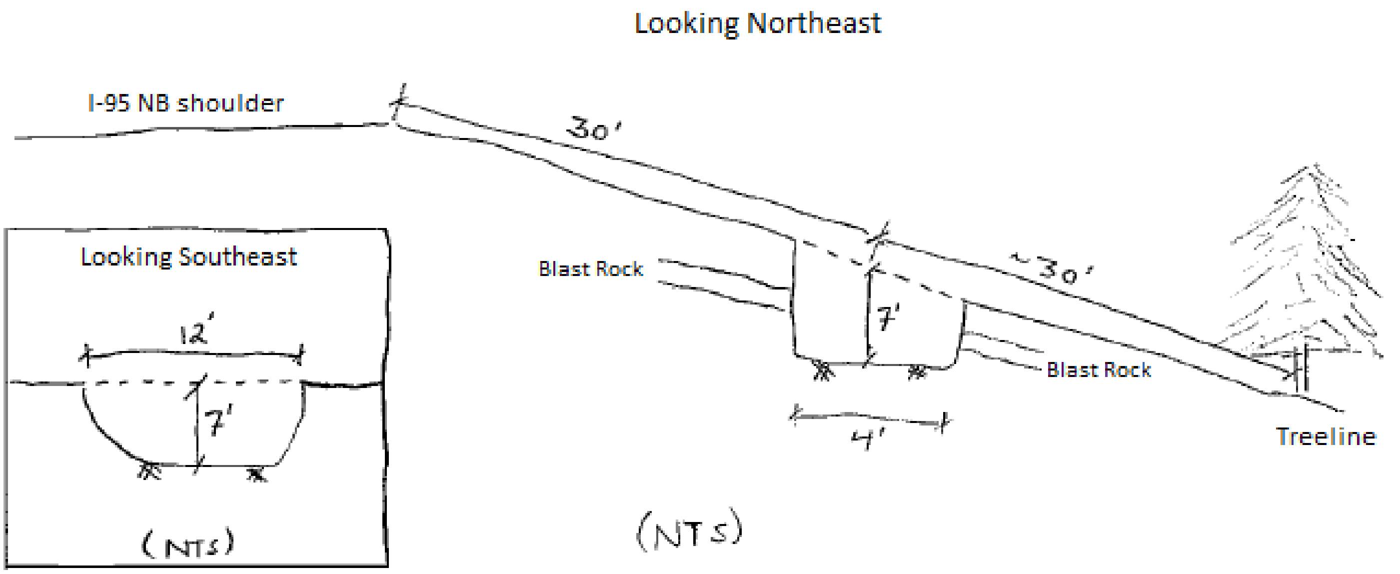
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		161.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1300		None Encountered	DATE START	1/14/2016	GRID	N	127251.3
					DATE END	1/14/2016	COORD	E	2824404.6

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		160.50	Top 6" Topsoil
5			Brown, medium to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders (blast rock). (FILL) Some plant roots at 3' deep. 1' - 2' thick layer of cobbles and boulders (blast rock) at 4' below grade.
		154.00	Bedrock at 7'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 7' deep.
2. Water was not encountered.

LEGEND

▼ WATER LEVEL ⧗ JAR SAMPLE ☒ BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-12

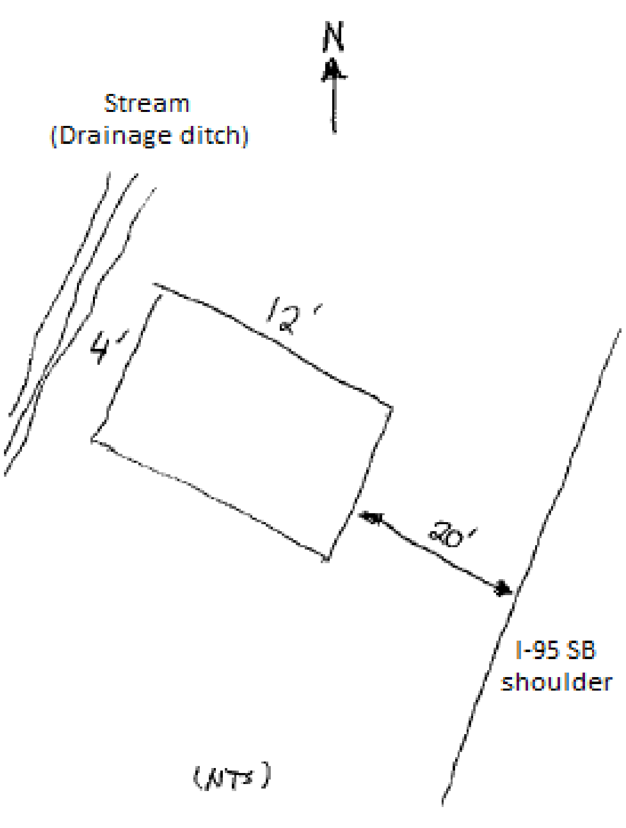
LOG OF TEST PIT

PROJECT	York Toll Plaza	TEST PIT NO.	TP-13
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		SHEET 1 OF 1

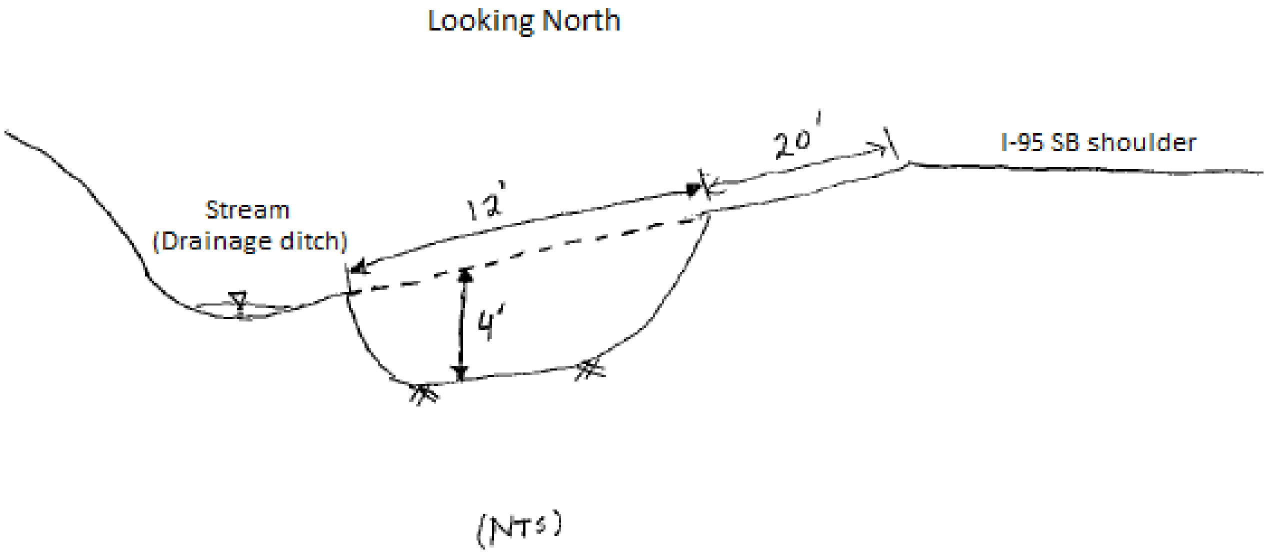
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		149.1
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 0900		None Encountered	DATE START	1/14/2016	GRID	N	127781.9
					DATE END	1/14/2016	COORD	E	2824360.8

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		148.60	Top 6" Topsoil
			Brown, medium to coarse SAND, some Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		145.10	Bedrock at 4'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 4' deep.
2. Water was not encountered although exposed bedrock was visibly wet/moist.

LEGEND

WATER LEVEL — JAR SAMPLE — BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-13

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Appendix C. **Rock Core Photos**

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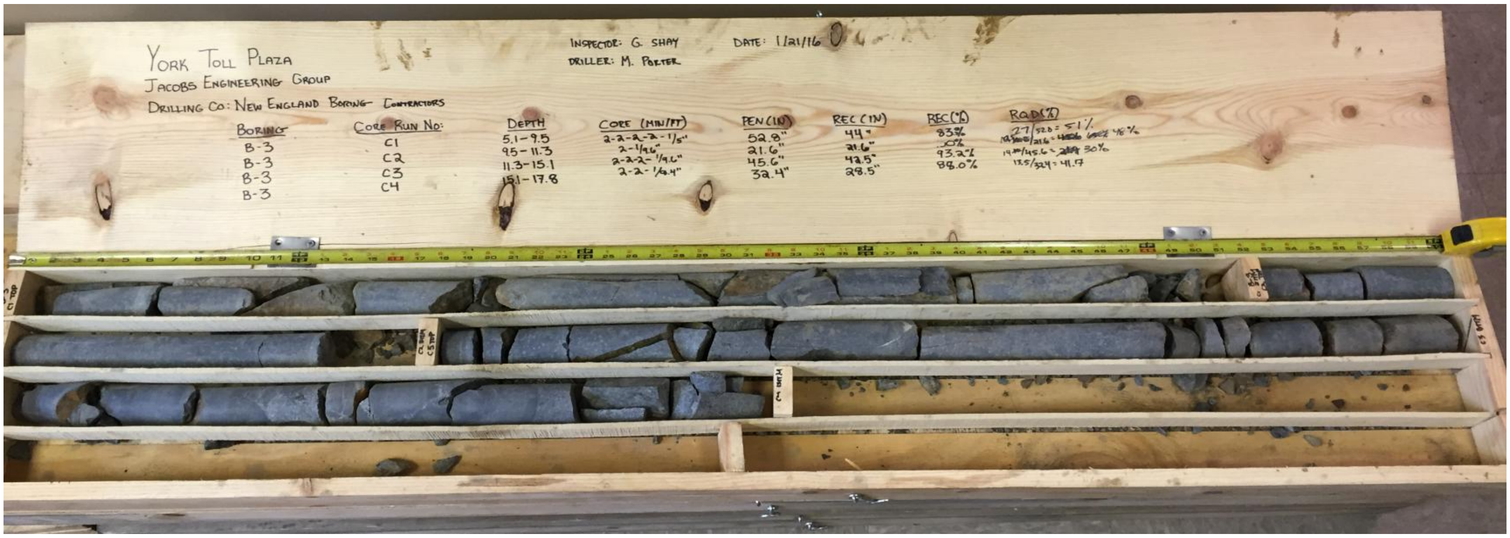
York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-3 (OW)

Bedrock Type: METAWACKE

B-3 (DRY)



B-3 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-8 & B-6

Bedrock Type: (B-6) GRANITE/ METAWACKE
(B-8) METAWACKE

B-6 & B-8 (DRY)

York Toll Plaza
Jacobs Engineering Group
Drilling Co: NEB
E2X71602
Inspector: G. Shay
Driller: M. Porter
Date: 1/20/2016

Boring	Core Run No.	Depth	Core Min/Ft	Pen(in)	Rec(in)	Rec(%)	RQD(%)
B-8	C1	6.2'-10.4'	2-2-2-2-0.5/6"	50	46.5	93	21.5/50=43%
B-8	C2	10.4'-15.4'	3-3-2-3-3	60	60	100	42/60=70%
B-8	C3	15.4'-16.4'	2.5	12	12	100	9/12=75%
B-6	C1	5.2'-8.5'	2-2-2-1/3.6"	39.6	39.6	100	0
B-6	*C2	8.5'-12.4'*	2-2-2-1.8/10.8"	46.8	46.8	100	13/46.8=27.8

*Note: Remaining sample in other core box.

York Toll Plaza
Jacobs Engineering Group
Drilling Co: New England Boring, Contractors
Inspector: G. Shay
Driller: M. Porter
Date: 1/20/16

Boring	Core No:	Depth	Core Min/Ft	Pen(in)	Rec(in)	Rec(%)	RQD(%)
B-6	C2	8.5'-12.4'	2-2-2-1.5/10.8"	46.8	46.8	100	13/46.8=27.8
B-6	C3	12.4'-15.2'	2-2-1/4.6"	33.6	33.6	100	10.5/33.6=31.3
B-6	C4	15.2'-16.7'	2-1/6"	18	16	88.9	8/18=44.4
B-6	C5	16.7'-20.2'	2-2-2-1/6"	42	42	100	29.5/42=70.2

(Continued on next page)

JACOBS

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-8 & B-6

Bedrock Type: (B-6) GRANITE/ METAWACKE
(B-8) METAWACKE

B-6 & B-8 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-7 & B-11
Bedrock Type: METAWACKE

B-7 & B-11 (DRY)

B-7 & B-11 (WET)

JACOBS

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-9 & B-10

Bedrock Type: (B-9) GRANITE/ METAWACKE

(B-10) GRANITE

B-9 & B-10 (DRY)

B-9 & B-10 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-12

Bedrock Type: METAWACKE

B-12 (DRY)

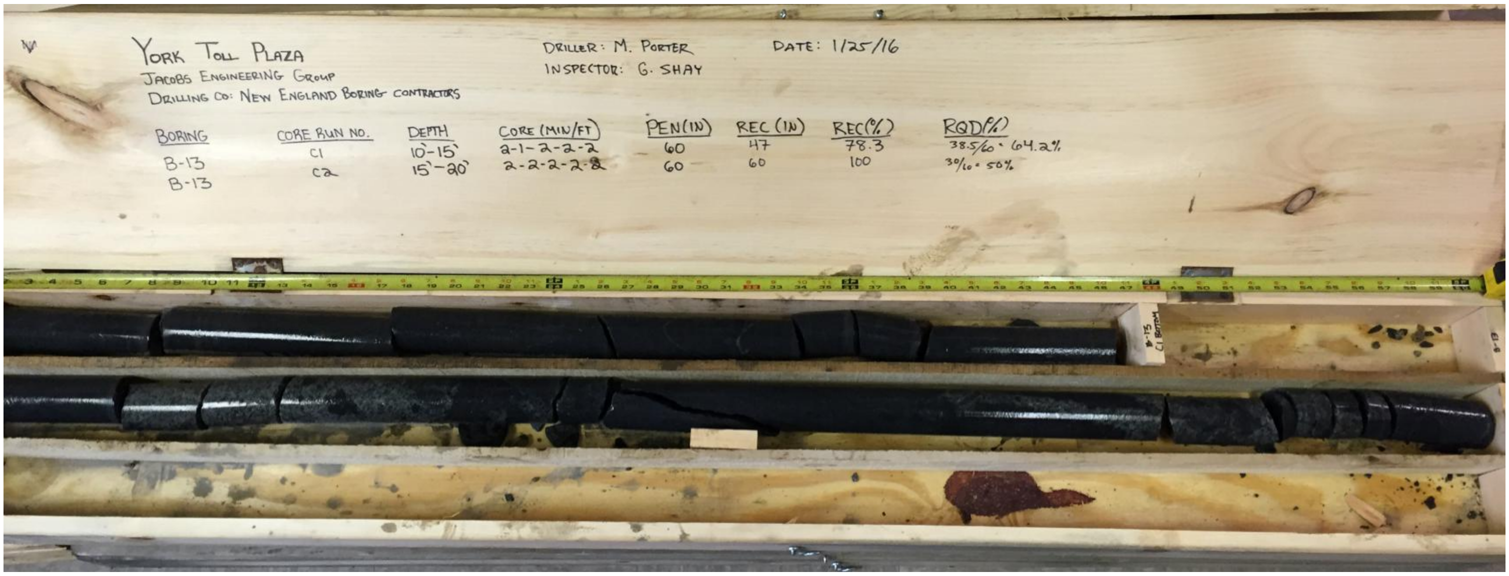
B-12 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-13 (OW)
Bedrock Type: METAWACKE

B-13 (DRY)

B-13 (WET)



Appendix D. **Laboratory Testing Results**

THIELSCH
ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

York Toll Plaza

MDOT Project Number:

Town(s): York, ME

Jacobs Engineering Group, Inc.
Project Number: E2X71602

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
B-2		S-2A	7.4-9.4	16-S-162		8.3			SM	A-4(0)	0
B-2		S-2B	7.4-9.4	16-S-163		2.9			GM	A-1-a	I
B-3		S-2A	2-3.6	16-S-164		45.6			SM	A-4(0)	III
B-3		S-2B	2-3.6	16-S-165		1.7			GP	A-1-a	0
B-4		S-2B	5-7	16-S-166		11.5			GW-GM	A-1-a	0
B-7		S-1	0-2	16-S-167		7.1			SP-SM	A-1-b	II
B-8		S-2	5-5.7	16-S-168		14.8			SM	A-1-b	II
B-10		S-1	1.4-3.4	16-S-169		8.6			SP-SM	A-1-a	II
B-10		S-2	3.4-5.4	16-S-170		10.4			SM	A-1-b	II
B-11		S-2	4-6	16-S-171		9.9			GM	A-1-a	0
B-12		S-3A	4-6	16-S-172		8.8			SM	A-1-b	II
B-12		S-3B	4-6	16-S-173		1.6			GP	A-1-a	0

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

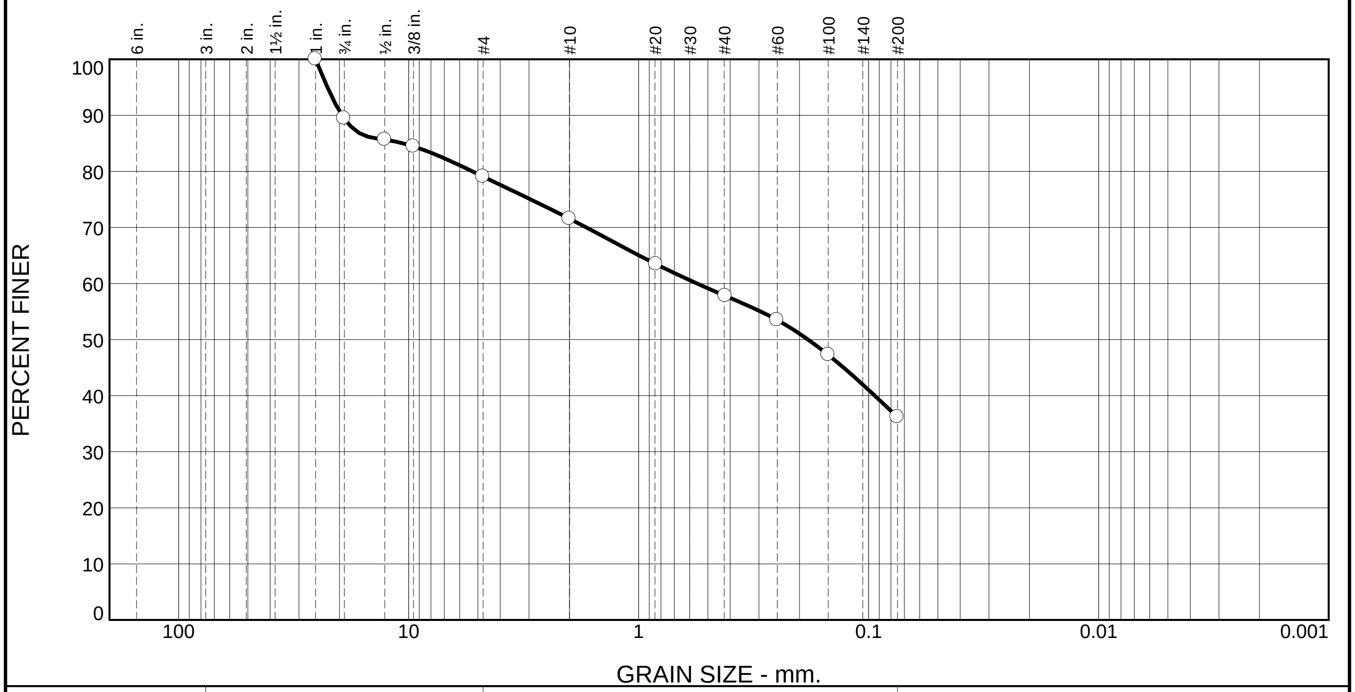
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.6	10.3	7.5	13.7	21.7	36.2	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	89.5		
.5"	85.7		
.375"	84.5		
#4	79.1		
#10	71.6		
#20	63.5		
#40	57.8		
#60	53.5		
#100	47.3		
#200	36.2		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 19.4994 D_{85}= 10.5918 D_{60}= 0.5573
D_{50}= 0.1835 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16
Tested By: MS
Checked By: Matthew Polsky
Title: Laboratory Manager

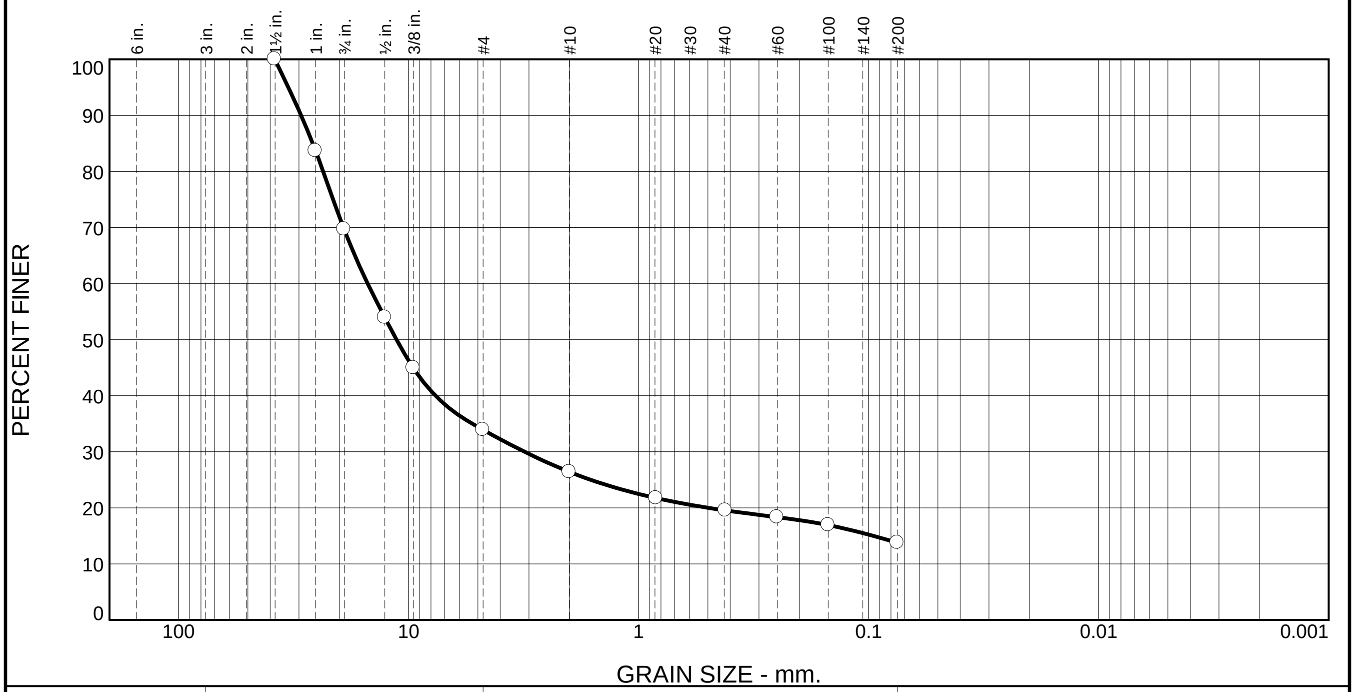
Source of Sample: Borings **Depth:** 7.4-9.4' **Date Sampled:**
Sample Number: B-2: S-2A

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-162

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.4	35.7	7.5	6.8	5.8	13.8	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	83.7		
0.75"	69.7		
.5"	53.9		
.375"	44.9		
#4	33.9		
#10	26.4		
#20	21.7		
#40	19.5		
#60	18.3		
#100	16.9		
#200	13.8		

* (no specification provided)

Material Description

Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}=	29.3694	D_{85}=	26.1444	D_{60}=	15.0765
D_{50}=	11.2970	D_{30}=	3.1330	D_{15}=	0.0957
D_{10}=		C_u=		C_c=	

Remarks

Maine DOT Frost = I

Date Received: 2/23/16 **Date Tested:** 2/24/16
Tested By: MS
Checked By: Matthew Polsky
Title: Laboratory Manager

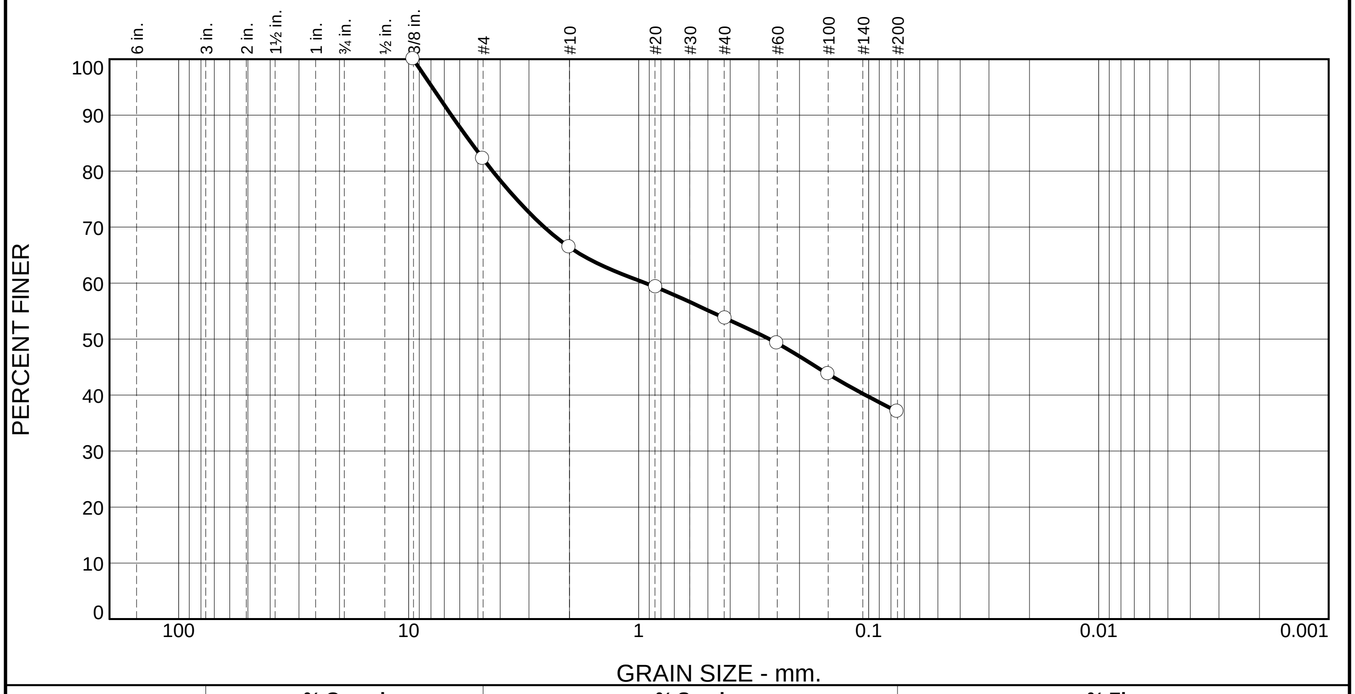
Source of Sample: Borings **Depth:** 7.4-9.4'
Sample Number: B-2: S-2B
Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-163

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	17.8	15.8	12.6	16.8	37.0	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	82.2		
#10	66.4		
#20	59.3		
#40	53.7		
#60	49.3		
#100	43.7		
#200	37.0		

* (no specification provided)

Material Description

Red-brown silty sand with gravel (with Organics)

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 6.5227	D_{85}= 5.3394	D_{60}= 0.9332
D_{50}= 0.2702	D_{30}=	D_{15}=
D_{10}=	C_u=	C_c=

Remarks

Maine DOT Frost = III

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 2-3.6'
Sample Number: B-3: S-2A

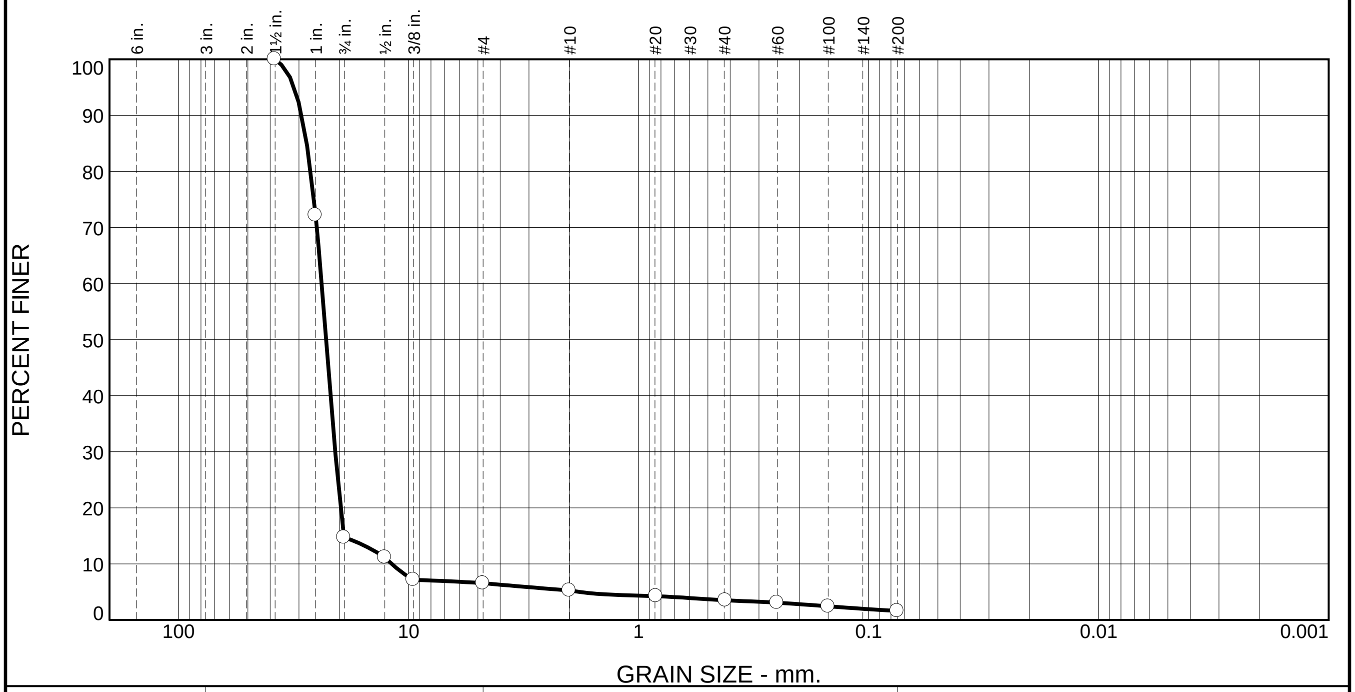
Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-164

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	85.3	8.1	1.3	1.8	1.9	1.6	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	72.2		
0.75"	14.7		
.5"	11.2		
.375"	7.1		
#4	6.6		
#10	5.3		
#20	4.2		
#40	3.5		
#60	3.1		
#100	2.4		
#200	1.6		

* (no specification provided)

Material Description

Brown poorly graded gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 29.1980 D_{85}= 27.7590 D_{60}= 23.8885
D_{50}= 22.8320 D_{30}= 20.8498 D_{15}= 19.1403
D_{10}= 11.8631 C_u= 2.01 C_c= 1.53

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16
Tested By: MS
Checked By: Matthew Polsky
Title: Laboratory Manager

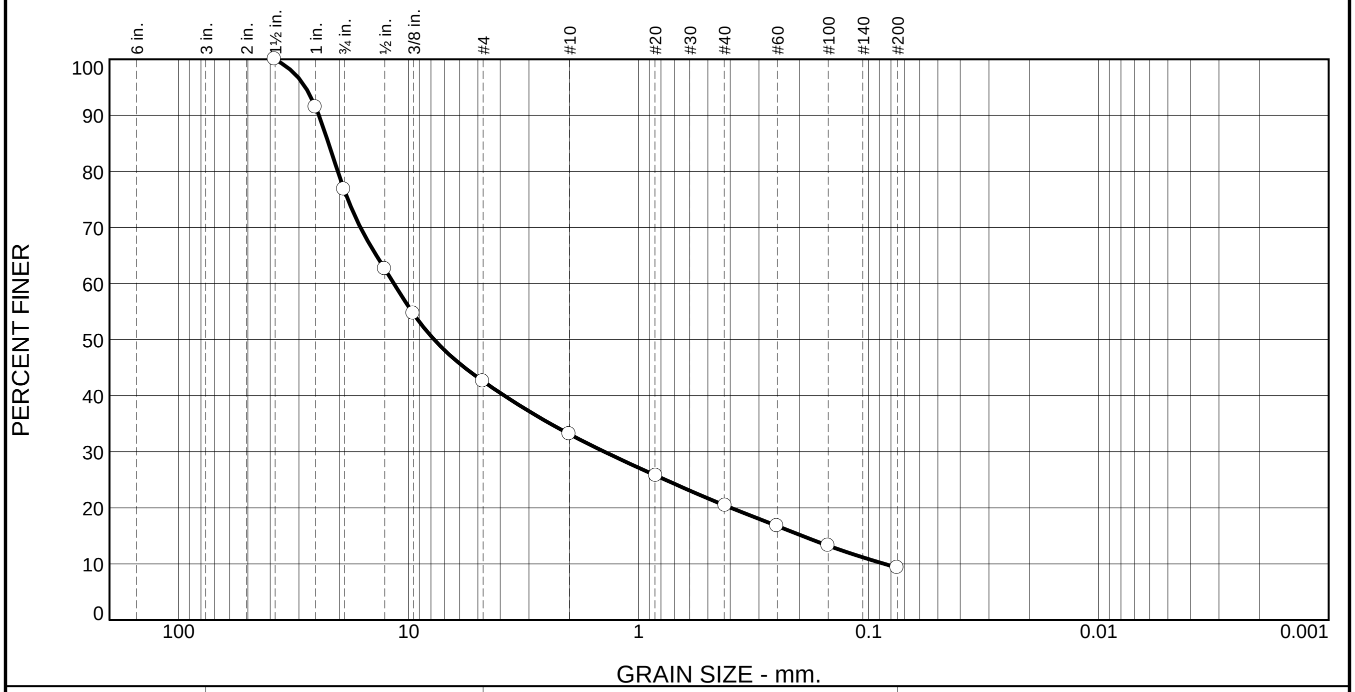
Source of Sample: Borings **Depth:** 2-3.6' **Date Sampled:**
Sample Number: B-3: S-2B

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-165

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.4	34.0	9.5	12.6	11.2	9.3	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.5		
0.75"	76.8		
.5"	62.6		
.375"	54.6		
#4	42.6		
#10	33.1		
#20	25.7		
#40	20.4		
#60	16.8		
#100	13.2		
#200	9.3		

* (no specification provided)

Material Description

Brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GW-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 24.5732	D_{85}= 22.2860	D_{60}= 11.6004
D_{50}= 7.7454	D_{30}= 1.4097	D_{15}= 0.1946
D_{10}= 0.0854	C_u= 135.83	C_c= 2.01

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 5-7'

Sample Number: B-4: S-2B

Date Sampled:

Thielsch Engineering Inc.

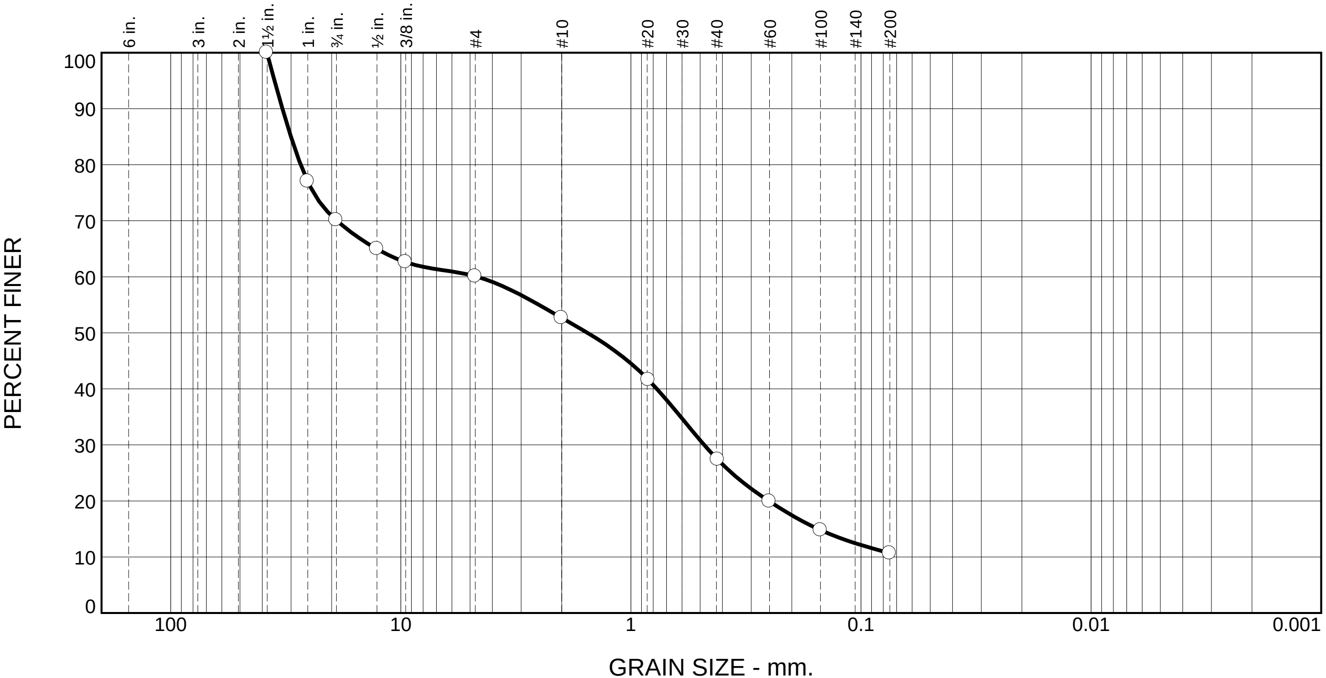
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-166

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	29.9	10.0	7.4	25.1	16.9	10.7	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	77.0		
0.75"	70.1		
.5"	65.0		
.375"	62.6		
#4	60.1		
#10	52.7		
#20	41.6		
#40	27.4		
#60	19.9		
#100	14.8		
#200	10.7		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 32.6878 D_{85}= 30.0273 D_{60}= 4.6508
D_{50}= 1.5435 D_{30}= 0.4802 D_{15}= 0.1537
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16
Tested By: MS/AS
Checked By: Matthew Polsky
Title: Laboratory Manager

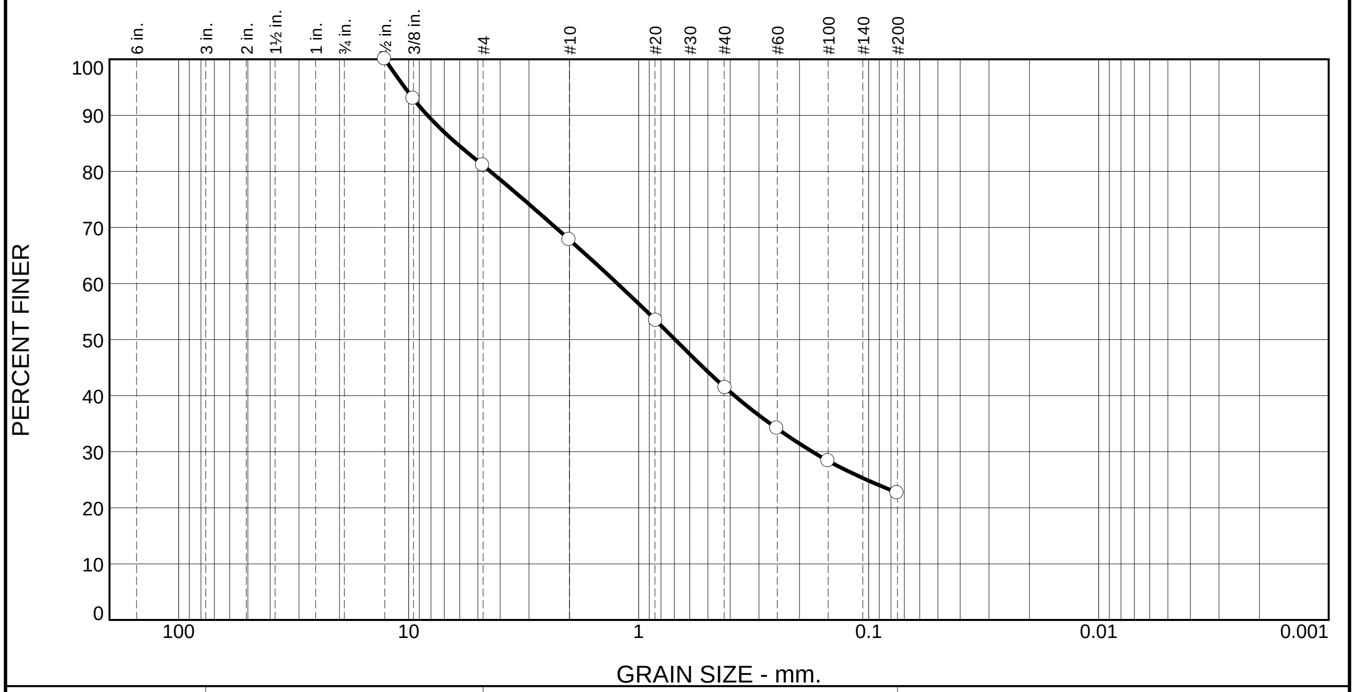
Source of Sample: Borings **Depth:** 0-2' **Date Sampled:**
Sample Number: B-7: S-1

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-167

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	18.9	13.3	26.2	18.9	22.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	93.0		
#4	81.1		
#10	67.8		
#20	53.4		
#40	41.4		
#60	34.1		
#100	28.4		
#200	22.7		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 8.2883	D_{85}= 6.1900	D_{60}= 1.2375
D_{50}= 0.6942	D_{30}= 0.1757	D_{15}=
D_{10}=	C_u=	C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 5-5.7'
Sample Number: B-8: S-2

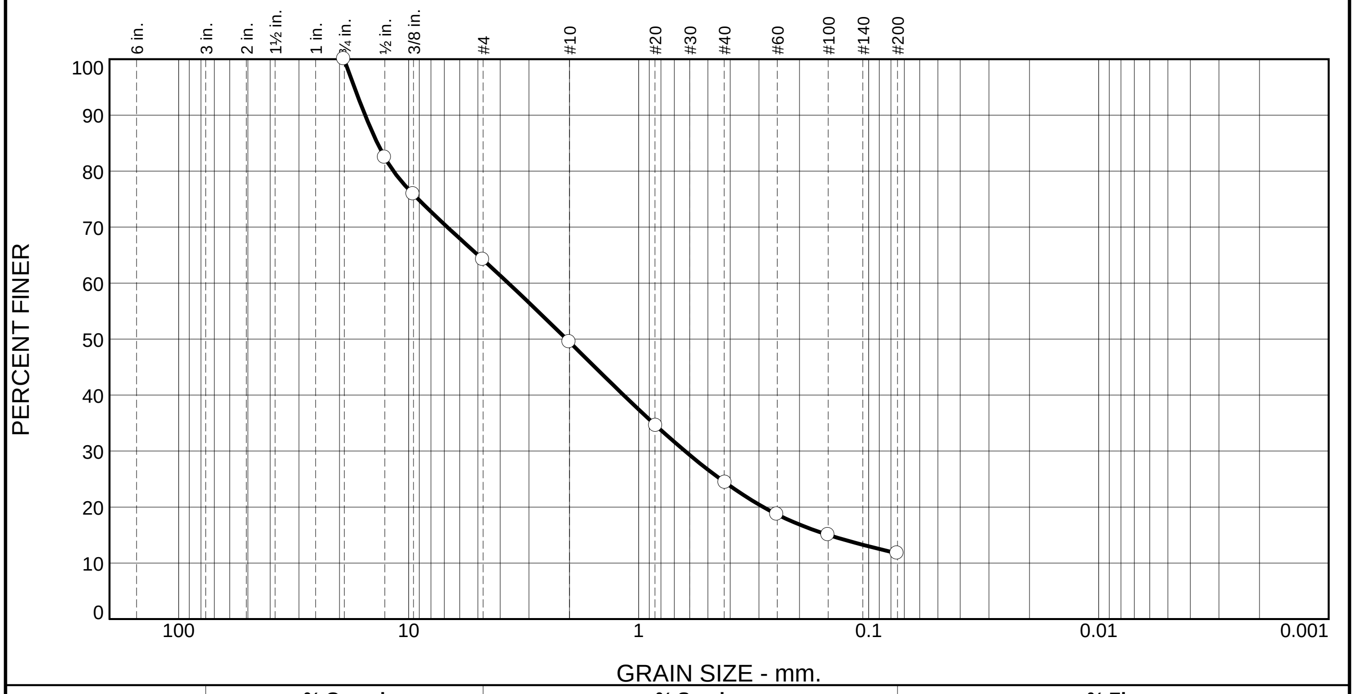
Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-168

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	35.7	14.7	25.0	12.8	11.7	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	82.4		
.375"	75.9		
#4	64.2		
#10	49.5		
#20	34.5		
#40	24.4		
#60	18.7		
#100	15.0		
#200	11.7		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 15.4595 D_{85}= 13.6829 D_{60}= 3.6877

D_{50}= 2.0589 D_{30}= 0.6287 D_{15}= 0.1490

D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 1.4-3.4'

Sample Number: B-10: S-1

Date Sampled:

Thielsch Engineering Inc.

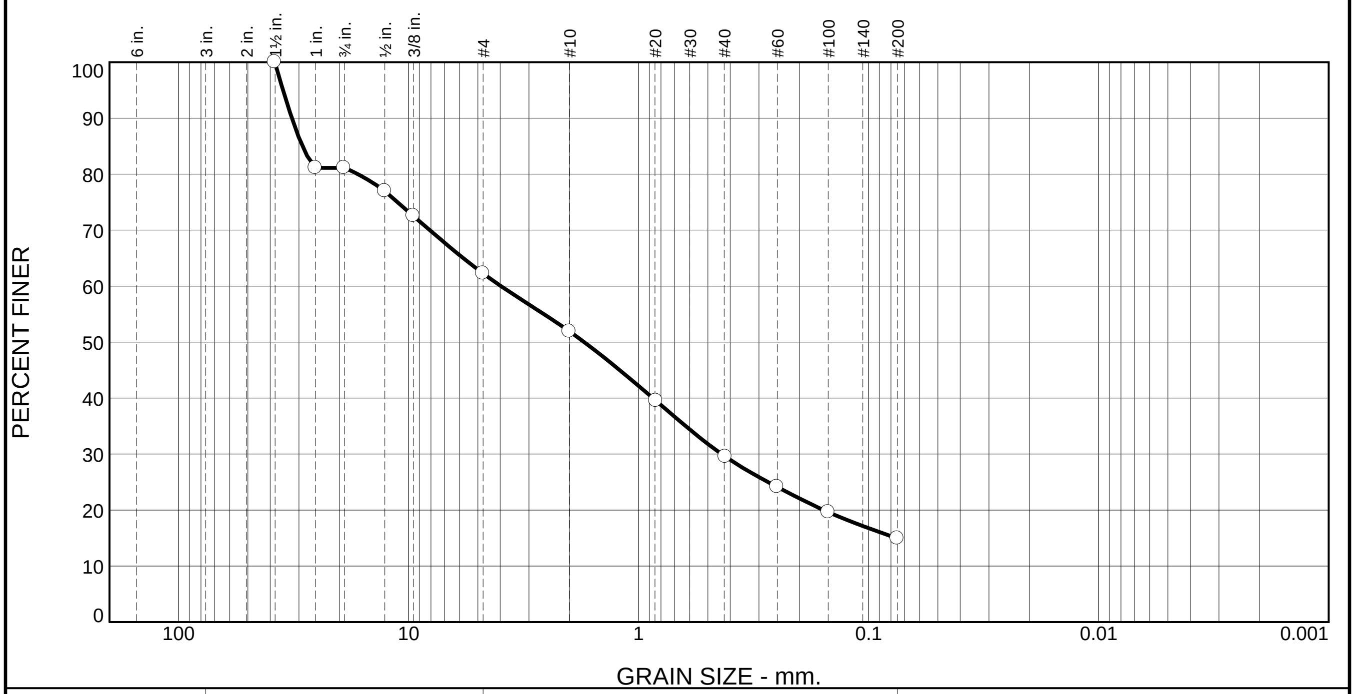
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-169

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.9	18.8	10.4	22.2	14.8	14.9	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	81.1		
0.75"	81.1		
.5"	77.0		
.375"	72.5		
#4	62.3		
#10	51.9		
#20	39.5		
#40	29.6		
#60	24.1		
#100	19.6		
#200	14.9		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 32.2010 D_{85}= 28.9845 D_{60}= 3.9668
D_{50}= 1.7258 D_{30}= 0.4355 D_{15}= 0.0756
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16
Tested By: MS/AS
Checked By: Matthew Polsky
Title: Laboratory Manager

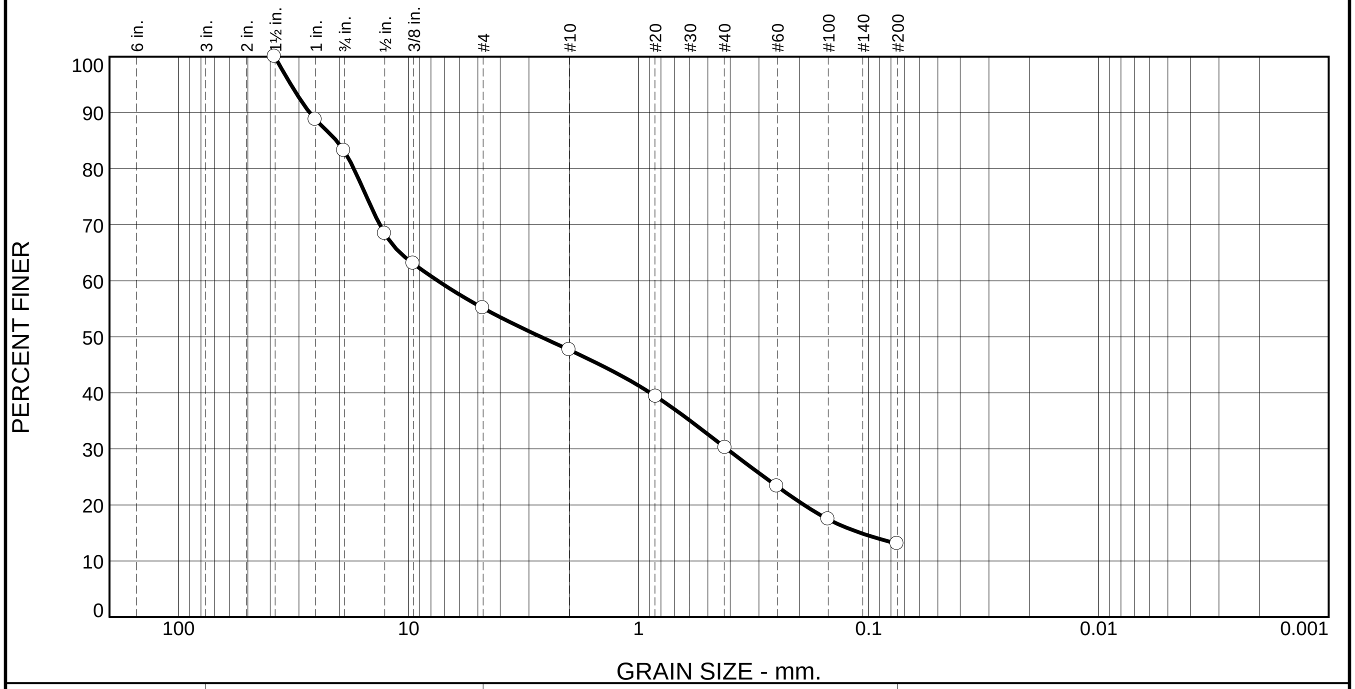
Source of Sample: Borings **Depth:** 3.4-5.4' **Date Sampled:**
Sample Number: B-10: S-2

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.9	28.0	7.4	17.3	17.3	13.1	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	88.8		
0.75"	83.2		
.5"	68.4		
.375"	63.1		
#4	55.1		
#10	47.7		
#20	39.3		
#40	30.2		
#60	23.3		
#100	17.4		
#200	13.1		

* (no specification provided)

Material Description

Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 26.9300	D_{85}= 20.5818	D_{60}= 7.4649
D_{50}= 2.6612	D_{30}= 0.4135	D_{15}= 0.1083
D_{10}=	C_u=	C_c=

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-6'
Sample Number: B-11: S-2

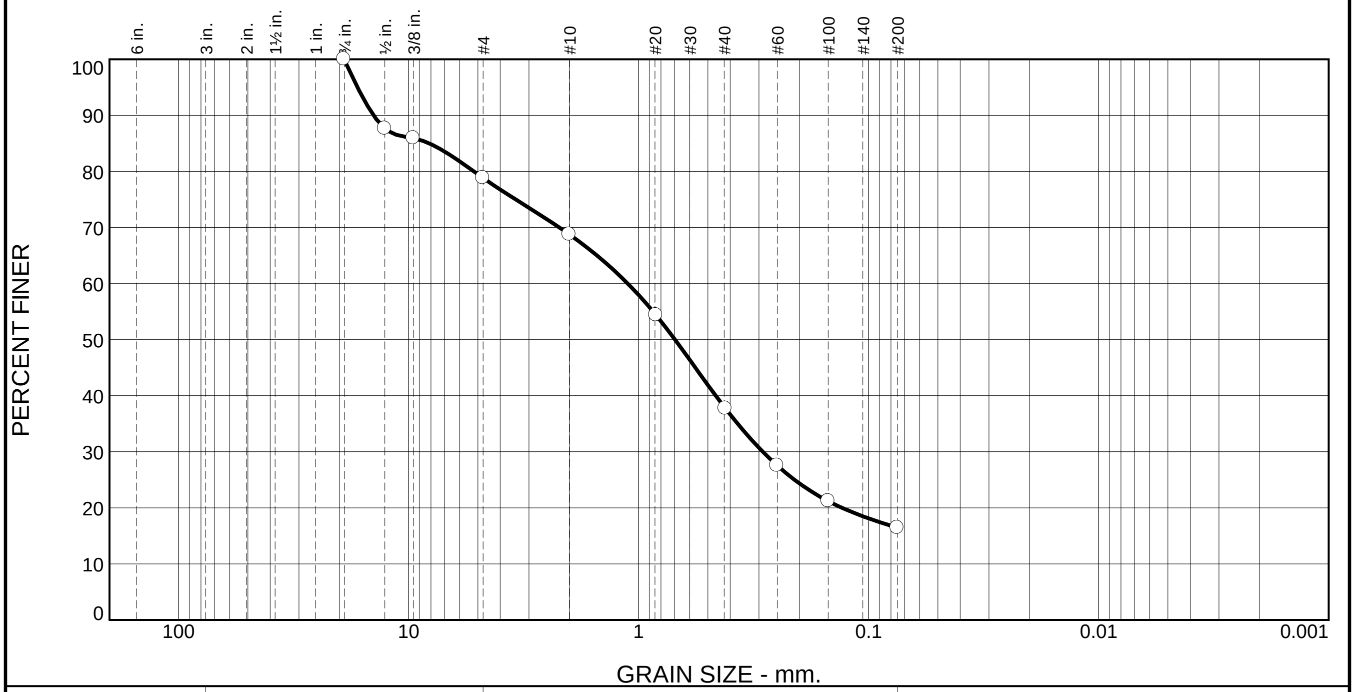
Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-171

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	21.1	10.1	30.7	21.6	16.4	

TEST RESULTS (D422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	87.6		
.375"	85.9		
#4	78.8		
#10	68.7		
#20	54.4		
#40	37.7		
#60	27.6		
#100	21.2		
#200	16.4		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.2188 D_{85}= 8.1536 D_{60}= 1.1164
D_{50}= 0.6953 D_{30}= 0.2886 D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16
Tested By: MS/AS
Checked By: Matthew Polsky
Title: Laboratory Manager

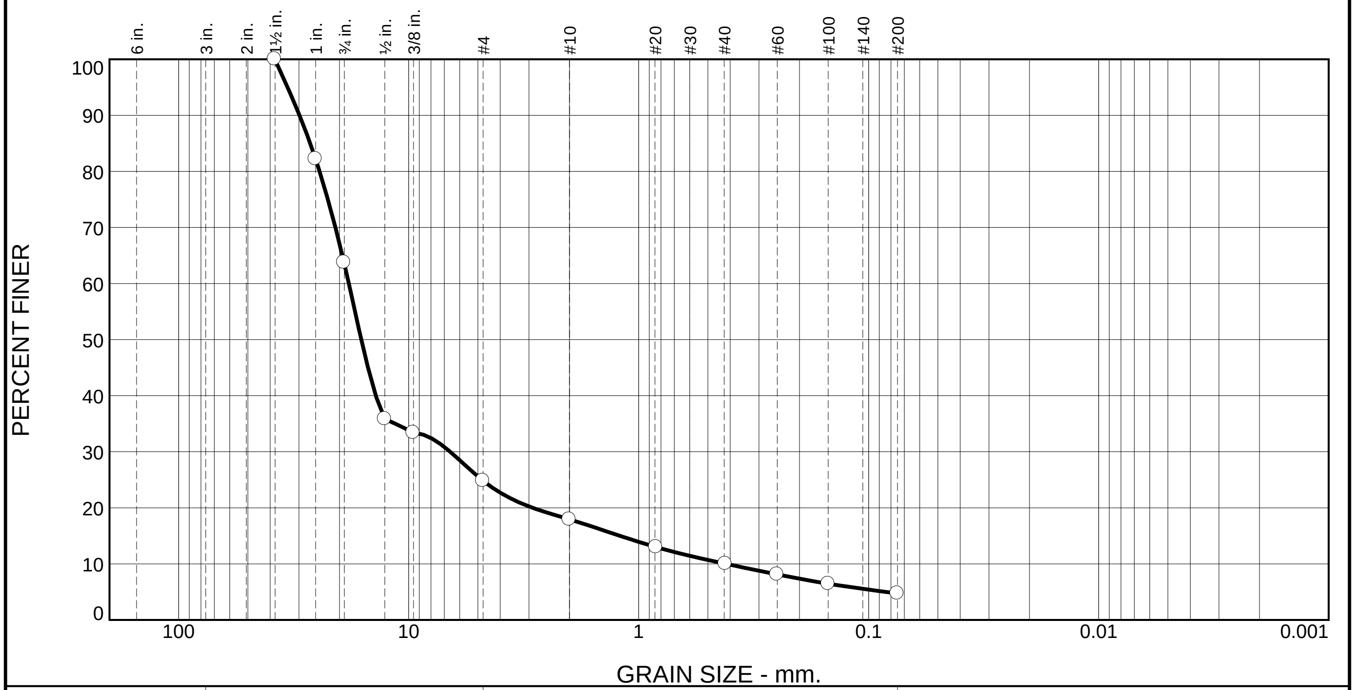
Source of Sample: Borings **Depth:** 4-6' **Date Sampled:**
Sample Number: B-12: S-3A

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-172

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	36.4	38.8	6.9	7.8	5.4	4.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	82.2		
0.75"	63.8		
.5"	35.8		
.375"	33.4		
#4	24.8		
#10	17.9		
#20	13.0		
#40	10.0		
#60	8.1		
#100	6.5		
#200	4.7		

* (no specification provided)

Material Description

Brown poorly graded gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 29.8358	D_{85}= 26.8137	D_{60}= 18.2067
D_{50}= 16.0670	D_{30}= 6.5988	D_{15}= 1.2044
D_{10}= 0.4164	C_u= 43.72	C_c= 5.74

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-6'

Sample Number: B-12: S-3B

Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-173

THIELSCH
ENGINEERING

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
http://www.thielsch.com

Client Information:
Jacobs Engineering Group
Boston, MA
PM: Phillip Lanergan
Assigned By: Phillip Lanergan

Laboratory Information
Project Name:
York Toll Plaza Relocation
York, ME
TEI Project Number: 74-16-0002.98
Report Date: 2/24/2016

LABORATORY TESTING DATA SHEET

				Identification Tests								Resistivity				
Boring ID	Sample No.	Depth (ft)	Lab No.	Do in.	L in.	(1) Unit Wt. PCF	(2) Wet Density PCF	(3) Other Tests	(4) Strength PSI	(5) Strain %	(6) Conf. Stress	(7) E sec PSI EE+06	(8) Poisson's Ratio	στ PSI	Is_{50} PSI	Laboratory Log and Rock Description
B-3	C2	10.2-10.6	16-R-140	1.985	4.530	188.9		U	12,842							
B-6	C3	14.1-14.5	16-R-141	1.985	4.572	168.0		U	33,762							
B-7	C1	5.1-5.5	16-R-142	1.978	4.575	186.4		U	13,681							
B-7	C3	13.5-13.9	16-R-143	1.972	4.526	183.9		U	21,374							
B-8	C1	6.4-6.8	16-R-144	1.988	4.536	172.0		U	27,242							
B-9	C1	13.1-13.5	16-R-145	1.981	4.535	174.2		U	31,465							
B-10	C1	20.6-21.0	16-R-146	1.975	4.517	166.5		U	6,848							*Sample fractured along healed joints*
B-11	C3	20.1-20.5	16-R-147	1.969	4.550	184.0		U	51,278							
B-12	C2	22.0-22.4	16-R-148	1.989	4.544	170.5		U	14,406							
B-13	C1	10.0-10.4	16-R-149	1.988	4.570	183.2		U	33,305							

(1) Volume Determined By Measuring Dimensions
(2) Determined by Measuring Dimensions and Weight of Saturated Sample

(3) P=Petrographic PLD=Point Load (diametrical), PLA= Point Load (Axial) RST= Splitting Tensile U= Unconfined Compressive Strength
(4) Taken at Peak Deviator Stress

(5) Strain at Peak Deviator Stress
(6) Represents Confining Stress on Triaxial Tests
(7) Represents Secant Modulus at 50% of Total Failure Stress
(8) Represents Secant Poisson's Ratio at 50% of Total Failure Stress

Reviewed By ______________________

Date Reviewed 2/24/2016

Appendix E. **Seismic Site Class Evaluation**

JOB York Toll Plaza
SUBJECT Seismic Site Class
CALCULATED BY PJL **DATE** 6/22/2016
CHECKED BY GJS **DATE** 7/14/2016

International Building Code (IBC) 2015 - Seismic Site Class Summary

PURPOSE:

Determine seismic site class for the proposed Toll Plaza Administration Building and Toll Plaza Canopies in accordance with the 2015 IBC.

SUBSURFACE INFORMATION:

SPT borings performed by New England Boring Contractors, Inc and observed by Jacobs in January 2016.

APPROACH:

1) Determine Site Class in accordance with Chapter 20 of ASCE 7-10 as specified by IBC 2015
a) Check for three categories of Site Class F requiring site-specific evaluation:
- Peats or highly organic clays greater than 10 feet in thickness
- Thick layers (greater than 25 feet) of high plastic clay (PI > 75)
- Very thick soft/medium stiff clays (greater than 120 feet)

b) Categorize the site using one of the V_s, N and s_u methods.
c) Determine the appropriate Site Class based on the boring-specific results.

2) Determine site coefficients and response parameters in accordance with Section 1613 of the 2015 IBC

SITE CLASS:

Per ASCE Table 20.3-1, borings B-4 through B-13 indicate Site Class C, and B-4 indicates Site Class D. The very loose soil encountered in Boring B-4 will be removed during construction, so the Site Class determination at this boring will not govern.

Shallow bedrock at the site indicates Site Class B, however we recommend **Site Class C** for the following reasons
- Site specific shear wave velocity measurements are unavailable.
- Presence of fractured bedrock in some of the borings.
- Distance between bottom of footings for the NB toll plaza and bedrock will be greater than 10 feet.

Approx. Project Coordinates

Lat	43.18013
Long	-70.6490

Seismic Coefficients (975-Year Return Period)

S_S = 0.264 (Probabilistic Seismic Hazard Deaggregation 0.2-sec period)
S_1 = 0.079 (Probabilistic Seismic Hazard Deaggregation 1.0-sec period)

Site Coefficient For Site Class C

F_A = 1.2 (See IBC 2015 Table 1613.3.3(1))
F_V = 1.7 (See IBC 2015 Table 1613.3.3(2))

Maximum Spectral Response Acceleration Parameters

$Sm_S = Ss \times F_A$ = 0.317 (IBC 2015 Eq. 16-37)
$Sm_1 = S_1 \times F_V$ = 0.134 (IBC 2015 Eq. 16-38)

Design Spectral Response Acceleration Parameters

$S_{DS} = 2/3\ Sm_s$ = 0.211 (IBC 2015 Eq. 16-39)
$S_{D1} = 2/3\ Sm_1$ = 0.090 (IBC 2015 Eq. 16-40)

Risk Category
II (IBC 2015 Table 1604.5)

Seismic Design Category (SDC)
B (IBC 2015 Tables 1613.3.5(1) and 1613.3.5(2))

JOB York Toll Plaza
SUBJECT Seismic Site Class
CALCULATED BY PJL DATE 6/22/2016
CHECKED BY GJS DATE 7/14/2016

ASCE 7-10 Chapter 20

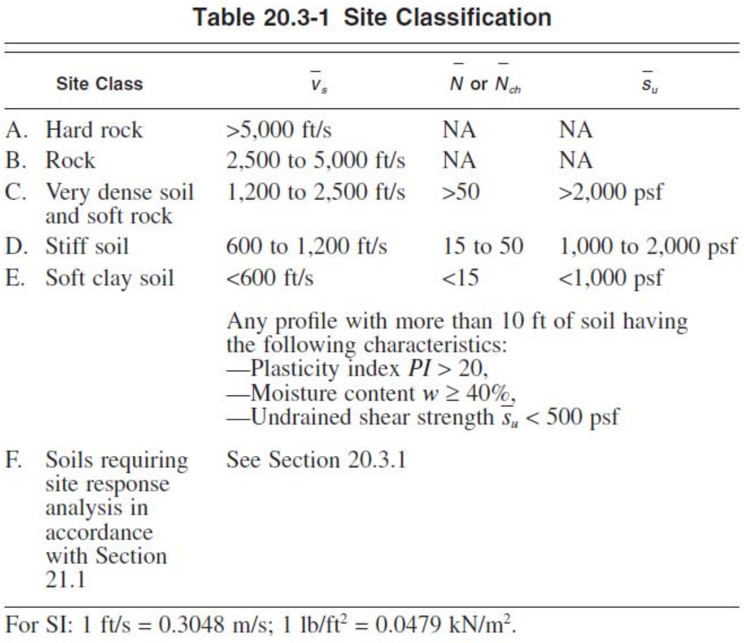


Table 20.3-1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard rock	>5,000 ft/s	NA	NA
B. Rock	2,500 to 5,000 ft/s	NA	NA
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the following characteristics: —Plasticity index $PI > 20$, —Moisture content $w \geq 40\%$, —Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1 ft/s = 0.3048 m/s; 1 lb/ft^2 = 0.0479 kN/m^2.

2015 IBC - Section 1613

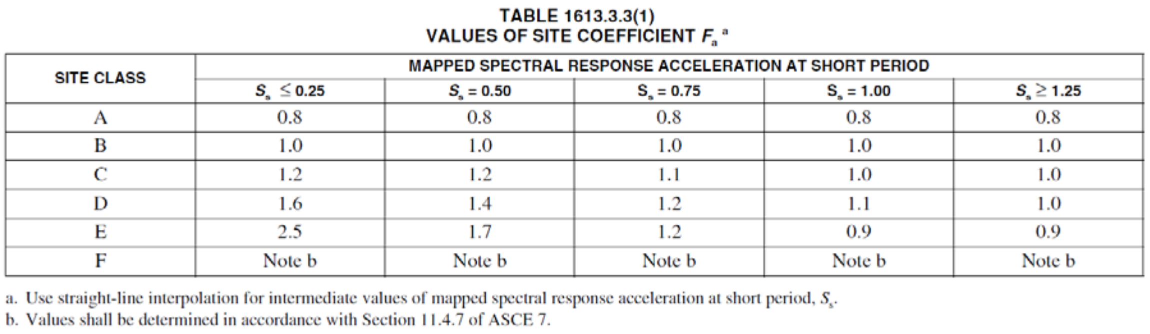


TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a [a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIOD				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

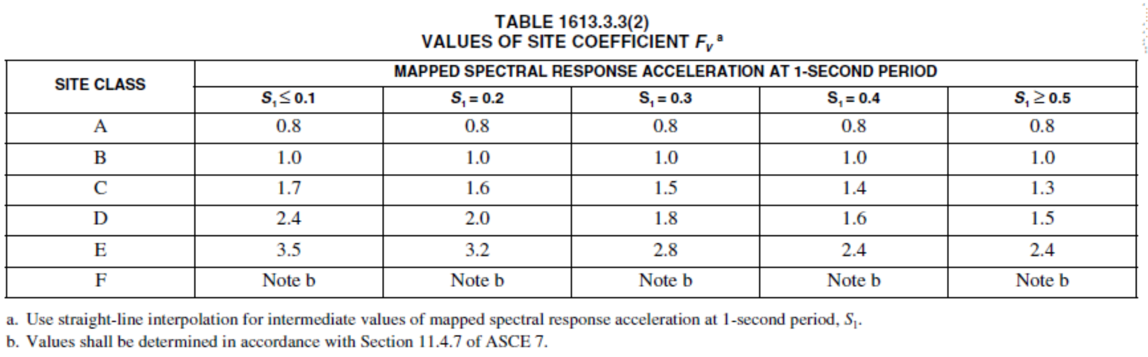


TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_V [a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at 1-second period, S_1.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

JOB	York Toll Plaza
SUBJECT	Seismic Site Class
CALCULATED BY PJL	**DATE** 6/22/2016
CHECKED BY GJS	**DATE** 7/14/2016

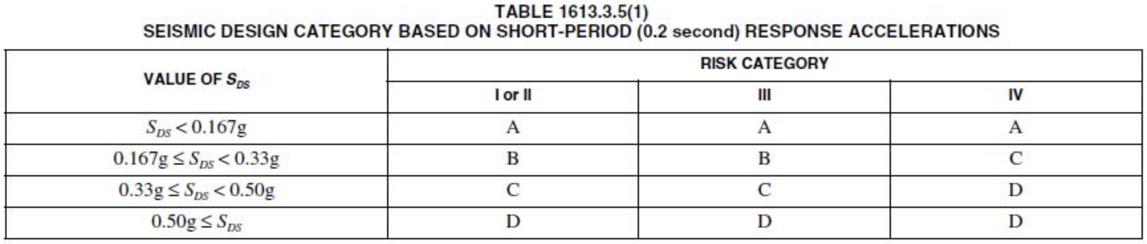


TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATIONS

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

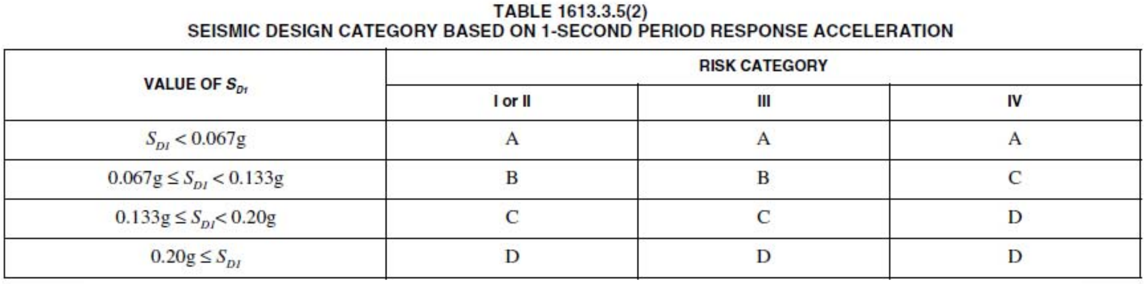


TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

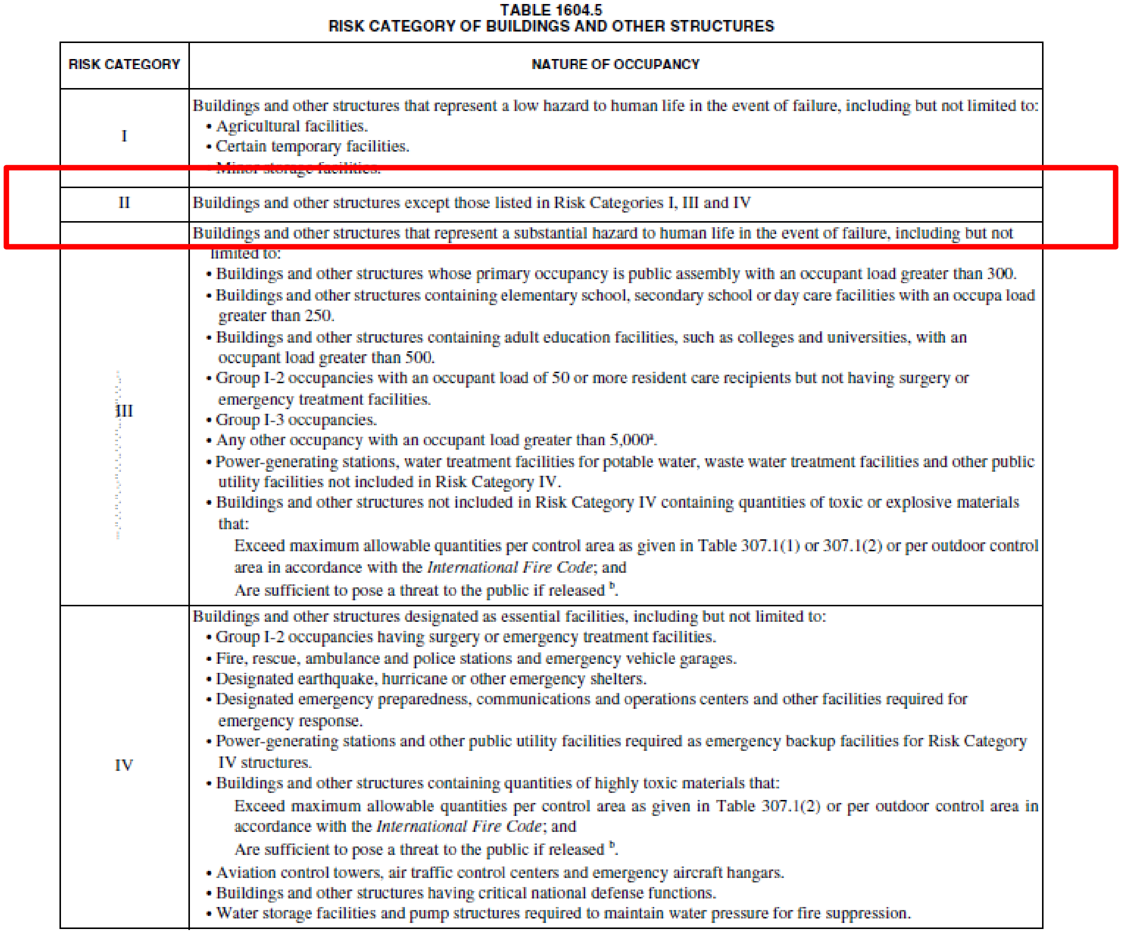


TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day care facilities with an occupa load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000[a]. • Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released [b].
IV	Buildings and other structures designated as essential facilities, including but not limited to: • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released [b]. • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

ATTACHMENTS: Refer to the attached calculation sheets for further information.

Authored by: PJL 3/10/16 Checked by: GJS 3/10/16

JACOBS™

Seismic Site Class Evaluation

Boring No.	Sample No.	N Value	Di	Di/N$_i$	N$_{bar}$
B-4	S-1	4	5	1.25	**42**
	S-2	19	4.2	0.22	
	Bedrock	100	90.8	0.91	
	Total Depth =	100			
	Depth to Bedrock =	9.2	sum	2.38	

N$_{bar}$ = Σ Di / ΣDi/Ni = 42

Per ASCE Table 20.3-1, 15 ≤ N$_{bar}$ ≤ 50, Site Class D

Boring No.	Sample No.	N Value	Di	Di/N$_i$	N$_{bar}$
B-5	S-1	7	5.5	0.79	**58**
	S-2	100	0.6	0.01	
	Bedrock	100	93.9	0.94	
	Total Depth =	100			
	Depth to Bedrock =	6.1	sum	1.73	

N$_{bar}$ = Σ Di / ΣDi/Ni = 58

Per ASCE Table 20.3-1, N$_{bar}$ > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N$_i$	N$_{bar}$
B-6	S-1	5	4.3	0.86	**55**
	Bedrock	100	95.7	0.96	
	Total Depth =	100			
	Depth to Bedrock =	4.3	sum	1.82	

N$_{bar}$ = Σ Di / ΣDi/Ni = 55

Per ASCE Table 20.3-1, N$_{bar}$ > 50, Site Class C

Seismic Site Class Evaluation

Boring No.	**Sample No.**	**N Value**	**Di**	**Di/N_i**	**N_{bar}**
B-7	S-1	41	3.5	0.09	**95**
	Bedrock	100	96.5	0.97	
	Total Depth =	100			
	Depth to Bedrock =	3.5	sum	1.05	

N_{bar} = Σ Di / ΣDi/Ni = 95

Per Table 1613.5.2, N_{bar} > 50, Site Class C

Boring No.	**Sample No.**	**N Value**	**Di**	**Di/N_i**	**N_{bar}**
B-8	S-1	17	5	0.29	**80**
	S-2	100	1.2	0.01	
	Bedrock	100	93.8	0.94	
	Total Depth =	100			
	Depth to Bedrock =	6.2	sum	1.24	

N_{bar} = Σ Di / ΣDi/Ni = 80

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	**Sample No.**	**N Value**	**Di**	**Di/N_i**	**N_{bar}**
B-9	S-1	8	4.5	0.56	**59**
	S-2	29	5	0.17	
	S-3	36	3	0.08	
	Bedrock	100	87.5	0.88	
	Total Depth =	100			
	Depth to Bedrock =	12.5	sum	1.69	

N_{bar} = Σ Di / ΣDi/Ni = 59

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	**Sample No.**	**N Value**	**Di**	**Di/N_i**	**N_{bar}**
B-10	S-1	38	3.4	0.09	**93**
	S-2	100	5.6	0.06	
	S-3	64	4	0.06	
	Bedrock	100	87	0.87	
	Total Depth =	100			
	Depth to Bedrock =	13	sum	1.08	

N_{bar} = Σ Di / ΣDi/Ni = 93

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Seismic Site Class Evaluation

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-11	S-1	35	4	0.11	**87**
	S-2	95	5	0.05	
	S-3	35	4	0.11	
	Bedrock	100	87	0.87	
	Total Depth =	100			
	Depth to Bedrock =	13	sum	1.15	

$N_{bar} = \Sigma Di / \Sigma Di/Ni =$ 87

Per ASCE Table 20.3-1, $N_{bar} > 50$, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-12	S-1	31	2	0.06	**93**
	S-2	50	2	0.04	
	S-3	67	2	0.03	
	S-4	100	9	0.09	
	S-5	100	3	0.03	
	Bedrock	100	82	0.82	
	Total Depth =	100			
	Depth to Bedrock =	18	sum	1.07	

$N_{bar} = \Sigma Di / \Sigma Di/Ni =$ 93

Per ASCE Table 20.3-1, $N_{bar} > 50$, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-13	S-1	23	5	0.22	**83**
	S-2	58	5	0.09	
	Bedrock	100	90	0.90	
	Total Depth =	100			
	Depth to Bedrock =	10	sum	1.20	

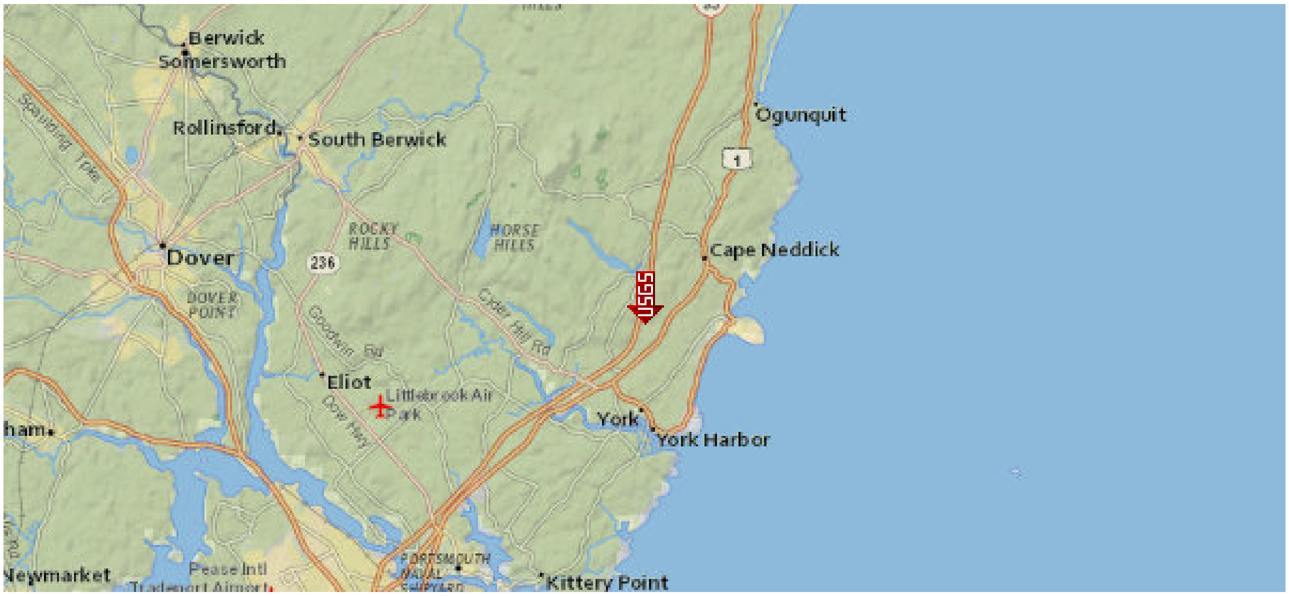
$N_{bar} = \Sigma Di / \Sigma Di/Ni =$ 83

Per ASCE Table 20.3-1, $N_{bar} > 50$, Site Class C

USGS Design Maps Summary Report

User–Specified Input

Report Title	York Toll Plaza Thu March 10, 2016 14:11:53 UTC
Building Code Reference Document	2012 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	43.18013°N, 70.649°W
Site Soil Classification	Site Class C – “Very Dense Soil and Soft Rock”
Risk Category	I/II/III

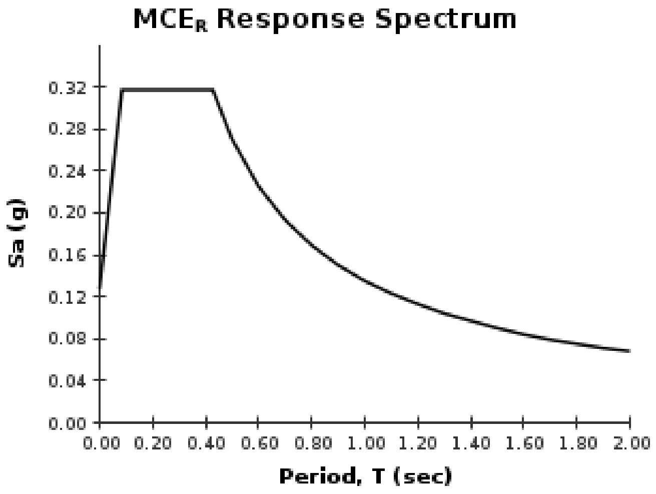


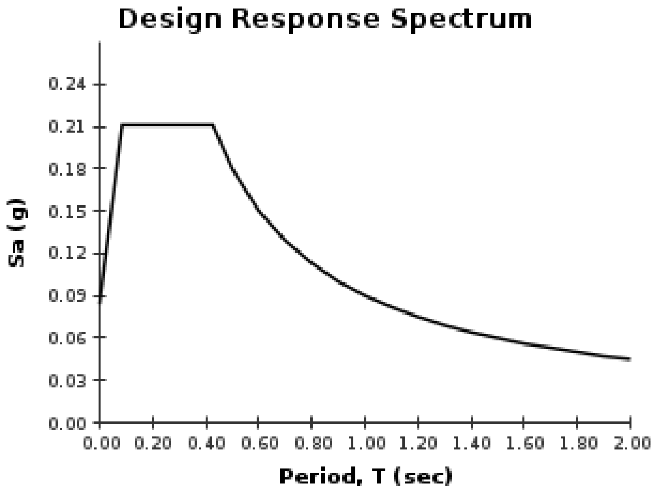
USGS–Provided Output

S_S = 0.264 g S_{MS} = 0.317 g S_{DS} = 0.211 g

S_1 = 0.079 g S_{M1} = 0.135 g S_{D1} = 0.090 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the “2009 NEHRP” building code reference document.





USGS Design Maps Detailed Report

2012 International Building Code (43.18013°N, 70.649°W)

Site Class C – “Very Dense Soil and Soft Rock”, Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2012 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From Figure 1613.3.1(1) [1] $S_S = 0.264$ g

From Figure 1613.3.1(2) [2] $S_1 = 0.079$ g

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1
SITE CLASS DEFINITIONS

Site Class	$\bar{v}_s$	$\bar{N}$ **or** $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.264 g, F_a = 1.200

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.079 g, F_v = 1.700

Equation (16-37):	$S_{MS} = F_aS_S = 1.200 \text{ x } 0.264 = 0.317 \text{ g}$
Equation (16-38):	$S_{M1} = F_vS_1 = 1.700 \text{ x } 0.079 = 0.135 \text{ g}$

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):	$S_{DS} = ⅔\, S_{MS} = ⅔ \text{ x } 0.317 = 0.211 \text{ g}$
Equation (16-40):	$S_{D1} = ⅔\, S_{M1} = ⅔ \text{ x } 0.135 = 0.090 \text{ g}$

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	**RISK CATEGORY**		
	I or II	**III**	**IV**
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.211 g, Seismic Design Category = B

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	**RISK CATEGORY**		
	I or II	**III**	**IV**
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.090 g, Seismic Design Category = B

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ “the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)” = B

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 1613.3.1(1)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
2. *Figure 1613.3.1(2)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf

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Appendix F. **Soil Property Summary**

Recommended Soil Properties

Purpose:

The purpose of this evaluation was to select representative soil properties for the proposed toll plaza and associated structures near Mile 8.8 on the Maine Turnpike I-95 in York, ME. The soil properties will be used in our engineering analyses.

Approach:

We evaluated field SPT N-values and corrected these for hammer efficiency and overburden pressure. Corrected N values were then used to estimate the angle of internal friction of the subsurface soils. Judgement was then applied to select the unit weight and friction angles for design.

Unit Weight:

A saturated unit weight in pounds per cubic foot (pcf) was used. The buoyant unit weight, if necessary, can be determined by subtracting the unit weight of water (62.4 pcf).

Angle of Internal Friction:

An angle of internal friction (ϕ) in degrees was used. We used Mohr-Coulumb's drained properties for each soil.

References:

1) AASHTO LRFD Bridge Design Specification, 7th Edition, 2014.
2) T.William Lambe, Robert V. Whitman. 1969. Soil Mechanics. 1st Edition, John Wiley & Sons, New York.

Subsurface Investigation and SPT Correlations

We reviewed Standard Penetration Test (SPT) N- values obtained during our subsurface investigation. We estimated angles of internal friction for soils based on N_{60} and $N_{1,60}$ values. The borings were drilled using a safety hammer that was lifted and dropped with either a rope and cathead (60% efficiency) , automatic hammer (73% efficiency) or a donut hammer (45%). Our field N values were corrected to N_{60} and $N_{1,60}$ (refer to the attached spreadsheets). N-values indicating refusal on obstructions, cobbles, boulders, or weathered bedrock were neglected in our evaluation.

Note: N-Values for Borings B-1 through B-5 were not included in this evaluation as those soils will be removed as part of the regrading of that area for the new Administration Building and Parking Area.

Soil Layer	N_{60ave}	$N_{1,60ave}$
Overburden	35	56

Results:

We selected the following soil properties for each layer/soil type:

Soil Type	Unit Weight (pcf)	Friction Angle (deg)
Existing Fill	125	34
Proposed Fill	125	34

References:

AASHTO Table 10.4.6.2.4-1 recommends using the following correlation to select friction angles of granular soils.

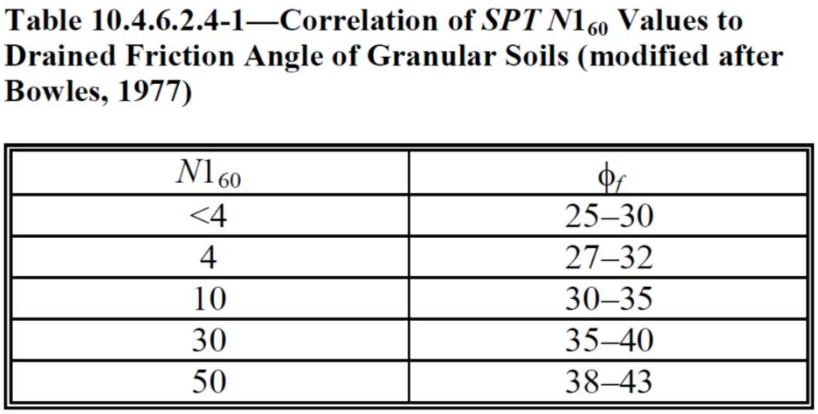

Table 10.4.6.2.4-1—Correlation of *SPT* $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

In Soil Mechanics, Lambe and Whitman presented the following N value and friction angle relationships (applies to overburden depths up to 40 feet):

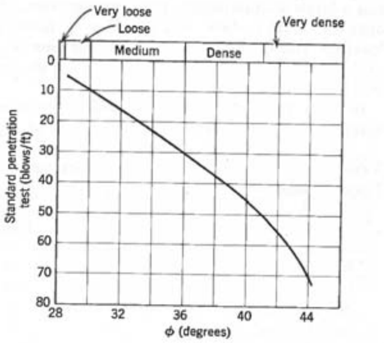

Fig. 11.14 Correlation between friction angle and penetration resistance (From Peck, Hanson, and Thornburn, 1953).

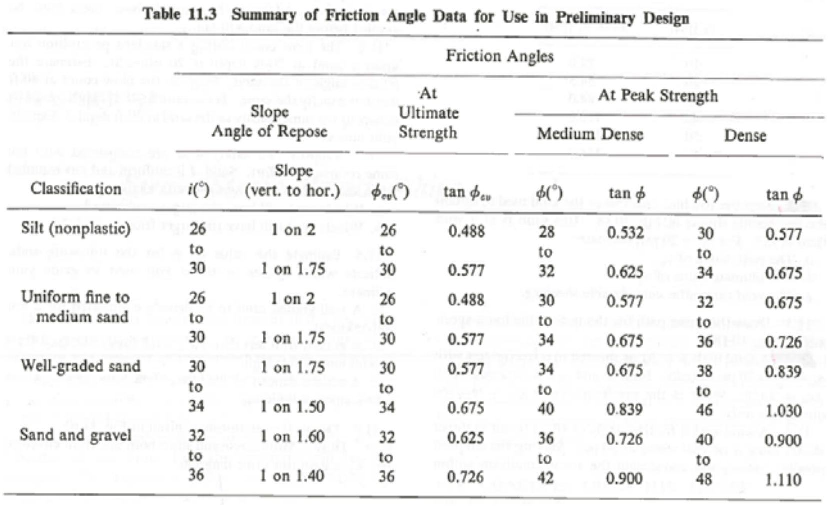

Table 11.3 Summary of Friction Angle Data for Use in Preliminary Design

	Friction Angles							
	Slope Angle of Repose		At Ultimate Strength		At Peak Strength			
					Medium Dense		Dense	
Classification	$i(°)$	Slope (vert. to hor.)	$\phi_{cv}(°)$	tan ϕ_{cv}	$\phi(°)$	tan ϕ	$\phi(°)$	tan ϕ
Silt (nonplastic)	26 to 30	1 on 2 1 on 1.75	26 to 30	0.488 0.577	28 to 32	0.532 0.625	30 to 34	0.577 0.675
Uniform fine to medium sand	26 to 30	1 on 2 1 on 1.75	26 to 30	0.488 0.577	30 to 34	0.577 0.675	32 to 36	0.675 0.726
Well-graded sand	30 to 34	1 on 1.75 1 on 1.50	30 to 34	0.577 0.675	34 to 40	0.675 0.839	38 to 46	0.839 1.030
Sand and gravel	32 to 36	1 on 1.60 1 on 1.40	32 to 36	0.625 0.726	36 to 42	0.726 0.900	40 to 48	0.900 1.110

CALCULATION SHEET

Sheet No. **1**

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. **B-6**
Ground Surface Elevation **164.10** ft (NAVD 88)
Ground Water Depth during Drilling **0.80** ft
Hammer Efficiency **60** %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.1	**1**	**5**	**n/a**	**n/a**	2.00	1.00	**5.0**	55	**10.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 2

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No.	**B-7**		References:	1. FHWA-IF-02-034 (2002)
Ground Surface Elevation	**164.30**	ft (NAVD 88)		2. FHWA-NHI-10-0.16 (May 2010)
Ground Water Depth during Drilling	**4.00**	ft		3. NAVFAC DM-7 (March 1971)
Hammer Efficiency	**60**	%		4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.3	**1**	**41**	**n/a**	**n/a**	1.92	1.00	**41.0**	130	**78.5**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)

$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.

C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]

$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]

Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 3

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. **B-8**
Ground Surface Elevation **164.50** ft (NAVD 88)
Ground Water Depth during Drilling **5.20** ft
Hammer Efficiency **60** %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.5	**1**	**17**	**n/a**	**n/a**	1.93	1.00	**17.0**	124	**32.8**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. **4**

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. **B-9**

Ground Surface Elevation **164.90** ft (NAVD 88)

Ground Water Depth during Drilling **9.50** ft

Hammer Efficiency **60** %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	**1**	**8**	**n/a**	**n/a**	1.95	1.00	**8.0**	116	**15.6**
159.4	**5.5**	**29**	**n/a**	**n/a**	1.35	1.00	**29.0**	701	**39.2**
154.4	**10.5**	**36**	**n/a**	**n/a**	1.22	1.00	**36.0**	1,039	**44.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)

$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.

C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]

$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]

Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 5

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-10

Ground Surface Elevation 165.90 ft (NAVD 88)

Ground Water Depth during Drilling 9.70 ft

Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
164.9	1	38	n/a	n/a	1.92	1.00	**38.0**	130	**72.8**
161.8	4.1	100	n/a	n/a	1.44	1.00	**100.0**	533	**144.4**
155.9	10	64	n/a	n/a	1.26	1.00	**64.0**	932	**80.5**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]

Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07}$- 62.4 [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$- 62.4 [pcf]

CALCULATION SHEET

Sheet No. **6**

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. **B-11**
Ground Surface Elevation **164.60** ft (NAVD 88)
Ground Water Depth during Drilling **8.00** ft
Hammer Efficiency **60** %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.6	**1**	**35**	**n/a**	**n/a**	1.92	1.00	**35.0**	130	**67.1**
159.6	**5**	**95**	**n/a**	**n/a**	1.38	1.00	**95.0**	650	**130.9**
154.6	**10**	**35**	**n/a**	**n/a**	1.24	1.00	**35.0**	988	**43.3**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 7

Project:	**York Toll Plaza**		Authored by:	**PJL**	Date	**3/9/2016**
Job No.	**E2X71602**		Checked by:	**GJS**	Date	**3/11/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No.	**B-12**		
Ground Surface Elevation	**164.50**	ft (NAVD 88)	
Ground Water Depth during Drilling	**8.80**	ft	
Hammer Efficiency	**60**	%	

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.5	**1**	**31**	**n/a**	**n/a**	1.92	1.00	**31.0**	130	**59.4**
161.5	**3**	**50**	**n/a**	**n/a**	1.55	1.00	**50.0**	390	**77.4**
159.5	**5**	**67**	**n/a**	**n/a**	1.38	1.00	**67.0**	650	**92.3**
158.0	**6.5**	**100**	**n/a**	**n/a**	1.29	1.00	**100.0**	845	**129.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 8

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No.	**B-13**		
Ground Surface Elevation	**158.10**	ft (NAVD 88)	
Ground Water Depth during Drilling	**2.60**	ft	
Hammer Efficiency	**60**	%	

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
157.1	1	23	n/a	n/a	1.92	1.00	**23.0**	128	**44.2**
152.1	6	58	n/a	n/a	1.49	1.00	**58.0**	466	**86.4**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{\text{granular, dry}}$ = 130 [pcf]
$\gamma_{\text{granular, submerged}}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{\text{granular}} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{\text{cohesive}} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{\text{granular}} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{\text{cohesive}} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

Appendix G. **Bearing Resistance Calculations**

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JACOBS	Project York Toll Plaza– Mile 8.8			Job Ref. E2X71602	
	Section Toll Plaza Canopy Footing - NB			Sheet no./rev. Rev 1	
	Calc. by PJL	Date 7/18/16	Chk'd by PJM	Date 7/28/16	App'd by	Date

Summary:

Evaluate bearing resistance for the proposed foundation for the northbound toll plaza canopy.

Design Codes

- 2015 International Building Code (IBC)
- AASHTO LRFD 2014 Bridge Design Specifications

Input/Analysis Assumptions

- Groundwater at elevation 163.2
- Proposed elevation of NB roadway at toll plaza = 167.7 feet
- Bottom of footing shall be minimum 6.3 feet below finished grade for frost protection.
- Bearing soils consist of compacted gravel borrow or medium dense to dense fill material.
- Soil conditions based on Boring B-12. Soil profile and properties used in analysis presented in Table 1 below.
- Surficial unsuitable soils present must be removed and replaced with compacted gravel borrow prior to construction.
- Assume 5’x5’ footings. Max footing eccentricity was conservatively estimated to be in the middle third (B/6) of the corresponding footing dimension (Section 10.6.3.3)
- IBC 2015 Building Code provides presumptive load bearing values of various soils in Table 1806.2, however per Section 1806.2, higher values can be used if data can substantiated. Therefore, bearing resistance was evaluated using procedures per AASHTO LRFD 2014 Design Specifications (attached).

Table 1: Soil Profile and Properties for Analysis

Strata	**Thickness (ft)**	**Unit Weight (pcf)**	**Friction Angle (Φ)**
Gravel Borrow/Fill	18	125	34
Bedrock	-	-	-

Conclusions

- Due to the amount of gravel borrow to be placed in areas the proposed footings, we recommend the following:
  - To limit settlement to about 0.5 inch for an effective width (B’) of about 3.3 feet (footing width of 5 feet), a maximum service design bearing resistance not to exceed 5 ksf is recommended.

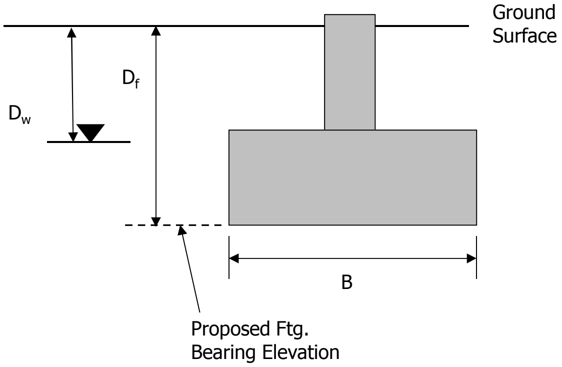
Purpose

Assess net factored bearing resistance of shallow footing for Northbound Toll Plaza Canopy.

Assumptions

1) Footing on compacted gravel borrow or dense to medium dense fill material
2) Approx. NB roadway elevation of 167.7 feet.
3) Assume groundwater at elev. 163.2 feet
4) Design Parameters are as follows:

γ	Φ_f	D_w	L	D_f
125	**34**	**4.5**	**5**	**6.3**



Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ_f	N_c	N_q	N_γ
34	42.2	29.4	41.1

Calculate Effective Footing Width (B') and Length (L):

B	5	footing width (ft)
Max e/B	0.167	(Max e = B/6)
e	0.83	eccentricity (ft)
$B'=B-2e_B$	3.33	ft.

Nominal Bearing Resistance

$$q_n = c*N_{cm} + \gamma*D_f*N_{qm}*C_{wq}+0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$$

c	**0**	cohesion
γ	125	total unit weight (pcf)
D_f	6.3	Depth of footing (ft)
B'	3.33	Effective footing width (ft)
L	5	Footing Length
B'/L	0.667	
D_f/B'	1.890	
C_{wq}	0.5	Table 10.6.3.1.2a-2
$C_{w\gamma}$	0.5	Table 10.6.3.1.2a-2

$$N_{cm} = N_c*s_c*i_c$$

N_c	42.2	
s_c	1.46	Table 10.6.3.1.2a-3
i_c	**1**	AASHTO Section 10.6.3.1.2
N_{cm}	61.6	

$$N_{qm} = N_q*s_q*d_q*i_q$$

N_q	29.4	
s_q	1.45	Table 10.6.3.1.2a-3
d_q	1.20	Table 10.6.3.1.2a-4
i_q	**1**	AASHTO P. 10-70
N_{qm}	51.2	

$N_{\gamma m} = N_{\gamma} * s_{\gamma} * i_{\gamma}$

N_{γ}	41.1	
s_{γ}	0.733	Table 10.6.3.1.2a-3
i_{γ}	1	AASHTO P. 10-70
$N_{\gamma m}$	30.1	
q_n	23,295 psf	

Factored Bearing Resistance

$q_r = RF*q_n$

RF	0.45	Table 10.5.5.2.2-1
q_r	$\boxed{10,483}$ psf	

Settlement Calculation

$S_e = [q_o*(1-v^2)*\sqrt{(A')}] / (144*E_s*\beta_z)$ Equation 10.6.2.4.2-1

v	0.3	Poisson's Ratio (Table C10.4.6.3-1)
E_s (ksi)	6.94	Young's Modulus (Table C10.4.6.3-1)
β_z	1.07	Shape/Rigidity Factor (Table 10.6.2.4.2-1)
B'	3.33	Effective Footing Width (ft)
L	5	Length of Footing (ft)
A' = B' * L	16.7	Footing Area (ft^2)

<u>Solve for q_o for a given settlement (S_e):</u>

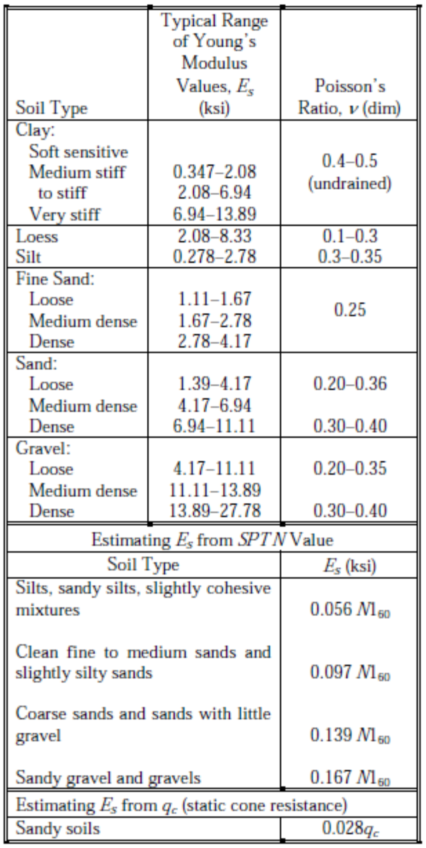
S_e =	0.50	Given Settlement (in)
	0.75	
	1.00	
	1.25	
	1.50	

q_o = (Applied Vertical Stress)

12.0 ksf for 0.5 inches settlement
18.0 ksf for 0.75 inches settlement
24.0 ksf for 1 inches settlement
30.0 ksf for 1.25 inches settlement
36.0 ksf for 1.5 inches settlement

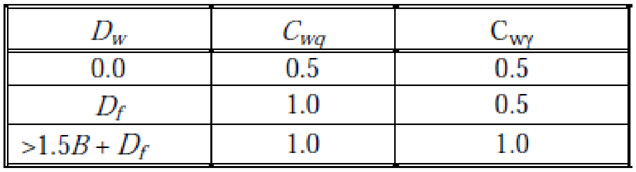
AASHTO 2014 References

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)



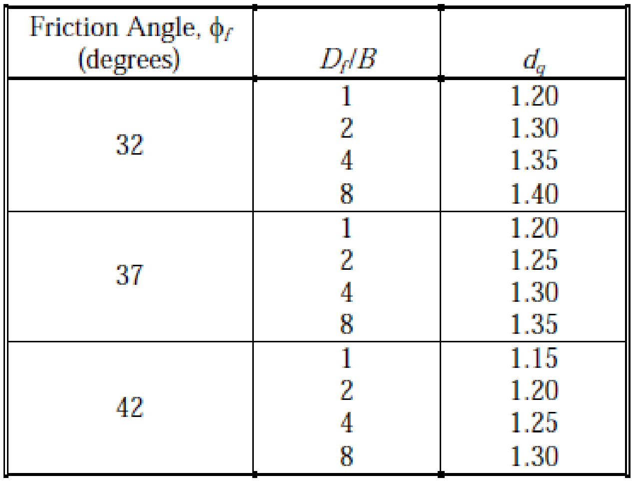
Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay: Soft sensitive Medium stiff to stiff Very stiff	0.347–2.08 2.08–6.94 6.94–13.89	0.4–0.5 (undrained)
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand: Loose Medium dense Dense	1.11–1.67 1.67–2.78 2.78–4.17	0.25
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40
Estimating E_s from *SPT N* Value		
Soil Type		E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures		$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands		$0.097\ N1_{60}$
Coarse sands and sands with little gravel		$0.139\ N1_{60}$
Sandy gravel and gravels		$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)		
Sandy soils		$0.028q_c$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths



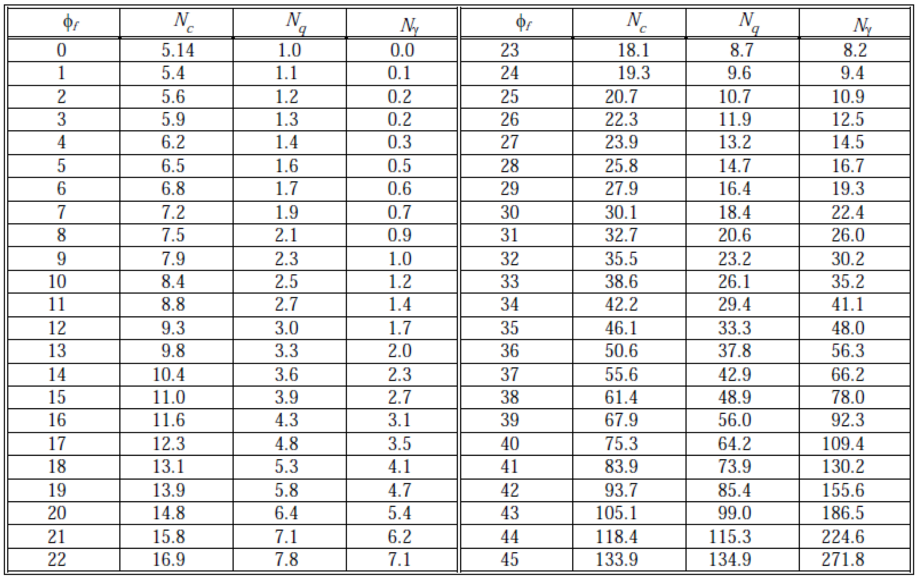
D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.6.3.1.2a-4—Depth Correction Factor d_q



Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

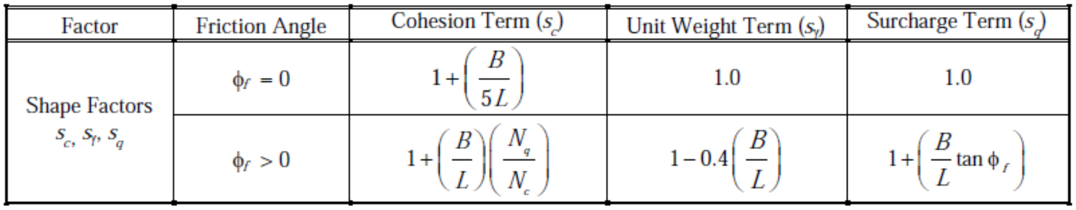
Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)



ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

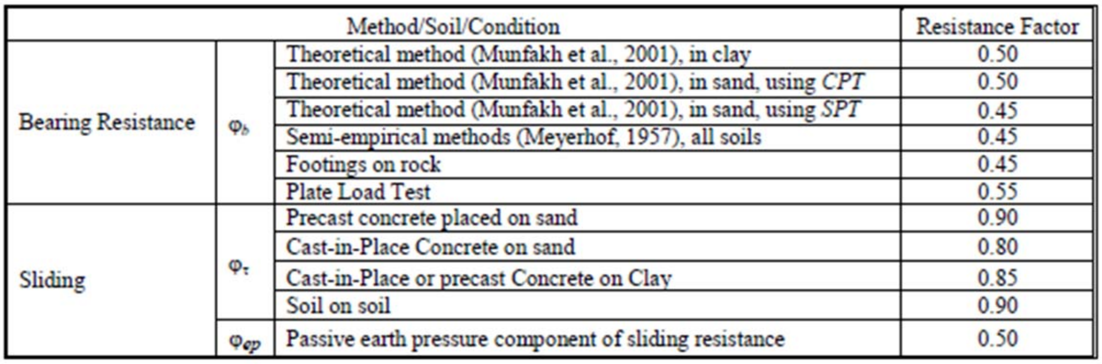
AASHTO 2014 References (cont.)

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q



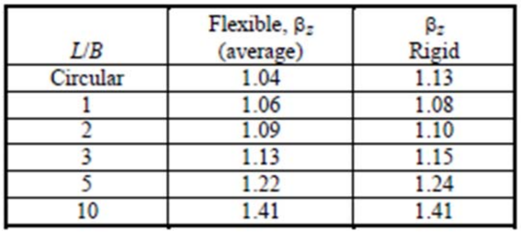
Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State



Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)



L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

JACOBS	Project York Toll Plaza– Mile 8.8			Job Ref. E2X71602	
	Section Toll Plaza Canopy Footing - SB			Sheet no./rev. Rev 1	
	Calc. by PJL	Date 7/18/16	Chk'd by	Date	App'd by	Date

Summary:

Evaluate bearing resistance for the proposed foundation for the southbound toll plaza canopy.

Design Codes

- 2015 International Building Code (IBC)
- AASHTO LRFD 2014 Bridge Design Specifications

Input/Analysis Assumptions

- Groundwater at elevation 163.2.
- Proposed elevation of SB roadway at toll plaza = 167.7 feet
- Bottom of footing shall be minimum 6.3 feet below finished grade for frost protection.
- Bearing soils consist of medium dense to dense fill material overlying shallow bedrock.
- Bedrock elevation based on most conservative elevation from Borings B-4, B-6, and B-8. Soil profile and properties used in analysis presented in Table 1 below.
- Surficial unsuitable soils present must be removed and replaced with compacted gravel borrow prior to construction.
- Assume 5'x5' footings. Max footing eccentricity was conservatively estimated to be in the middle third (B/6) of the corresponding footing dimension (Section 10.6.3.3)
- IBC 2015 Building Code provides presumptive load bearing values of various soils in Table 1806.2, however per Section 1806.2, higher values can be used if data can substantiated. Therefore, bearing resistance was evaluated using procedures per AASHTO LRFD 2014 Design Specifications (attached).

Table 1: Soil Profile and Properties for Analysis

Strata	Thickness (ft)	Unit Weight (pcf)	Friction Angle (Φ)
Gravel Borrow	9.2	125	34
Bedrock	-	-	-

Conclusions

- Due to the shallow bedrock, we also evaluated bearing resistance using an alternative method. However, due to varying thicknesses of overburden soils and depth to bedrock, we recommend the following:
  - To limit settlement to about 0.5 inch for an effective width (B') of about 3.3 feet (footing width of 5 feet), a maximum service design bearing resistance not to exceed 5 ksf is recommended.

Calculated by: PJL Date: 7/18/2016
Reviewed by: PJM Date: 7/28/16

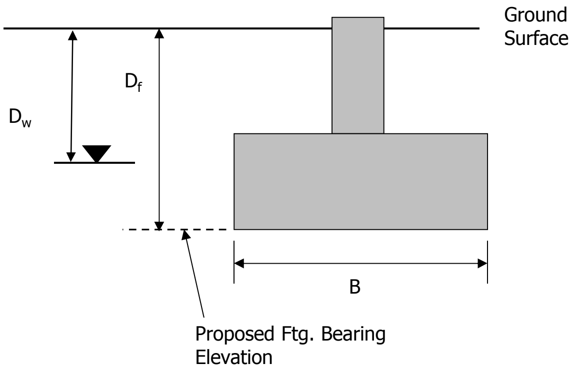
Purpose

Assess net factored bearing resistance of shallow footing for Southbound Toll Plaza Canopy.

Assumptions

1) Footing on medium dense to dense gravel borrow over shallow bedrock.
2) Approx. NB roadway elevation of 167.7 feet.
3) Assume groundwater at elev. 163.2 feet.
4) Design Parameters are as follows:

γ	Φ_f	D_w	L	D_f
125	**34**	**4.5**	**5**	**6.3**



Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ_f	N_c	N_q	N_γ
34	42.2	29.4	41.1

Calculate Effective Footing Width (B') and Length (L):

B	5	footing width (ft)
Max e/B	0.167	(Max e = B/6)
e	0.83	eccentricity (ft)
$B'=B-2e_B$	3.33	ft.

Nominal Bearing Resistance

$$q_n = c*N_{cm} + \gamma*D_f*N_{qm}*C_{wq}+0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$$

c	**0**	cohesion
γ	125	total unit weight (pcf)
D_f	5	Depth of footing (ft)
B'	3.33	Effective footing width (ft)
L	5	Footing Length
B'/L	0.667	
D_f/B'	1.500	
C_{wq}	0.5	Table 10.6.3.1.2a-2
$C_{w\gamma}$	0.5	Table 10.6.3.1.2a-2

$$N_{cm} = N_c*s_c*i_c$$

	N_c	42.2	
	s_c	1.46	Table 10.6.3.1.2a-3
	i_c	**1**	AASHTO Section 10.6.3.1.2
N_{cm}	61.6		

$$N_{qm} = N_q*s_q*d_q*i_q$$

	N_q	29.4	
	s_q	1.45	Table 10.6.3.1.2a-3
	d_q	1.20	Table 10.6.3.1.2a-4
	i_q	**1**	AASHTO P. 10-70
N_{qm}	51.2		

$N_{\gamma m} = N_{\gamma} * s_{\gamma} * i_{\gamma}$

N_{γ}	41.1	
s_{γ}	0.733	Table 10.6.3.1.2a-3
i_{γ}	**1**	AASHTO P. 10-70
$N_{\gamma m}$	30.1	
q_n	19,135	psf

Factored Bearing Resistance

$q_r = RF*q_n$

RF	**0.45**	Table 10.5.5.2.2-1
q_r	$\boxed{8,611}$	psf

Settlement Calculation

$S_e = [q_o*(1-\nu\hat{}2)*\sqrt{(A')}]/(144*E_s*\beta_z)$ Equation 10.6.2.4.2-1

v	**0.3**	Poisson's Ratio (Table C10.4.6.3-1)
E_s (ksi)	**6.94**	Young's Modulus (Table C10.4.6.3-1)
β_z	1.07	Shape/Rigidity Factor (Table 10.6.2.4.2-1)
B'	3.33	Effective Footing Width (ft)
L	5	Length of Footing (ft)
A' = B' * L	16.7	Footing Area (ft^2)

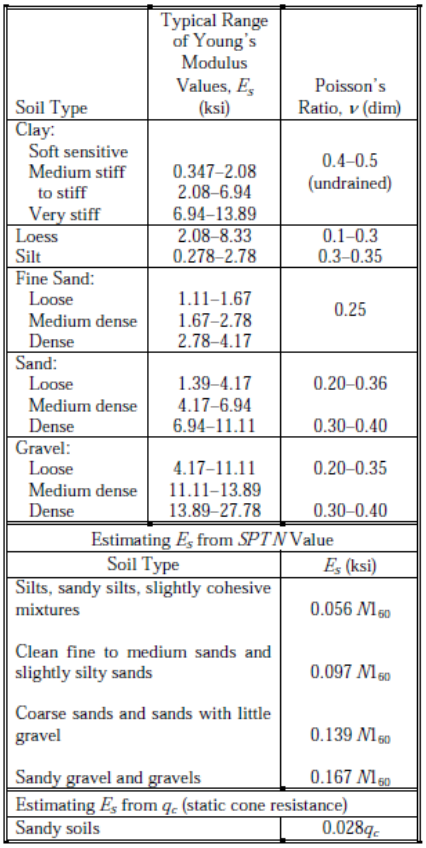
<u>Solve for q_o for a given settlement (S_e):</u>

S_e =	**0.50**	Given Settlement (in)
	0.75	
	1.00	
	1.25	
	1.50	

q_o = 12.0 ksf for 0.5 inches settlement (Applied Vertical Stress)
18.0 ksf for 0.75 inches settlement
24.0 ksf for 1 inches settlement
30.0 ksf for 1.25 inches settlement
36.0 ksf for 1.5 inches settlement

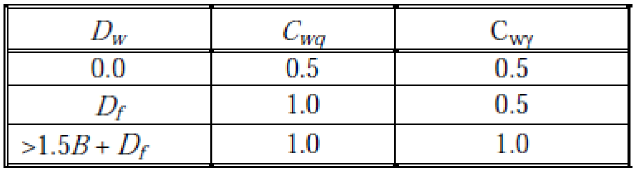
AASHTO 2014 References

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)



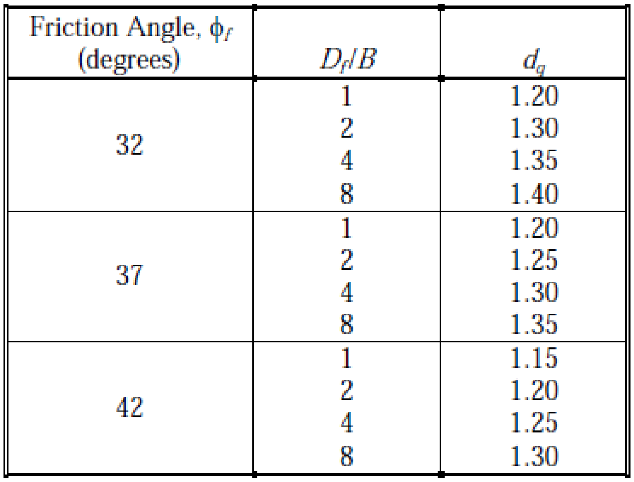
Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40
Estimating E_s from $SPT\ N$ Value		
Soil Type		E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures		$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands		$0.097\ N1_{60}$
Coarse sands and sands with little gravel		$0.139\ N1_{60}$
Sandy gravel and gravels		$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)		
Sandy soils		$0.028q_c$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths



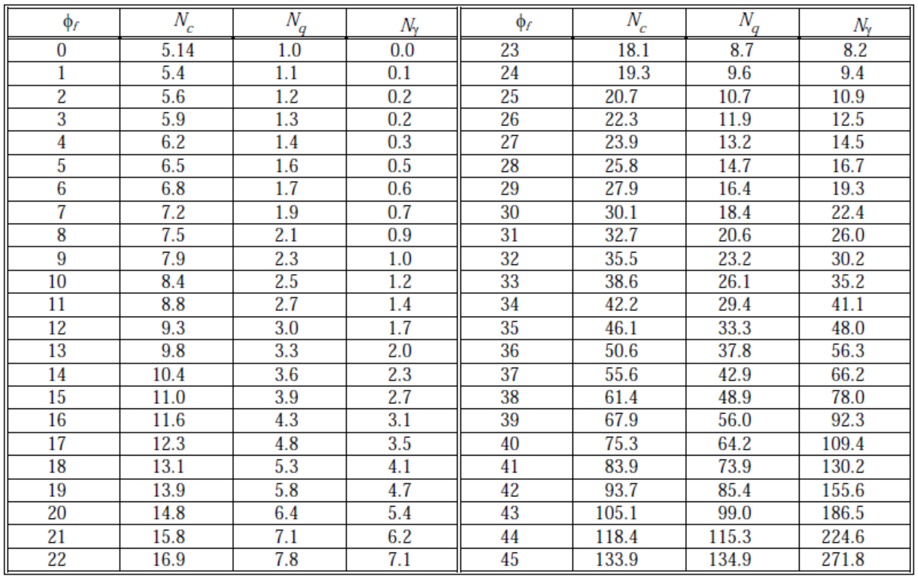
D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.6.3.1.2a-4—Depth Correction Factor d_q



Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

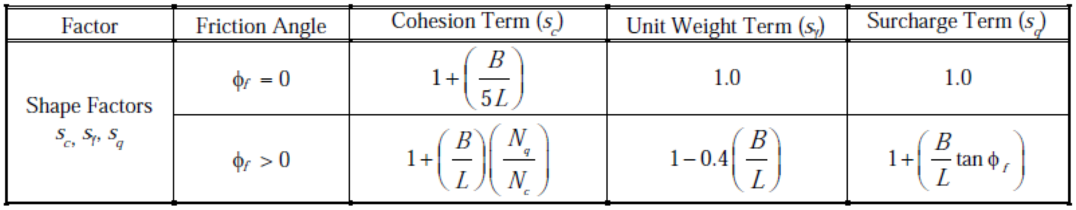
Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)



ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

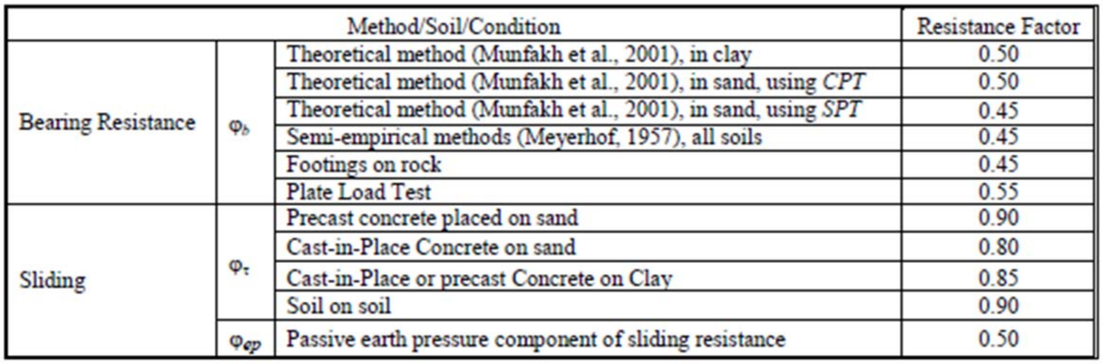
AASHTO 2014 References (cont.)

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q



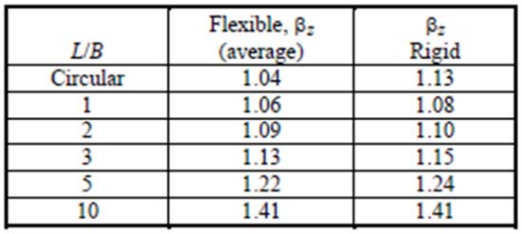
Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State



Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)



L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

JACOBS

CALCULATION SHEET

Sheet No. 1

Project:	York Toll Plaza	Originator by:	PJL	Date:	7/7/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	AMS	Date:	7/18/2016
Subject:	Administration Building	Recheck by:		Date:	

Estimation of Rock Mass Rating (RMR)

References:

1. AASHTO LRFD Bridge Design Specification 2010.

Assumptions

1. Basement floor elevation = 154.5, bottom of footing elevation = 153, evaluated interior footing (highest bearing pressure)
2. Bedrock classification and strength based on boring B-3.

Method:

The rock mass rating (RMR) is evaluated based on the five parameters in the Table 10.4.6-4-1 as well as the adjustment according to Table 10.4.6.4-2. The rock classification is determined in accordance with Table 10.4.6.4-3.

Table 10.4.6.4-1 Geomechanics Classification of Rock Masses (AASHTO LRFD 2012)

	Parameter		Range of Values							Run 1
1	Strength of intact rock material	Point load strength index (ksf)	> 175	85 - 175	45 - 85	20 -45	For this low range, uniaxial compressive test is preferred			
		Uniaxial compressive strength (ksf)	>4,320	2,160-4,320	1,080-2,160	520-1,080	215-520	70-215	20-70	
	Relative Rating		**15**	**12**	**7**	**4**	**2**	**1**	**0**	7
2	Drill core quality RQD (%)		90-100	75-90	50-75	25-50	<25			
	Relative Rating		**20**	**17**	**13**	**8**	**3**			8
3	Spacing of joints		>10 ft	3-10 ft	1-3 ft	2 in. - 1 ft	< 2 in.			
	Relative Rating		**30**	**25**	**20**	**10**	**5**			10
4	Condition of joints		. Very rough surfaces . Not continuous . No separation . Hard joint wall rock	. Slightly rough surfaces . Separation < 0.05 in. . Hard joint wall rock	. Slightly rough surfaces . Separation < 0.05 in. . Soft joint wall rock	. Slicken-sided surfaces or . Gouge <0.2 in. thick or . Joints open 0.05-0.2 in. . Continuous joints	. Soft gouge >0.2 in. thick or . Joints open >0.2 in. . Continuous joints			
	Relative Rating		**25**	**20**	**12**	**6**	**0**			12
5	Ground water conditions (use one of the three evaluation criteria as appropriate to the method of exploration)	Inflow per 30 ft tunnel length	None	<400 gal./hr	400-2,000 gal./hr	>2,000 gal./hr				
		Ratio = joint water pressure / major principal stress	0	0.0-0.2	0.2-0.5	>0.5				
		General conditions	Completely Dry	Moist only (interstitial water)	Water under moderate pressure	Severe water problems				
	Relative Rating*		**10**	**7**	**4**	**0**				4

RMR prior to Adjustment = **41**

Table 10.4.6.4-2 Geomechanics Rating Adjustment for Joint Orientations.

Strike and Dip Orientations of Joints		Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable	
Ratings*	Tunnels	0	-2	-5	-10	-12	
	Foundations	0	-2	-7	-15	-25	-7
	Slopes	0	-5	-25	-50	-60	

RMR after Adjustment = **34**

Table 10.4.6.4-3 Geomechanics Rack Mass Classes Determined from Total Ratings

RMR Rating	100- 81	80- 61	60 - 41	40 - 21	< 20	34
Ratings	I	II	III	IV	V	Class IV
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock	Poor Rock

Note: *In order to avoid double counting the effects of groundwater (an effective stress parameter in numerical analysis) and joint orientation, Hoek and Brown (1988) suggested that the rating for groundwater should always be set at 10 (completely dry) and the rating for joint orientation should always be set to zero (very favorable).

Results:

RMR of the Rock: **34**

Rock Mass Classification: **Class IV** , **Poor Rock**

JACOBS

CALCULATION SHEET

Sheet No. 2

Project:	York Toll Plaza	Originator by:	PJL	Date:	7/7/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	AMS	Date:	7/18/2016
Subject:	Administration Building	Recheck by:		Date:	

Estimation of Rock Mass Strength

References:

1. AASHTO LRFD Bridge Design Specification 2010.

Method:

The shear strength of fractured rock masses is evaluated using the Hoek and Brown criteria, in which the shear strength is represented as a curved envelope. The shear strength of the rock nmass is determined as:

$$\tau = \left(\cot\phi_i' - \cos\phi_i'\right)m\frac{q_u}{8}$$

Eqn. 10.4.6.4-1

in which:

$$\phi_i' = \tan^{-1}\left\{4h\cos^2\left[30 + 0.33\sin^{-1}\left(h^{\frac{-3}{2}}\right)\right] - 1\right\}^{\frac{-1}{2}}$$

$$h = 1 + \frac{16\left(m\sigma_n' + sq_u\right)}{3m^2 q_u}$$

where:

τ = the shear strength of the rock mass (ksf)

ϕ'_i = the instantaneous friction angle of the rock mass (degrees)

q_u = average unconfined compressive strength of rock mass core (ksf)

σ'_n = effective normal stress (ksf)

m, s = constants from Table10.4.6.4-4 (dim)

The instantaneous cohesion at a discrete value of normal stress is taken as:

$$c_i = \tau - \sigma_n' \tan\phi_i'$$

Eqn. C10.4.6.4-1

Analyses:

The Rock Mass Rating (RMR) = 34

Rock Type Selection = E (amphibolite, gabbro gneiss, granite, norite, quartz-diorite)

Average q_u = 1849 ksf from lab test (minimum value used)

Effective normal stress, σ'_n = 4.6 ksf from Structural Analysis

Fractured rock mass parameters (AASHTO Table 10.4.6.4-4 (Hoek and Brown, 1988):

m = 2.2586E-01

s = 1.6841E-05

h = 1.06

τ = 8.75 ksf Eqn. 10.4.6.4-1

Results:

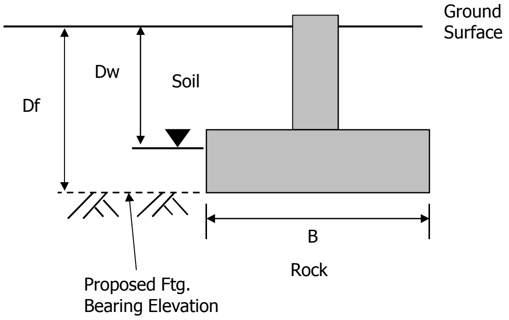
The instantaneous friction angle and cohesion:

ϕ'_i = **51.86** degree

c_i = **2.89** ksf Eqn. C10.4.6.4-1

Purpose

Assess net factored bearing resistance and elastic settlement of shallow footing for the Administrative Building
Following AASHTO LRFD Bridge Design Specification 2010



Assumptions

1) Footing sits 4' below existing grade on ledge.
2) Footing is 4 feet wide x 4 feet long
3) Groundwater assumed at bottom of footing
4) Rock instantaneous friction angle (ϕ'_i) and cohesion (c_i) from RMR based shear strength evaluation. (AASHTO Section 10.4.6.4)
5) Design Parameters are as follows:

γ_{soil} (pcf)	Φ'_i (degree)	D_w (ft)	L (ft)	D_f (ft)
120	**42**	**4**	**4**	**4**

Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ'_i (degree)	Nc	Nq	Nγ
42	93.7	85.4	155.6

Calculate Effective Footing Width (B'):

B	**4**	footing width (ft)	
e/B	**0.250**	(Max e = B/4)	AASHTO 10.6.3.3
e	1.00	eccentricity (ft)	
B'=B-2e	2.00	ft.	

Nominal Bearing Resistance

*qn = c*Ncm + γ*Df *Nqm*Cwq+0.5*γ*B'*Nγm*Cwγ*

c_i (psf)	**2890**	instantaneous cohesion
γ (pcf)	120	total unit weight of overburden soil
Df (ft)	4	Depth of footing
B' (ft)	2.00	Effective footing width
L (ft)	4	Length of footing
B'/L	0.500	
Df/B'	2.000	
Cwq	1	Table 10.6.3.1.2a-2
Cwγ	0.5	Table 10.6.3.1.2a-2

*Ncm = Nc*sc*ic*

	Nc		93.7		
	sc		1.46	Table 10.6.3.1.2a-3	
	ic		**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Ncm		136.8			

*Nqm = Nq*sq*dq*iq*

	Nq		85.4		
	sq		1.45	Table 10.6.3.1.2a-3	
	dq		1.20	Table 10.6.3.1.2a-4	
	iq		**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Nqm		148.6			

*Nγm = Nγ*sγ*iγ*

	Nγ		155.6		
	sγ		0.8	Table 10.6.3.1.2a-3	
	iγ		**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Nγm		124.5			

qn 474,150 psf

Factored Bearing Resistance

*qr = RF*qn* Eqn. 10.6.3.1.1-1

where,

RF = resistance factor =	0.45		Table 10.5.5.2.2-1
qr	213,368	psf	
	213	ksf	
>	**120**	ksf	AASHTO Table C10.6.2.6.1-1 (granite, metamoprphic rock)
Use qr=	**120**	ksf	

Maximum Bearing Pressure

From Structure Analysis (worst case)

p_{max} (ksf) = 4.6 < 120 ksf **OK**

SETTLEMENT CALCULATIONS:

For square footings:

$$\rho = q_o\left(1-\nu^2\right)\frac{rI_p}{144\,E_m}$$ Eqn. 10.6.2.4.4-1

$$I_p = \frac{\left(\sqrt{\pi}\right)}{\beta_z}$$ Eqn. 10.6.2.4.4-2

$$E_m = 145\left(10^{\frac{RMR-10}{40}}\right)$$ Eqn. 10.4.6.5-1

where: q_o = applied vert. stress (ksf)
v = Poisson's Ratio (dim)
E_m = Rock Mass Modulus (ksi)
β_z = Shape/Rigidity Factor (dim)
I_p = influence coefficient to account for rigidity and dimensions of footing (dim)
r = B/2 (ft)

B' = eff. width of footing (ft) =	2.0	(from bearing resistance calcs)
L = length of footing (ft):	4.0	(from bearing resistance calcs)
L/B' =	2.0	
β_z = Shape/Rigidity Factor =	1.08	Table 10.6.2.4.2-1
I_p =	1.6	Eqn. 10.6.2.4.4-4
RMR =	34	(from RMR calculation sheet)
E_m = Rock Mass Modulus (ksi) =	577	Eqn. 10.4.6.5-1
v = Poisson's Ratio =	0.20	Table C10.4.6.5-2 (mean value for Granite)
q_o (ksf) =	4.6	From Structure Analysis
ρ (ft) =	0.00009	Eqn. 10.6.2.4.4-3
ρ (in) =	0.00	

Appendix H. **ORT Slab Settlement Calculations**

JACOBS	Project York Toll Plaza– Mile 8.8				Job Ref. E2X71602	
	Section ORT Slab Settlement				Sheet no./rev. Rev 0	
	Calc. by PJL	Date 7/14/16	Chk'd by AMS	Date 7/14/16	App'd by PJM	Date 7/28/16

Purpose

Determine estimated settlement of open road tolling (ORT) slabs.

Design Codes/References

- AASHTO LRFD Bridge Specifications, 7th edition
- WINSAF-I software by Prototype Engineering

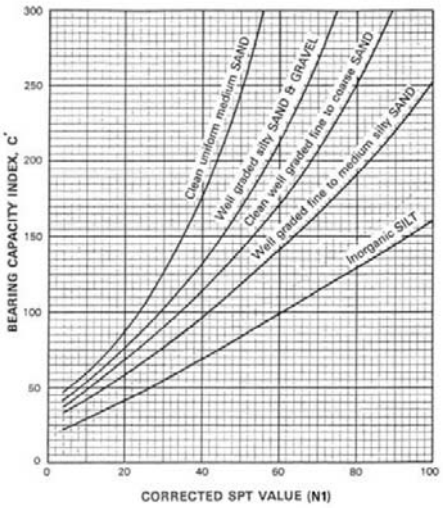
Input/Analysis Assumptions

- ORT slab is 12 inches thick.
- Proposed roadway elevation = 167.7 ft
- Groundwater elevation = 156 ft
- ORT Slabs are 58’-9” wide x by 65’ long.
- Assumed 250 psf load across entire ORT slab.
- Soil profile and bedrock elevation based on boring B-10.
- Average N-value of existing fill based on borings B-9 and B-10.
- Sand assumed to be a normally consolidated, clean well graded fine to coarse sand
- Compression Index (C_c) = 1/ Bearing Capacity Factor (C’)
- Bearing Capacity Factor determined by AASHTO Figure 10.6.2.4.2-1 (See below)

Layer	Top Elev (ft)	Bottom Elev (ft)	Unit Weight (pcf)	Avg. $(N_1)_{60}$	Bearing Capacity Factor (C’)	C_c
Compacted Fill	166.7	165.7	130	75 [1]	230	0.004
Existing Fill	165.7	152.9	125	50 [2]	140	0.007
Bedrock	152.9	-		-	-	-

Notes:

1. Assumed required density and compaction is achieved.
2. See N value correction sheets (attached).



Reference: Hough, "Compressibility
as a Basis for Soil Bearing
Value" ASCE 1959

Figure 10.6.2.4.2-1—Bearing Capacity Index versus Corrected SPT (modified from Cheney and Chassie, 2000, after Hough, 1959)

Conclusions

We recommend 12 inches of compacted gravel borrow (MaineDOT Spec 703.20) be placed under the ORT slabs. The gravel borrow should be compacted to at least 98 percent of the maximum dry density as determined by the Modified Proctor Test. We estimate settlement of the ORT slabs should be less than ¼”.

Attachments:

1. WINSAF-I Output File

```
                                 York ORT Slabs.TXT
                              RECTANGULAR LOADS

           Increment of stresses obtained using : Boussinesq


           Settlement for X =  29.40 (ft)      Y =  32.50 (ft)

     Footing #      Corner Point P1     Corner Point P2         Load
                     X1(ft)  Y1(ft)      X2(ft)  Y2(ft)        (psf)
         1            0.00    0.00       58.75   65.00         250.00

Foundation Elev.        =  166.70 (ft)  Ground Surface Elev.=  166.70 (ft)
Water table Elev.       =  156.00 (ft)  Unit weight of Wat. =   62.40 (pcf)


     Layer         Comp. Recomp. Swell.   Unit     Primary      Secondary
N°.  Type   Thick.       Ratio           Weight   Settlement    Settlement
             (ft)                         (pcf)     (in.)         (in.)

 1    COMP.   1.0   0.004  0.004  0.004   130.00       0.03          0.00
 2    COMP.  12.8   0.007  0.007  0.007   125.00       0.14          0.00

                              Total Settlement =       0.18          0.00


          Sublayer                  Soil Stresses
   N§.  Thick.  Elev.   Initial  Increment  Max.Past Press.   Settlement
        (ft)     (ft)    (psf)     (psf)       (psf)             (in.)

    1   1.00   166.20     65.00    250.00       65.00             0.03
    2   2.56   164.42    290.00    249.92      290.00             0.06
    3   2.56   161.86    610.00    249.29      610.00             0.03
    4   2.56   159.30    930.00    247.57      930.00             0.02
    5   2.56   156.74   1250.00    244.41     1250.00             0.02
    6   2.56   154.18   1456.43    239.65     1456.43             0.01
                                         Total Settlement =       0.18 (in.)
```

CALCULATION SHEET

Sheet No. **1**

Project:	**York Toll Plaza - Mile 8.8**		Authored by:	**PJL**	Date	**6/8/2016**
Job No.	**E2X71602**		Checked by:	**AMS**	Date	**7/14/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No.	**B-9**	
Ground Surface Elevation	**164.90**	ft (NAVD 88)
Ground Water Depth during Drilling	**9.50**	ft
Hammer Efficiency	**73**	%

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	**1**	**8**	**n/a**	**n/a**	1.95	1.22	**9.7**	118	**19.0**
159.9	**5**	**29**	**n/a**	**n/a**	1.38	1.22	**35.3**	638	**48.8**
154.9	**10**	**36**	**n/a**	**n/a**	1.24	1.22	**43.8**	976	**54.4**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. **2**

Project:	**York Toll Plaza - Mile 8.8**		Authored by:	**PJL**	Date	**6/8/2016**
Job No.	**E2X71602**		Checked by:	**AMS**	Date	**7/14/2016**

Corrected N Value for Estimation of Soil Strength Parameters

Boring No.	**B-10**		References:	1. FHWA-IF-02-034 (2002)
Ground Surface Elevation	**165.90**	ft (NAVD 88)		2. FHWA-NHI-10-0.16 (May 2010)
Ground Water Depth during Drilling	**9.70**	ft		3. NAVFAC DM-7 (March 1971)
Hammer Efficiency	**73**	%		4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	**2**	**38**	**n/a**	**n/a**	1.68	1.22	**46.2**	260	**77.9**
161.9	**4**	**100**	**n/a**	**n/a**	1.45	1.22	**121.7**	520	**176.7**
155.9	**10**	**64**	**n/a**	**n/a**	1.26	1.22	**77.9**	926	**98.1**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf] $\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

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Appendix I. **Existing Toll Plaza Area Settlement Calculations**

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Page from Jacobs Memo, "Supplemental Memoradndum to Jacobs 11/11/2014 Geotechnical Memorandum," dated March 2, 2015

JACOBS

Authored by: DH Date: 2/16/2015
Checked by: PJM Date: 2/27/2015

Proposed York Toll Plaza

File #: E2X71601

Table C-1: Evaluation of Maximum Past Pressure

Boring	Depth (ft)	Elevation (ft)	Estimate of Maximum Past Pressure (tsf)			
			Casagrande	Log-Log	Strain Energy	Average
B-1	23	24.5	1.3	1.2	1.5	1.3
B-1	66.0	-18.5	2.0	1.7	1.7	1.8
B-2	16.4	30.3	4.0	3.5	3.2	3.6
B-2	43.4	3.3	1.2	1.4	0.8	1.1
B-9	12.9	25.9	0.8	0.9	0.7	0.8
B-9	24.9	13.9	0.9	1.0	0.8	0.9
B-9	63	-24.2	2.0	1.8	1.8	1.9
B-10	6.9	31.3	3.9	3.3	3.4	3.5
B-10	41.8	-3.6	2.0	1.9	1.8	1.9
HA09-1	35.2	12.0	1.3	1.4	1.4	1.4

Notes:

1) Values shown in yellow highlighted areas are considered most representative for design considering potential sample disturbance effects.

Table C-2: Summary of Consolidation Parameters

Boring	Depth (ft)	Elevation (ft)	CR[1)]	RR[1)]	Cα (loading)	Cα (reloading)
B-1	23	24.5	0.14	0.012	0.00438	0.00038
B-1	66.0	-18.5	0.17	0.015	0.00400	0.00037
B-2	16.4	30.3	0.12	0.010	0.00325	0.00031
B-2	43.4	3.3	0.17	0.018	0.00475	0.00050
B-9	12.9	25.9	0.17	0.012	0.00488	0.00050
B-9	24.9	13.9	0.14	0.009	0.00450	0.00044
B-9	63	-24.2	0.20	0.013	0.00437	0.00025
B-10	6.9	31.3	0.13	0.013	0.00425	0.00025
B-10	41.8	-3.6	0.23	0.013	0.00475	0.00045
HA09-1	35.2	12.0	0.13	0.016	N/A	N/A
		Minimum	0.12	0.009	0.00325	0.00025
		Maximum	0.23	0.018	0.00488	0.00050
		Average	0.16	0.013	0.00435	0.00038

Notes: 1) CR and RR values are based on Engineer's estimates from the lab data.

```
                               Raising Grade 1 ft.TXT
                   STRIP FOOTING UNIFORM VERTICAL LOADING

Project Name: York Toll Plaza           Project Number : E2X71601
Client      : Maine Turnpike Authority  Project Manager: Thom Morin
Date        : 7/19/2016                 Computed by    : PL

           Increment of stresses obtained using : Boussinesq


                     Settlement for X =   0.00 (ft)

Width of strip b        =  300.00 (ft)  Foundation Elev.    =   45.00 (ft)
Ground Surface Elev.    =   45.00 (ft)  p load/unit area    =  120.00 (psf)
Water table Elev.       =   40.00 (ft)  Unit weight of Wat. =   62.40 (pcf)


     Layer          Comp. Recomp. Swell.   Unit     Primary      Secondary
N°.  Type   Thick.       Ratio            Weight   Settlement    Settlement
             (ft)                          (pcf)     (in.)         (in.)

 1   INCOMP.  0.5                          150.00       0.00          0.00
 2   INCOMP.  9.5                          120.00       0.00          0.00
 3    COMP.   5.0   0.160  0.013  0.013    118.00       0.04          0.00
 4    COMP.  56.5   0.160  0.013  0.013    118.00       2.24          0.00

                              Total Settlement =       2.28          0.00


          Sublayer                Soil Stresses
   N§.  Thick.  Elev.   Initial  Increment  Max.Past Press.   Settlement
        (ft)     (ft)    (psf)     (psf)       (psf)            (in.)

    1   INCOMP.
    2   INCOMP.
    3   1.67    34.17    949.33    119.98    15879.32             0.01
    4   1.67    32.50   1042.00    119.97    10000.00             0.01
    5   1.67    30.83   1134.67    119.96     4120.67             0.01
    6   9.42    25.29   1442.78    119.89     1443.38             0.62
    7   9.42    15.88   1966.35    119.64     1966.13             0.46
    8   9.42     6.46   2489.92    119.20     2489.69             0.37
    9   9.42    -2.96   3013.48    118.52     3012.85             0.30
   10   9.42   -12.38   3537.05    117.58     3536.71             0.26
   11   9.42   -21.79   4060.62    116.39     4060.57             0.22

                                         Total Settlement =       2.28 (in.)
```

Appendix J. **Gantry Foundation Calculations**

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JACOBS

Project York Toll Plaza– Mile 8.8				Job Ref. E2X71602	
Section Gantry – Drilled Shafts				Sheet no./rev. Rev 2	
Calc. by PJL	Date 07/20/2016	Chk'd by AMS	Date 7/20/2016	App'd by PJM	Date 7/29/2016

Purpose

Evaluate required embedment of gantry drilled shaft foundations to resist lateral and axial loading.

Design Codes/References

- 2013 AASHTO Sign Support Manual with 2015 Interim Revisions
- 2014 ASHTO LRFD Bridge Design Specifications
- LPILE Version 2013 by Ensoft, Inc

Input/Analysis Assumptions

- See attached loading spreadsheet for design loading on shaft.
- Proposed Roadway Elevation = 167.7 feet
- Assumed groundwater four feet below proposed roadway surface (Elev = 163.7 feet)
- Analysis performed for two soil profiles, as shown in Tables 1 and 2 below.
- Shallow bedrock profile based on bedrock elevation encountered in Boring B-7.
- Deep bedrock profile based on bedrock elevation encountered in Boring B-12.
- Evaluated 3 foot diameter drilled shaft.
- Assumed 11 - #9 bars arranged in circle for shaft reinforcement.

Table 1: Soil Profile and Properties for Lateral Analysis (Shallow Bedrock Profile)

Layer	Layer Top Elev (ft)	Layer Bottom Elev (ft)	Top Depth^1 (ft)	Bottom Depth^1 (ft)	Φ (degrees) ^{2}	k (pci) ^{3}	γ' (pcf) ^{4}	UCS ^{5} (psi)
Dense Fill	167.7	163.7	0	4	34	135	125	--
Dense Fill (Submerged)	163.7	160.8	4	6.9	34	80	63	-
Bedrock	160.8	-	6.9	-	--	--	103	4,000

Table 2: Soil Properties for Lateral Analysis (Deep Bedrock Profile)

Layer	Layer Top Elev (ft)	Layer Bottom Elev (ft)	Top Depth^1 (ft)	Bottom Depth^1 (ft)	Φ (degrees) ^{2}	k (pci) ^{3}	γ' (pcf) ^{4}	UCS (psi) ^{5}
Dense Fill	167.7	163.7	0	4	34	135	125	--
Dense Fill (Submerged)	163.7	146.5	4	21.3	34	80	63	-
Bedrock	146.5	-	21.3	-	--	--	103	4,000

Notes:

1. Depth in reference to top of drilled shaft
2. Φ = angle of internal friction
3. k = horizontal modulus of subgrade reaction
4. γ' = effective unit weight
5. UCS = unconfined compressive strength

Conclusions:

We recommend using three foot diameter drilled shafts, terminating in soil at least 15 feet below proposed ground surface, or 3 feet into bedrock, whichever occurs first. The analysis indicates pile head deflections less than about ½" under the design loads.

Table 3: Analysis Summary

	LPILE Input			Results		
	Vertical (P)	Moment (M)	Shear (V)	Pile Head Deflection	Max. Moment	Max. Shear
Load Case	lbs	lb-in	lbs	in	lbs-in	lbs
Shallow Rock	22800	2364000	8500	0.14	2586194	-99800
Deep Rock	22800	2364000	8500	0.17	2565787	-18762

Attachments:

1. LPILE Output – Shallow Bedrock Profile
2. LPILE Output – Deep Bedrock Profile

Lanergan, Phillip

From: Massenzio, David
Sent: Thursday, March 03, 2016 1:42 PM
To: Lanergan, Phillip
Cc: Deutscher, Michael
Subject: RE: York
Attachments: Elevations at Tunnel and Admin. Building_022916.pdf; Struct_Structural Sheets(3-02-2016).pdf

Phil,

Due to the rock elevations, we will set the bottom of footing elevation 4'-6" below the top of roadway. As discussed, we can come up with some design criteria for the tunnel walls that accounts for the additional lateral pressure from the footings.

The following reactions are at the bottom of columns/top of pedestals:

AASHTO Sign Supports Manual - Group 2 Loads (governs): DL + W

- P (DL) = 22.8 kips
- M (WIND-L) = 163.2 kip-ft (for moment about axis perpendicular to traffic)
- M (WIND-T) = 24.5 kip-ft (for moment about axis parallel to traffic)
- VL = 8.37 kips (shear parallel to traffic)
- VT = 1.26 kips (shear perpendicular to traffic)

Note that top of pedestals/barriers are 3'-9" higher than top of pavement. Pg. 8 shows a preliminary detail on the drilled shaft foundations. Let me know if you have any comments on this for the 30% submission.

I only have the progress set from Clint that was distributed to the group for the highway sections/profile. The profile would have the top of roadway elevations and the sections show the typical cross slopes.
The tunnel top of floor slab elevations are shown in the attachment.

-Dave

Calculated by: PJL Date: 7/18/2016
Reviewed by: AMS Date: 7/19/2016

Purpose

Determine design loading on open road tolling (ORT) drilled shaft foundations from OH gantry

Design Codes

2013 AASHTO Sign Support Manual

1) **Preliminary Loading (provided by Jacobs Structural Engineer on 3/2016 - See attached email)**

P (DL)	22.8	kips
M (WIND-L)	163.2	kip-ft (for moment about axis perpendicular to traffic)
M (WIND-T)	24.5	kips-ft (for moment about axis parallel to traffic)
VL	8.37	kips (shear parallel to traffic)
VT	1.26	kips (shear perpendicular to traffic)

2) **Calculated resultant of loads above**

P	22.8	kips
M	165	kips-ft
V	8.5	kips

3) **Transfer load to ground surface**

Assume 3.75 ft stickup

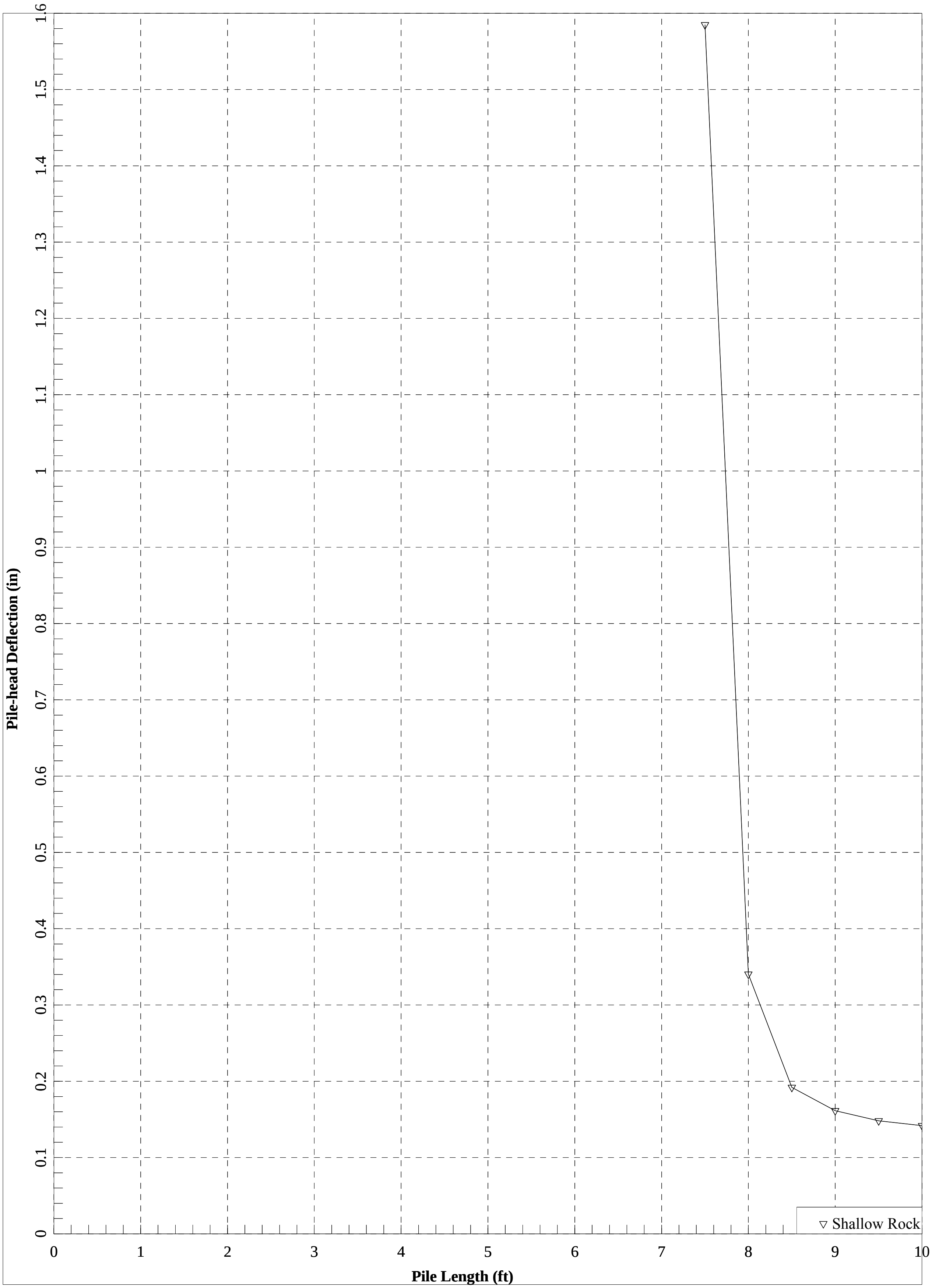
8.5 kips x 3.75 ft = 31.875 kip-ft

165 kips-ft
\+ 31.875 kips-ft
196.875 kips-ft

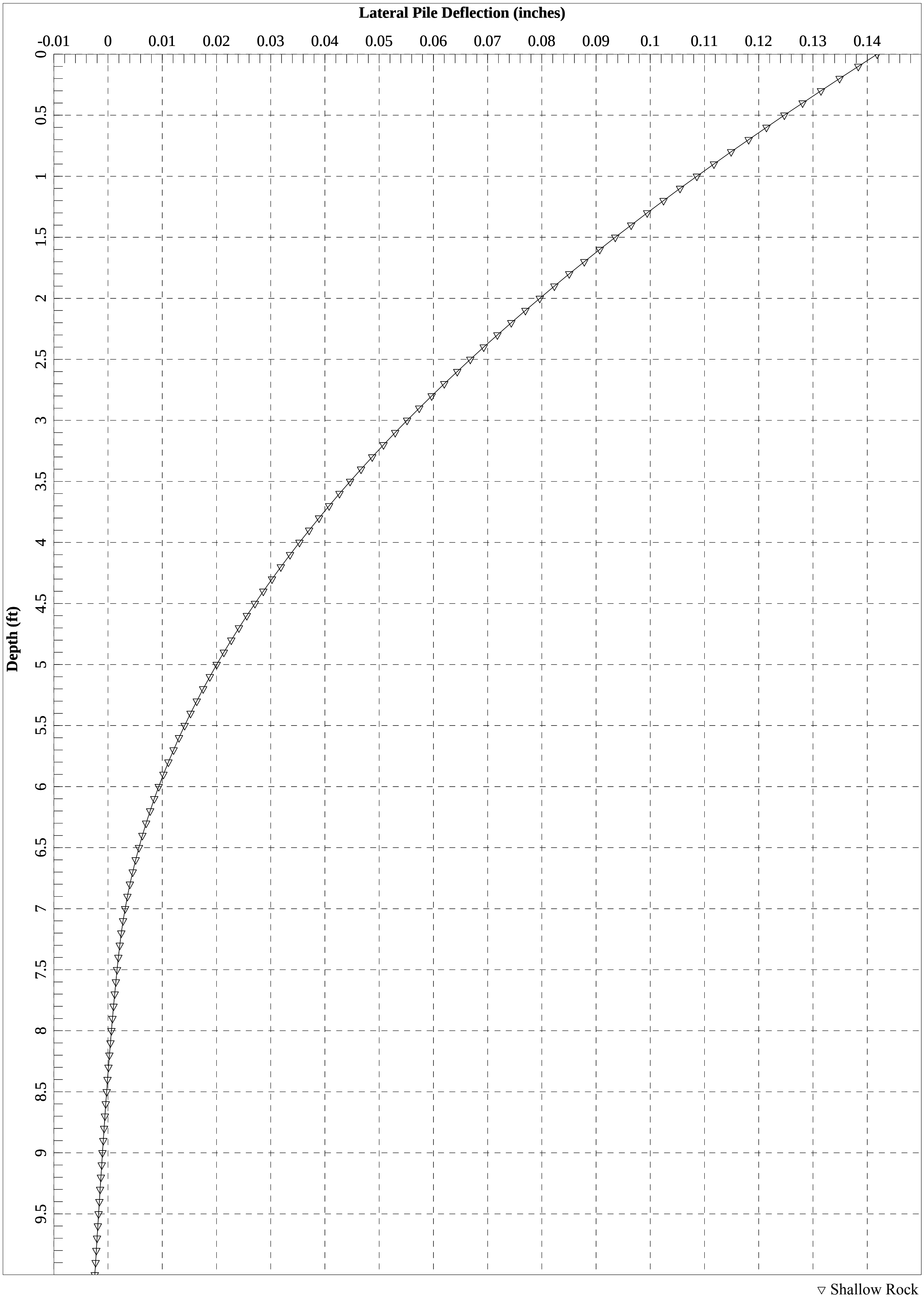
4) **Loads Inputted in LPILE**

P = 22.8 kips
= 22800 lbs
M = 197 kips-ft
= 2364000 lb-in
V = 8.5 kips
= 8500 lbs

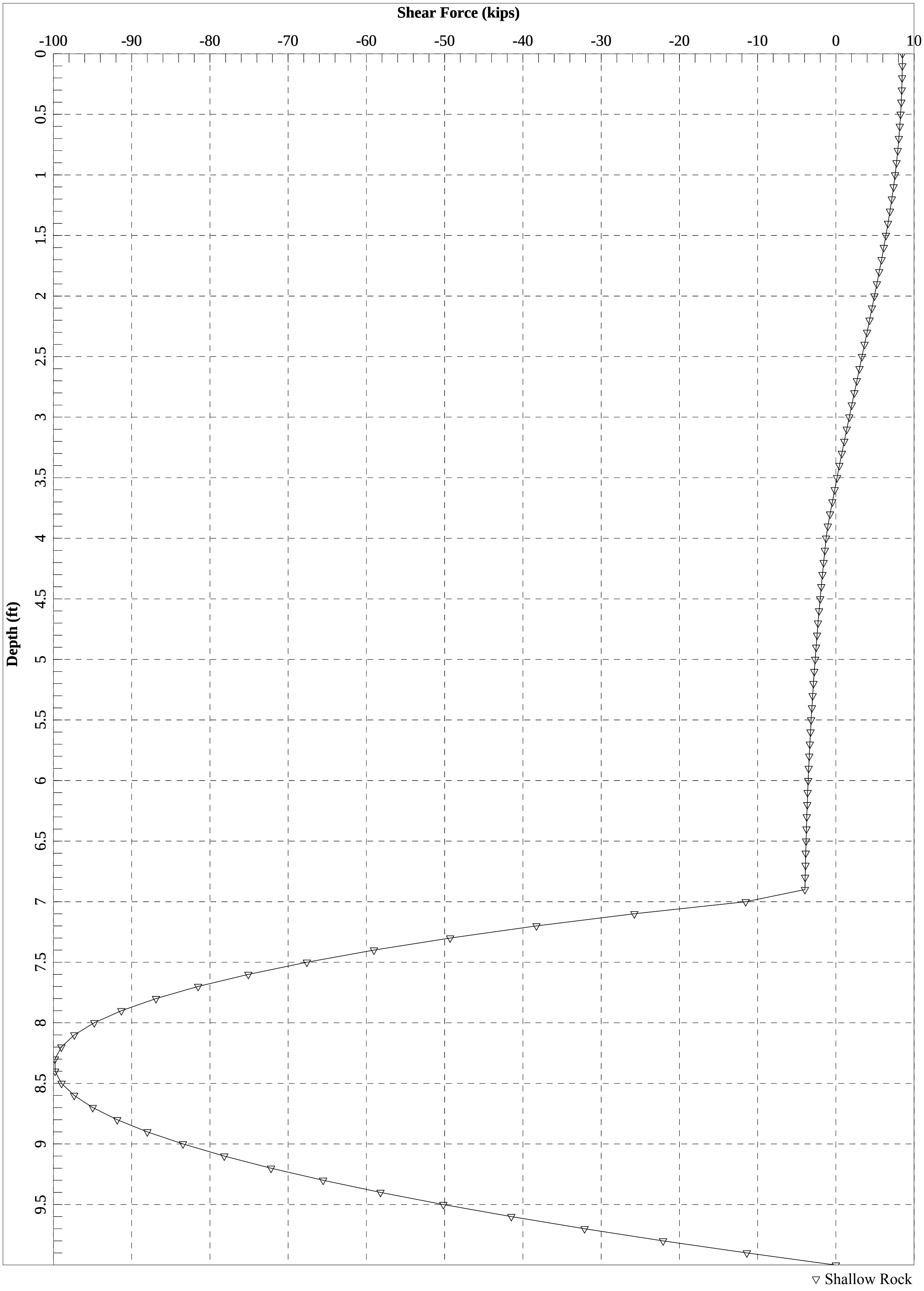
Shallow Rock



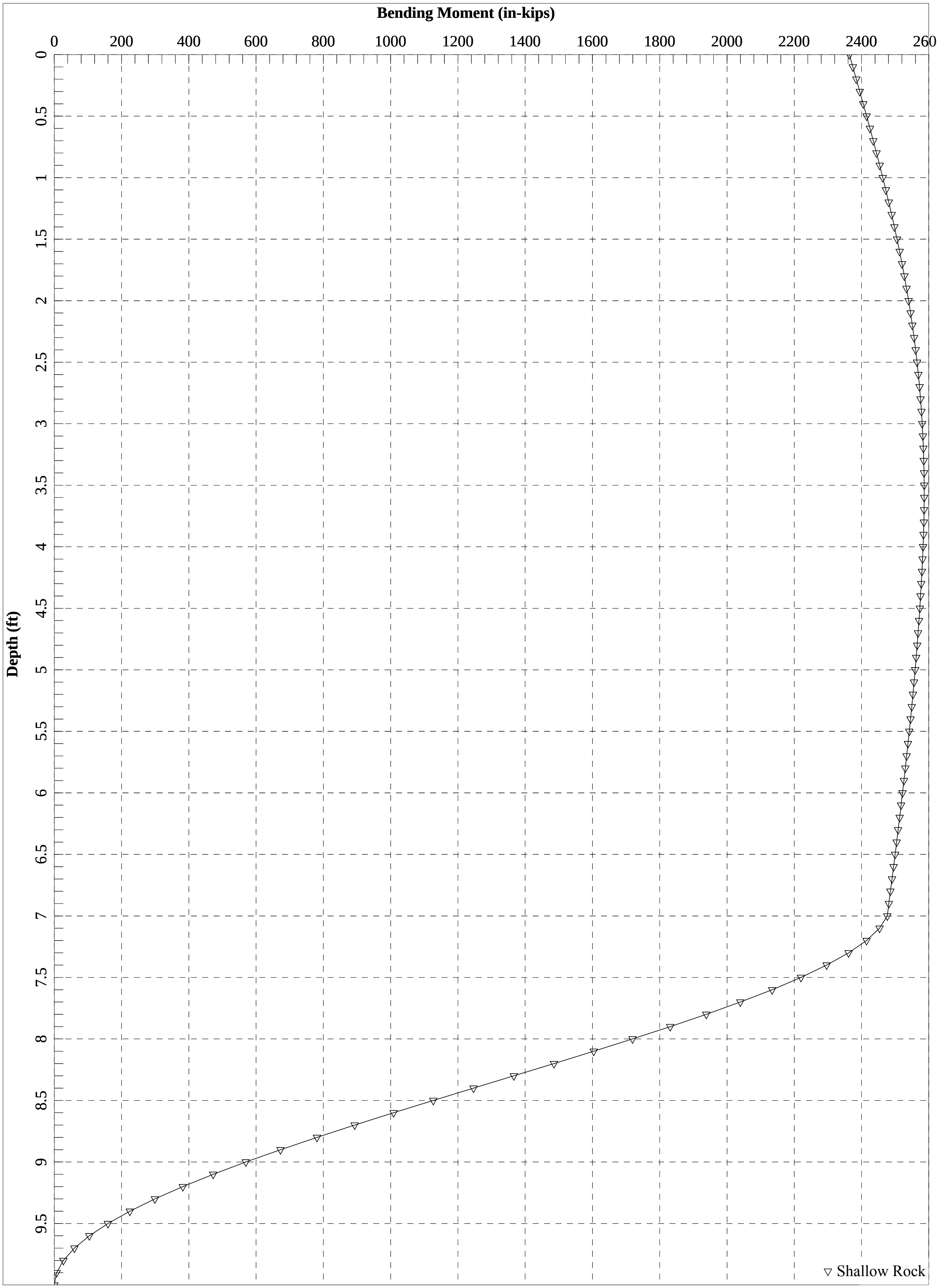
Shallow Rock



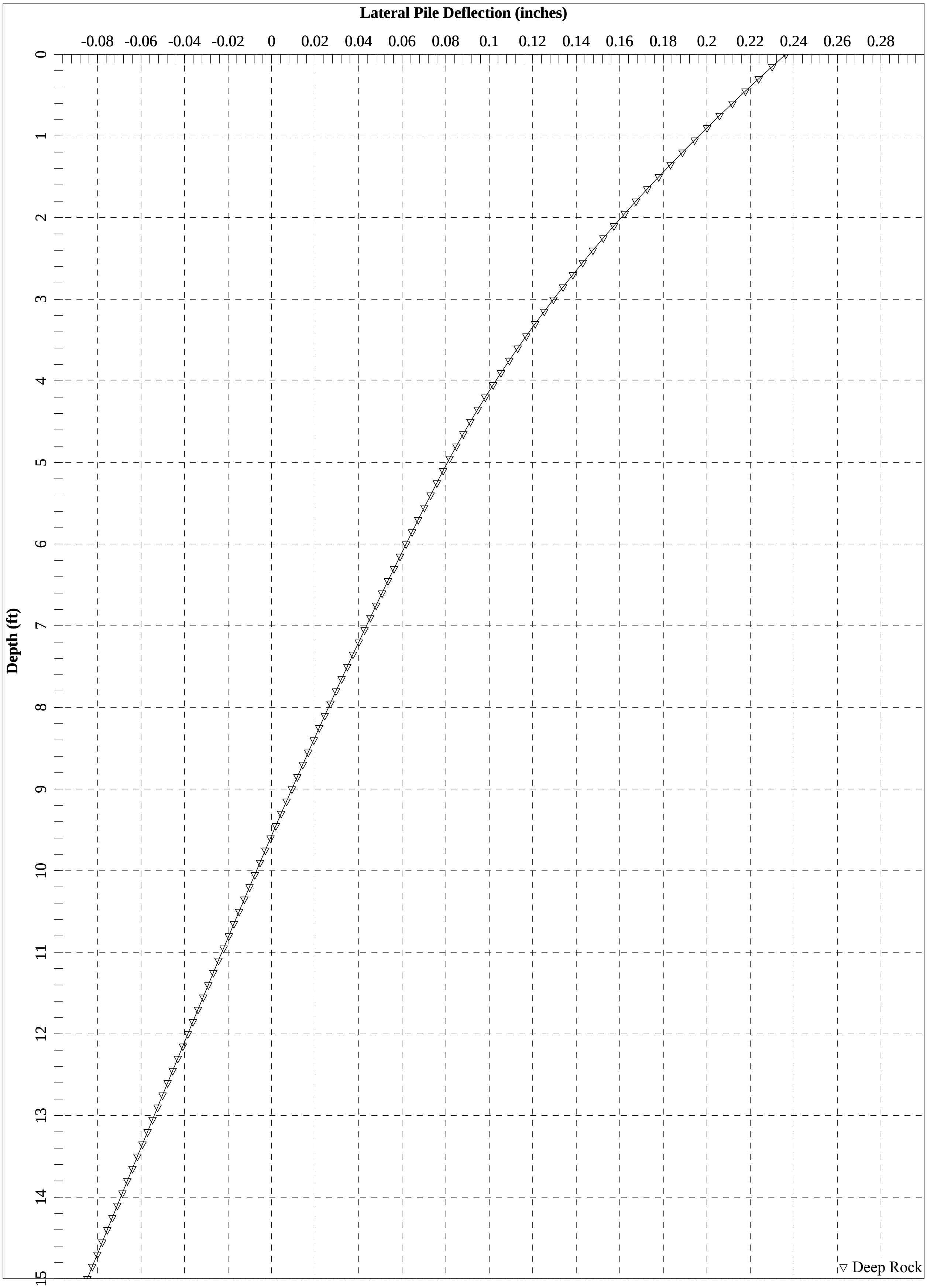
Shallow Rock



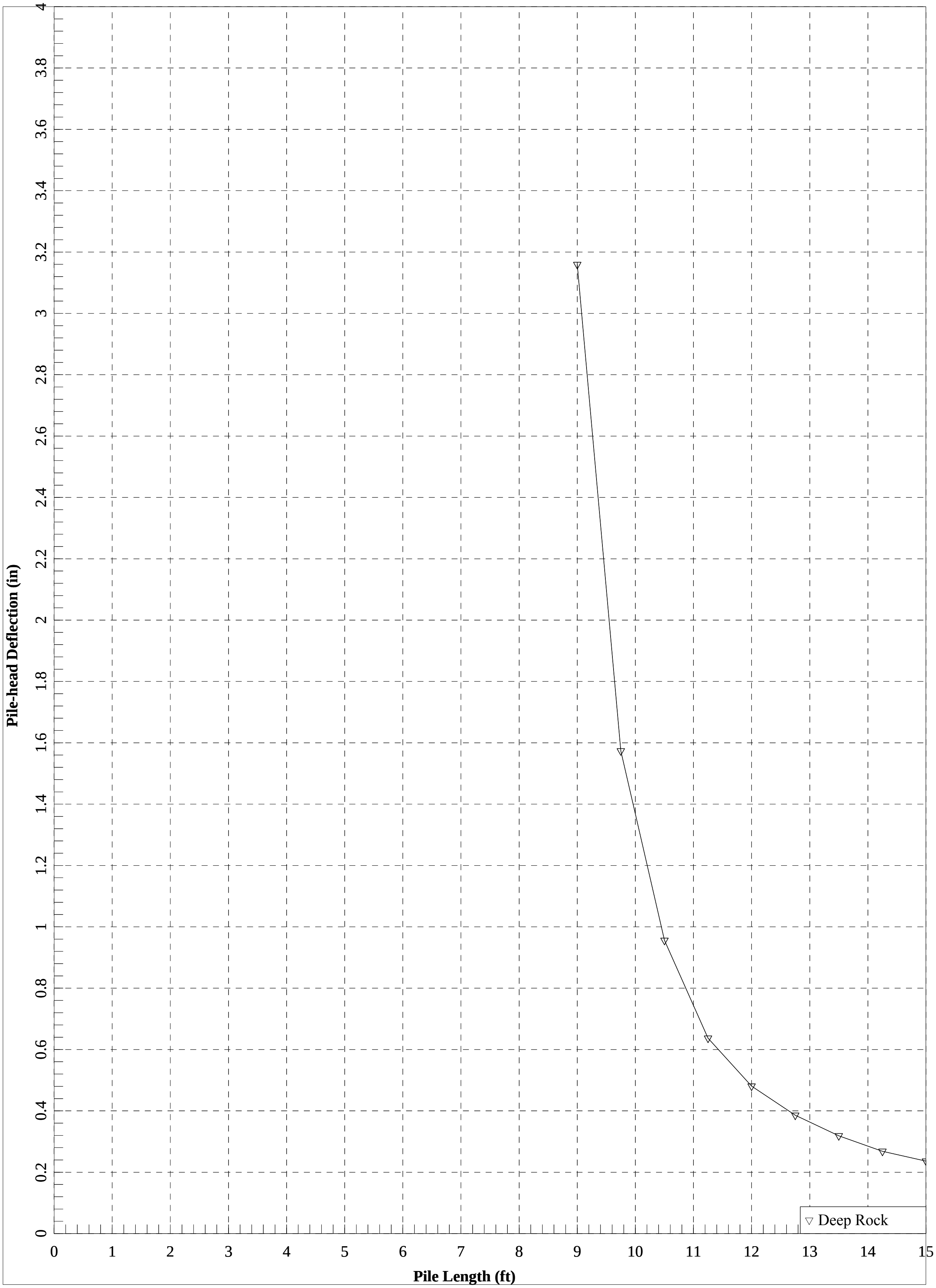
Shallow Rock



Deep Rock

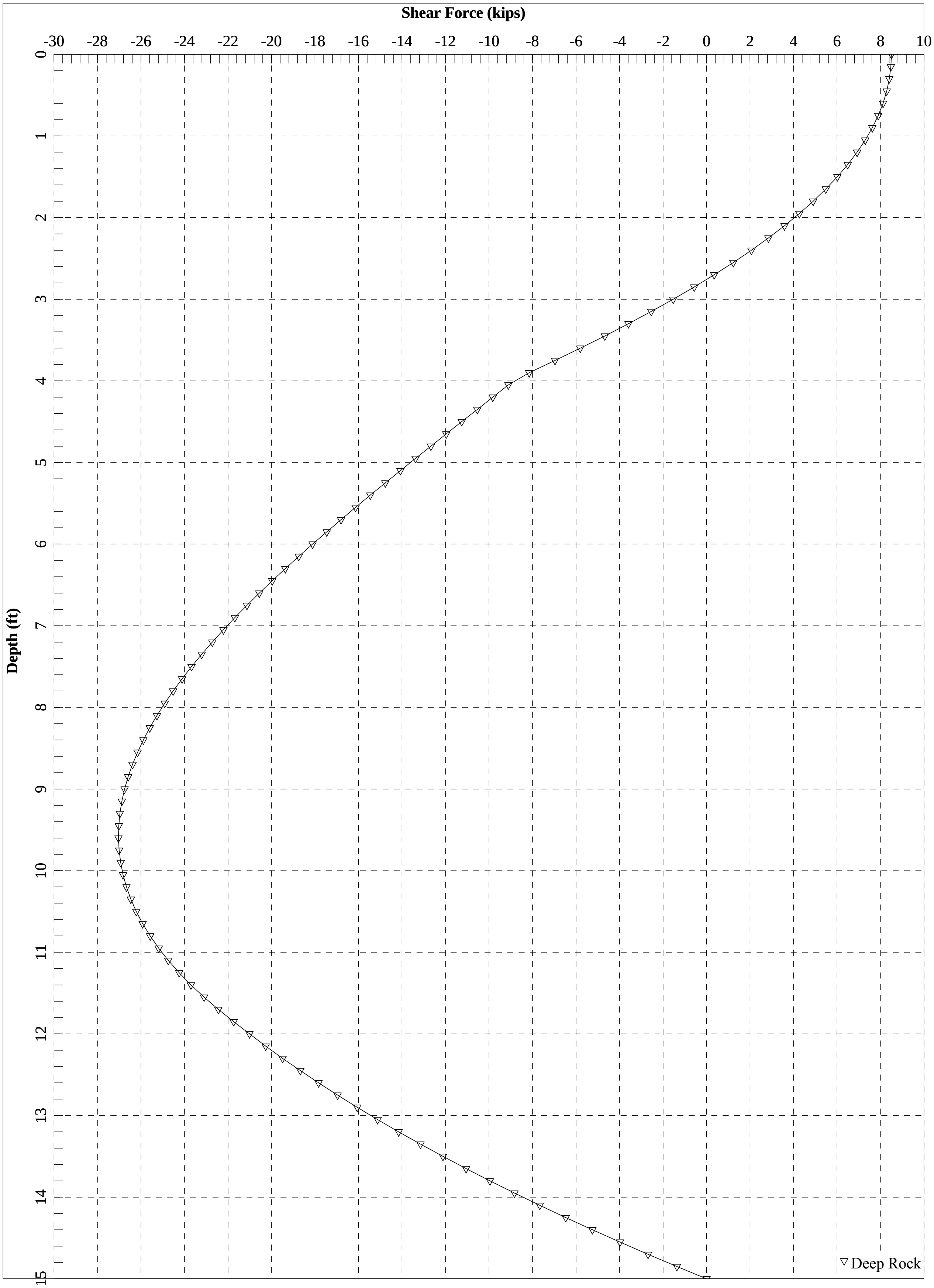

Lateral Pile Deflection (inches)
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
▽ Deep Rock

Deep Rock

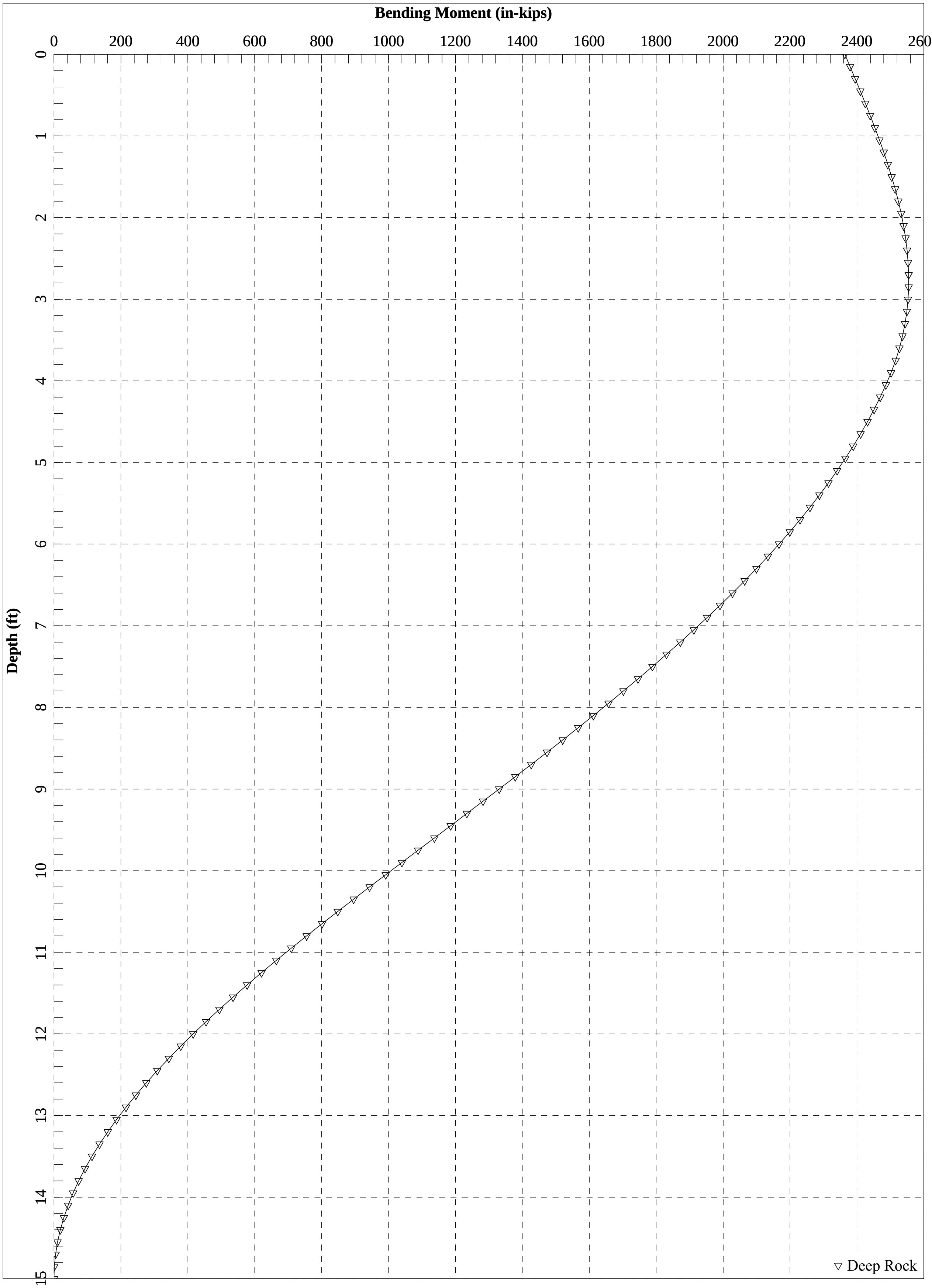


Pile-head Deflection (in)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Pile Length (ft)
▽ Deep Rock

Deep Rock


Shear Force (kips)
-30
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
▽ Deep Rock

Deep Rock


Bending Moment (in-kips)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
▽ Deep Rock

Jacobs Engineering Group
343 Congress Street
Boston, MA 02210
617/242-9222

CALCULATION WORKSHEET

Project	York Toll Plaza		
Page	1	**of**	1
Calc By	PJL	**DATE**	7/20/2016
Check	AMS	**DATE**	7/20/2016

PURPOSE: Evaluated axial capacity of drilled shaft gantry foundations

INPUT: Preliminary Vertical Loading (provided by Jacobs Structural Group); unfactored per 2013 AASHTO Sign Support Manual with 2015 Interim Revisions

P = 22.8 kips

ASSUMPTIONS:
- Minimum 15 foot embedment into soil or three foot rock socket, whichever occurs first to satisfy lateral stability of shaft, based on lateral loading provided by Jacobs Structural Group.
- Three foot diameter drilled shaft.
- 3.75 foot stickup above final roadway surface.

Weight of Drilled Shaft

18.75 total length (ft)
3 dia (ft)
7.07 cross sectional area (sq-ft)
150 pcf (unit weight concrete)
19.9 Total weight of shaft (kips) (W)

Required Design Load

P + W = 42.7 kips

Evaluate Capacity in Soil

Pile Embedment = 15 ft

Side Friction

Assume side fricton in sandy soils = 0.5 ksf conservative value
Side friction capacity = 4.7 kips/ft (perimeter (ft) x ultimate side friction (ksf))

Capacity in Side Friction = 70.7 kips

End Bearing

Assume bearing capacity in sandy soils = 5 ksf See bearing capacity calculations (Section 10.1 and Appendix G)
Tip Area = 7.07 sf

Capacity in End Bearing = 35.4 kips

Total Capacity = 106.0 kips
Factor of Safety = 2.0
Allowable Capacity = 53.0 kips

53.0 kips > 42.7 kips **OK**

Evaluate Rock Socket Capacity

Rock Socket = 3 feet

Side Friction

Assume side fricton in rock socket = 6 ksf conservative value
Circumference (π D) = 9.42 ft
Side friction capacity = 56.52 kips/ft

Capacity in Side Friction = 169.56 kips
Factor of Safety = 2
Allowable Capacity = 84.78 kips

.

84.78 kips > 42.7 kips **OK**
(No End Bearing Required)

```
================================================================================

                   LPile Plus for Windows, Version 2013-07.004

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method

                           © 1985-2013 by Ensoft, Inc.
                               All Rights Reserved

================================================================================

This copy of LPile is used by:

P Lanergan
Jacobs

Serial Number of Security Device:  239146528
This copy of LPile is licensed for exclusive use by:  JACOBS, Global License,

Use of this program by any entity other than JACOBS, Global License,
is forbidden by the software license agreement.


--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:        \\BOSFIL10\Group\INFRASTRUCTURE\GEOTECHNICAL\Maine Turnpike Authority - York
Plaza\Geotechnical\New Toll Location\Analysis\Gantry LPILE\
Name of input data file:       Shallow Rock Profile.lp7d
Name of output report file:    Shallow Rock Profile.lp7o
Name of plot output file:      Shallow Rock Profile.lp7p
Name of runtime messeage file: Shallow Rock Profile.lp7r


--------------------------------------------------------------------------------
                           Date and Time of Analysis
--------------------------------------------------------------------------------

               Date:  July 21, 2016     Time:   7:54:27


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

Project Name: York Toll Plaza


Job Number: E2X71602


Client: Maine Turnpike
```

```
Engineer: Jacobs Engineering


Description: Gantry Foundation - Soil Profile




--------------------------------------------------------------------------------
                           Program Options and Settings
--------------------------------------------------------------------------------

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                 =          500
- Deflection tolerance for convergence                 =   1.0000E-05 in
- Maximum allowable deflection                         =     100.0000 in
- Number of pile increments                            =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of pile
   (only if nonlinear pile properties are input)
 - Use of p-y modification factors for p-y curves not selected
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------

Total number of pile sections                          =          1

Total length of pile                                   =      10.00 ft

Depth of ground surface below top of pile              =       0.00 ft
```

```
Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         36.0000000
  2         10.000000         36.0000000


Input Structural Properties:
----------------------------

Pile Section No. 1:

   Section Type                                    = Drilled Shaft (Bored Pile)
   Section Length                                  =     10.00000 ft
   Section Diameter                                =     36.00000 in


--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                 =        0.000 degrees
                                                   =        0.000 radians

Pile Batter Angle                                  =        0.000 degrees
                                                   =        0.000 radians


--------------------------------------------------------------------------------
                       Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer       =       0.0000 ft
   Distance from top of pile to bottom of layer    =      4.00000 ft
   Effective unit weight at top of layer           =    125.00000 pcf
   Effective unit weight at bottom of layer        =    125.00000 pcf
   Friction angle at top of layer                  =     34.00000 deg.
   Friction angle at bottom of layer               =     34.00000 deg.
   Subgrade k at top of layer                      =    135.00000 pci
   Subgrade k at bottom of layer                   =    135.00000 pci


Layer 2 is sand, p-y criteria by Reese et al., 1974
```

```
   Distance from top of pile to top of layer           =      4.00000 ft
   Distance from top of pile to bottom of layer        =      7.00000 ft
   Effective unit weight at top of layer               =     63.00000 pcf
   Effective unit weight at bottom of layer            =     63.00000 pcf
   Friction angle at top of layer                      =     34.00000 deg.
   Friction angle at bottom of layer                   =     34.00000 deg.
   Subgrade k at top of layer                          =     80.00000 pci
   Subgrade k at bottom of layer                       =     80.00000 pci


Layer 3 is strong rock (vuggy limestone)

   Distance from top of pile to top of layer           =      7.00000 ft
   Distance from top of pile to bottom of layer        =     15.00000 ft
   Effective unit weight at top of layer               =    103.00000 pcf
   Effective unit weight at bottom of layer            =    103.00000 pcf
   Uniaxial compressive strength at top of layer       =   4000.00000 psi
   Uniaxial compressive strength at bottom of layer    =   4000.00000 psi


   (Depth of lowest soil layer extends    5.00 ft below pile tip)


--------------------------------------------------------------------------------
                           Summary of Soil Properties
--------------------------------------------------------------------------------

                      Layer                     Layer      Effective    Angle of      Uniaxial
Layer               Soil Type                   Depth       Unit Wt.    Friction      qu            kpy
 Num.         (p-y Curve Criteria)               ft           pcf         deg.       psi           pci
-----   ----------------------------------   ----------   ----------   ----------   ----------   ----------
  1     Sand (Reese, et al.)                       0.00      125.000       34.000       --          135.000
                                                  4.000      125.000       34.000       --          135.000
  2     Sand (Reese, et al.)                      4.000       63.000       34.000       --           80.000
                                                  7.000       63.000       34.000       --           80.000
  3     Vuggy Limestone                           7.000      103.000       --         4000.000       --
                                                 15.000      103.000       --         4000.000       --


--------------------------------------------------------------------------------
                                 Loading Type
--------------------------------------------------------------------------------

Static loading criteria were used when computing p-y curves for all analyses.



--------------------------------------------------------------------------------
               Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 1
```

```
Load    Load         Condition               Condition            Axial Thrust           Compute
 No.    Type             1                       2                 Force, lbs      Top y vs. Pile Length
-----   ----   --------------------   -----------------------   ----------------   ---------------------
   1     1     V =   8500.00000 lbs   M =     2364000. in-lbs           22800.             Yes

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
    Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile):
--------------------------------------------------------

Length of Section                                      =     10.00000 ft
Shaft Diameter                                         =     36.00000 in
Concrete Cover Thickness                               =      3.00000 in
Number of Reinforcing Bars                             =           11 bars
Yield Stress of Reinforcing Bars                       =       60000. psi
Modulus of Elasticity of Reinforcing Bars              =    29000000. psi
Gross Area of Shaft                                    =   1017.87602 sq. in.
Total Area of Reinforcing Steel                        =     11.00000 sq. in.
Area Ratio of Steel Reinforcement                      =         1.08 percent
Edge-to-Edge Bar Spacing                               =      7.00618 in
Maximum Concrete Aggregate Size                        =      0.75000 in
Ratio of Bar Spacing to Aggregate Size                 =         9.34
Offset of Center of Rebar Cage from Center of Pile     =       0.0000 in

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     4083.379 kips
Tensile Load for Cracking of Concrete                  =     -455.573 kips
Nominal Axial Tensile Capacity                         =     -660.000 kips


Reinforcing Bar Dimensions and Positions Used in Computations:

     Bar         Bar Diam.      Bar Area          X              Y
    Number         inches         sq. in.        inches         inches
```

```
  ----------     ----------     ----------     ----------     ----------
       1            1.12800        1.00000       14.43600        0.00000
       2            1.12800        1.00000       12.14434        7.80469
       3            1.12800        1.00000        5.99693       13.13145
       4            1.12800        1.00000       -2.05446       14.28906
       5            1.12800        1.00000       -9.45357       10.91000
       6            1.12800        1.00000      -13.85124        4.06709
       7            1.12800        1.00000      -13.85124       -4.06709
       8            1.12800        1.00000       -9.45357      -10.91000
       9            1.12800        1.00000       -2.05446      -14.28906
      10            1.12800        1.00000        5.99693      -13.13145
      11            1.12800        1.00000       12.14434       -7.80469

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero =      7.00618 inches between Bars 8 and 9

Spacing to aggregate size ratio =      9.34158


Concrete Properties:
--------------------

Compressive Strength of Concrete                     =   4000.00000 psi
Modulus of Elasticity of Concrete                    =     3604997. psi
Modulus of Rupture of Concrete                       =   -474.34164 psi
Compression Strain at Peak Stress                    =      0.00189
Tensile Strain at Fracture of Concrete               =   -0.0001154
Maximum Coarse Aggregate Size                        =      0.75000 in


Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

   Number     Axial Thrust Force
                    kips
   ------     ------------------
      1              22.800


Definitions of Run Messages and Notes:
--------------------------------------

   C = concrete in section has cracked in tension.
   Y = stress in reinforcing steel has reached yield stress.
   T = ACI 318-08 criteria for tension-controlled section met, tensile strain in
       reinforcement exceeds 0.005 while simultaneously compressive strain in
       concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
   Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.
```

```
Axial Thrust Force =      22.800 kips

    Bending       Bending       Bending       Depth to      Max Comp      Max Tens    Max Concrete   Max Steel     Run
   Curvature      Moment       Stiffness       N Axis        Strain        Strain        Stress        Stress      Msg
    rad/in.       in-kip        kip-in2          in           in/in         in/in          ksi           ksi
 ------------- ------------- ------------- ------------- ------------- ------------- ------------- -------------  ---

   0.000000625   235.6838122    377094099.    25.9694342     0.0000162  -0.000006269     0.0680688     0.4674335
   0.000001250   470.6899938    376551995.    21.9936791     0.0000275    -0.0000175     0.1148086     0.7907459
   0.000001875   704.8294056    375909016.    20.6686561     0.0000388    -0.0000287     0.1612707     1.1140707
   0.000002500   938.0967930    375238717.    20.0062051     0.0000500    -0.0000400     0.2074540     1.4373999
   0.000003125  1170.4914908    374557277.    19.6087649     0.0000613    -0.0000512     0.2533581     1.7607318
   0.000003750  1402.0133299    373870221.    19.3438249     0.0000725    -0.0000625     0.2989830     2.0840660
   0.000004375  1632.6622588    373179945.    19.1545979     0.0000838    -0.0000737     0.3443288     2.4074021
   0.000005000  1862.4382453    372487649.    19.0126903     0.0000951    -0.0000849     0.3893952     2.7307401
   0.000005625  2091.3412857    371794006.    18.9023291     0.0001063    -0.0000962     0.4341824     3.0540799
   0.000006250  2319.3713730    371099420.    18.8140500     0.0001176    -0.0001074     0.4786904     3.3774215
   0.000006875  2319.3713730    337363109.    11.4269519     0.0000786    -0.0001689     0.3212178    -4.8633639  C
   0.000007500  2319.3713730    309249516.    11.2397800     0.0000843    -0.0001857     0.3440631    -5.3461978  C
   0.000008125  2319.3713730    285461092.    11.0790729     0.0000900    -0.0002025     0.3667608    -5.8295809  C
   0.000008750  2319.3713730    265071014.    10.9401933     0.0000957    -0.0002193     0.3893478    -6.3132509  C
   0.000009375  2319.3713730    247399613.    10.8169295     0.0001014    -0.0002361     0.4117552    -6.7977098  C
     0.0000100  2319.3713730    231937137.    10.7093287     0.0001071    -0.0002529     0.4341031    -7.2820946  C
     0.0000106  2319.3713730    218293776.    10.6144266     0.0001128    -0.0002697     0.4563828    -7.7664673  C
     0.0000113  2319.3713730    206166344.    10.5273375     0.0001184    -0.0002866     0.4784705    -8.2517311  C
     0.0000119  2319.3713730    195315484.    10.4496337     0.0001241    -0.0003034     0.5004993    -8.7369199  C
     0.0000125  2319.3713730    185549710.    10.3799080     0.0001297    -0.0003203     0.5224693    -9.2220333  C
     0.0000131  2319.3713730    176714009.    10.3170211     0.0001354    -0.0003371     0.5443804    -9.7070713  C
     0.0000138  2319.3713730    168681554.    10.2600408     0.0001411    -0.0003539     0.5662324   -10.1920337  C
     0.0000144  2319.3713730    161347574.    10.2062295     0.0001467    -0.0003708     0.5879146   -10.6777405  C
     0.0000150  2319.3713730    154624758.    10.1570787     0.0001524    -0.0003876     0.6095385   -11.1633707  C
     0.0000156  2319.3713730    148439768.    10.1120307     0.0001580    -0.0004045     0.6311040   -11.6489236  C
     0.0000163  2319.3713730    142730546.    10.0706126     0.0001636    -0.0004214     0.6526111   -12.1343988  C
     0.0000169  2319.3713730    137444230.    10.0324215     0.0001693    -0.0004382     0.6740596   -12.6197962  C
     0.0000175  2319.3713730    132535507.     9.9971119     0.0001749    -0.0004551     0.6954496   -13.1051157  C
     0.0000181  2319.3713730    127965317.     9.9643861     0.0001806    -0.0004719     0.7167810   -13.5903570  C
     0.0000188  2319.3713730    123699807.     9.9339862     0.0001863    -0.0004887     0.7380536   -14.0755199  C
     0.0000194  2319.3713730    119709490.     9.9056873     0.0001919    -0.0005056     0.7592675   -14.5606044  C
     0.0000200  2319.3713730    115968569.     9.8784741     0.0001976    -0.0005224     0.7803601   -15.0460850  C
     0.0000206  2319.3713730    112454370.     9.8528343     0.0002032    -0.0005393     0.8013780   -15.5316109  C
     0.0000213  2319.3713730    109146888.     9.8288342     0.0002089    -0.0005561     0.8223375   -16.0170558  C
     0.0000219  2319.3713730    106028406.     9.8063337     0.0002145    -0.0005730     0.8432388   -16.5024195  C
     0.0000225  2319.3713730    103083172.     9.7852081     0.0002202    -0.0005898     0.8640816   -16.9877017  C
     0.0000231  2319.3713730    100297140.     9.7653462     0.0002258    -0.0006067     0.8848659   -17.4729022  C
     0.0000238  2319.3713730     97657742.     9.7466485     0.0002315    -0.0006235     0.9055917   -17.9580208  C
     0.0000244  2319.3713730     95153697.     9.7290258     0.0002371    -0.0006404     0.9262588   -18.4430573  C
     0.0000256  2319.3713730     90512054.     9.6966919     0.0002485    -0.0006740     0.9674167   -19.4128833  C
     0.0000269  2319.3713730     86302191.     9.6677904     0.0002598    -0.0007077     1.0083391   -20.3823783  C
     0.0000281  2319.3713730     82466538.     9.6418657     0.0002712    -0.0007413     1.0490253   -21.3515407  C
     0.0000294  2388.7526621     81319240.     9.6185399     0.0002825    -0.0007750     1.0894746   -22.3203688  C
     0.0000306  2480.5518296     80997611.     9.5974966     0.0002939    -0.0008086     1.1296864   -23.2888608  C
     0.0000319  2572.2660045     80698541.     9.5784693     0.0003053    -0.0008422     1.1696601   -24.2570149  C
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0.0000331  2663.8947982     80419466.     9.5612315     0.0003167     -0.0008758     1.2093949    -25.2248294  C
0.0000344  2755.4378184     80158191.     9.5455900     0.0003281     -0.0009094     1.2488903    -26.1923024  C
0.0000356  2846.8885536     79912661.     9.5310098     0.0003395     -0.0009430     1.2880996    -27.1598129  C
0.0000369  2938.2495131     79681343.     9.5175300     0.0003510     -0.0009765     1.3270419    -28.1272038  C
0.0000381  3029.5241958     79462930.     9.5052592     0.0003624     -0.0010101     1.3657452    -29.0942352  C
0.0000394  3120.7121839     79256182.     9.4940840     0.0003738     -0.0010437     1.4042088    -30.0609052  C
0.0000406  3211.8127031     79060005.     9.4839050     0.0003853     -0.0010772     1.4424319    -31.0272128  C
0.0000419  3302.8260735     78873458.     9.4746347     0.0003968     -0.0011107     1.4804141    -31.9931537  C
0.0000431  3393.7514663     78695686.     9.4661958     0.0004082     -0.0011443     1.5181544    -32.9587271  C
0.0000444  3484.5884475     78525937.     9.4585196     0.0004197     -0.0011778     1.5556523    -33.9239307  C
0.0000456  3575.3365791     78363541.     9.4515450     0.0004312     -0.0012113     1.5929069    -34.8887625  C
0.0000469  3665.9954187     78207902.     9.4452175     0.0004427     -0.0012448     1.6299175    -35.8532203  C
0.0000481  3756.5645195     78058484.     9.4394883     0.0004543     -0.0012782     1.6666834    -36.8173020  C
0.0000494  3847.0434304     77914804.     9.4343134     0.0004658     -0.0013117     1.7032038    -37.7810053  C
0.0000506  3937.4316957     77776429.     9.4296533     0.0004774     -0.0013451     1.7394780    -38.7443280  C
0.0000519  4027.7288555     77642966.     9.4254722     0.0004889     -0.0013786     1.7755052    -39.7072679  C
0.0000531  4117.9344450     77514060.     9.4217379     0.0005005     -0.0014120     1.8112847    -40.6698226  C
0.0000544  4208.0479949     77389388.     9.4184209     0.0005121     -0.0014454     1.8468156    -41.6319900  C
0.0000556  4298.0690314     77268657.     9.4154946     0.0005237     -0.0014788     1.8820973    -42.5937677  C
0.0000569  4387.9970754     77151597.     9.4129347     0.0005354     -0.0015121     1.9171289    -43.5551533  C
0.0000581  4477.8316436     77037964.     9.4107188     0.0005470     -0.0015455     1.9519096    -44.5161445  C
0.0000594  4567.5722474     76927533.     9.4088267     0.0005586     -0.0015789     1.9864386    -45.4767389  C
0.0000606  4657.2183933     76820097.     9.4072397     0.0005703     -0.0016122     2.0207152    -46.4369340  C
0.0000619  4746.7695828     76715468.     9.4059407     0.0005820     -0.0016455     2.0547385    -47.3967275  C
0.0000631  4836.2253121     76613470.     9.4049140     0.0005937     -0.0016788     2.0885077    -48.3561167  C
0.0000644  4925.5850726     76513943.     9.4041449     0.0006054     -0.0017121     2.1220220    -49.3150993  C
0.0000656  5014.8483499     76416737.     9.4036201     0.0006171     -0.0017454     2.1552805    -50.2736727  C
0.0000669  5104.0146245     76321714.     9.4033273     0.0006288     -0.0017787     2.1882824    -51.2318344  C
0.0000681  5193.0833716     76228747.     9.4032550     0.0006406     -0.0018119     2.2210268    -52.1895816  C
0.0000694  5282.0540606     76137716.     9.4033925     0.0006524     -0.0018451     2.2535129    -53.1469119  C
0.0000706  5370.9261553     76048512.     9.4037301     0.0006641     -0.0018784     2.2857398    -54.1038226  C
0.0000719  5459.6991140     75961031.     9.4042585     0.0006759     -0.0019116     2.3177067    -55.0603109  C
0.0000731  5548.3723890     75875178.     9.4049693     0.0006877     -0.0019448     2.3494126    -56.0163743  C
0.0000744  5636.9454268     75790863.     9.4058545     0.0006996     -0.0019779     2.3808568    -56.9720099  C
0.0000794  5990.2236230     75467384.     9.4109991     0.0007470     -0.0021105     2.5039968    -60.0000000  CY
0.0000844  6341.8528073     75162700.     9.4184243     0.0007947     -0.0022428     2.6228743    -60.0000000  CY
0.0000894  6690.8601455     74862771.     9.4273883     0.0008426     -0.0023749     2.7373358    -60.0000000  CY
0.0000944  6977.7262799     73936173.     9.4105973     0.0008881     -0.0025094     2.8414948    -60.0000000  CY
0.0000994  7190.6621680     72358865.     9.3647469     0.0009306     -0.0026469     2.9344925    -60.0000000  CY
0.0001044  7384.2590722     70747392.     9.3167554     0.0009724     -0.0027851     3.0221703    -60.0000000  CY
0.0001094  7534.2984354     68885014.     9.2547731     0.0010122     -0.0029253     3.1020493    -60.0000000  CY
0.0001144  7666.4108298     67028729.     9.1916678     0.0010513     -0.0030662     3.1770864    -60.0000000  CY
0.0001194  7797.4728941     65319145.     9.1325684     0.0010902     -0.0032073     3.2485690    -60.0000000  CY
0.0001244  7916.4440151     63649801.     9.0730370     0.0011285     -0.0033490     3.3156739    -60.0000000  CY
0.0001294  8002.5858493     61855736.     9.0029369     0.0011648     -0.0034927     3.3763582    -60.0000000  CY
0.0001344  8083.2450884     60154382.     8.9365021     0.0012008     -0.0036367     3.4338929    -60.0000000  CY
0.0001394  8163.4216992     58571636.     8.8757364     0.0012371     -0.0037804     3.4888344    -60.0000000  CY
0.0001444  8243.1078008     57095119.     8.8200645     0.0012734     -0.0039241     3.5411556    -60.0000000  CY
0.0001494  8321.7145145     55710223.     8.7658054     0.0013094     -0.0040681     3.5901834    -60.0000000  CY
0.0001544  8393.2468768     54369211.     8.7121995     0.0013449     -0.0042126     3.6358768    -60.0000000  CY
0.0001594  8446.7448746     52999184.     8.6528756     0.0013791     -0.0043584     3.6771285    -60.0000000  CY
0.0001644  8491.5566804     51659660.     8.5932027     0.0014125     -0.0045050     3.7151651    -60.0000000  CY
0.0001694  8535.4209478     50393629.     8.5373774     0.0014460     -0.0046515     3.7508767    -60.0000000  CY
0.0001744  8578.9410474     49198228.     8.4854055     0.0014796     -0.0047979     3.7843093    -60.0000000  CY
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0.0001794  8621.7603410     48065563.     8.4353517     0.0015131    -0.0049444     3.8151739   -60.0000000  CY
0.0001844  8663.8696026     46990479.     8.3869624     0.0015463    -0.0050912     3.8434941   -60.0000000  CY
0.0001894  8705.6432006     45970393.     8.3417509     0.0015797    -0.0052378     3.8695508   -60.0000000  CY
0.0001944  8747.0757230     45001033.     8.2994818     0.0016132    -0.0053843     3.8933196   -60.0000000  CY
0.0001994  8788.1614476     44078553.     8.2599436     0.0016468    -0.0055307     3.9147753   -60.0000000  CY
0.0002044  8827.2151106     43191267.     8.2218639     0.0016803    -0.0056772     3.9337715   -60.0000000  CY
0.0002094  8862.0960192     42326429.     8.1837114     0.0017135    -0.0058240     3.9501884   -60.0000000  CY
0.0002144  8891.7260894     41477439.     8.1447277     0.0017460    -0.0059715     3.9640462   -60.0000000  CY
0.0002194  8914.6381409     40636527.     8.1038703     0.0017778    -0.0061197     3.9753844   -60.0000000  CY
0.0002244  8935.0185551     39821810.     8.0613589     0.0018088    -0.0062687     3.9843752   -60.0000000  CY
0.0002294  8954.4227112     39038355.     8.0204151     0.0018397    -0.0064178     3.9913186   -60.0000000  CY
0.0002344  8973.5850811     38287296.     7.9816900     0.0018707    -0.0065668     3.9962507   -60.0000000  CY
0.0002394  8992.5024154     37566590.     7.9450516     0.0019018    -0.0067157     3.9991491   -60.0000000  CY
0.0002444  9011.1612396     36874317.     7.9103905     0.0019331    -0.0068644     3.9991086   -60.0000000  CY
0.0002494  9029.4881516     36208474.     7.8776786     0.0019645    -0.0070130     3.9964192   -60.0000000  CY
0.0002544  9047.5781949     35567875.     7.8466906     0.0019960    -0.0071615     3.9991417   -60.0000000  CY
0.0002594  9065.4199571     34951017.     7.8173428     0.0020276    -0.0073099     3.9995956   -60.0000000  CY
0.0002644  9082.8763801     34356034.     7.7897110     0.0020594    -0.0074581     3.9952788   -60.0000000  CY
0.0002694  9100.1165843     33782335.     7.7634998     0.0020913    -0.0076062     3.9984262   -60.0000000  CY
0.0002744  9117.1124390     33228656.     7.7385110     0.0021233    -0.0077542     3.9998886    60.0000000  CY
0.0003044  9210.8317861     30261460.     7.6026723     0.0023141    -0.0086434     3.9952069    60.0000000  CY
0.0003344  9276.4419328     27742630.     7.4851178     0.0025028    -0.0095347     3.9976729    60.0000000  CY
0.0003644  9310.7636545     25552696.     7.3726918     0.0026864    -0.0104311     3.9969033    60.0000000  CY
0.0003944  9337.2509089     23676072.     7.2714768     0.0028677    -0.0113298     3.9921814    60.0000000  CY
0.0004244  9361.5339473     22059579.     7.1899404     0.0030512    -0.0122263     3.9939968    60.0000000  CYT
0.0004544  9383.8234286     20652156.     7.1239499     0.0032369    -0.0131206     3.9982269    60.0000000  CYT
0.0004844  9404.5033819     19415749.     7.0700898     0.0034246    -0.0140129     3.9842776    60.0000000  CYT
0.0005144  9423.9454477     18321158.     7.0256118     0.0036138    -0.0149037     3.9988750    60.0000000  CYT
0.0005444  9441.3502558     17343468.     6.9849145     0.0038024    -0.0157951     3.9829507    60.0000000  CYT


--------------------------------------------------------------------------------
   Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1
--------------------------------------------------------------------------------

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

 Load          Axial Thrust        Nominal Mom. Cap.      Max. Comp.
  No.              kips                 in-kip              Strain
 ----         ----------------     ------------------     ------------
   1               22.800               9354.756          0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
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bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

 Axial     Resistance           Nominal            Ultimate (Factored)     Ultimate (Factored)     Bending Stiffness
 Load        Factor         Moment Capacity           Axial Thrust           Moment Capacity       at Ult. Mom. Cap.
  No.      for Moment            in-kip                   kips                    in-kip                kip-in^2
 -----     ----------     -------------------     -------------------     -------------------     -------------------
   1          0.65              9354.756                 14.820                6080.591             75389081.367

   1          0.70              9354.756                 15.960                6548.329             74985258.862

   1          0.75              9354.756                 17.100                7016.067             73652166.347



--------------------------------------------------------------------------------
                 Computed Values of Pile Loading and Deflection
                   for Lateral Loading for Load Case Number 1
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Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head                               =       8500.0 lbs
Applied moment at pile head                            =    2364000.0 in-lbs
Axial thrust load on pile head                         =      22800.0 lbs

   Depth     Deflect.    Bending    Shear       Slope       Total    Bending   Soil Res.  Soil Spr.   Distrib.
     X          y        Moment     Force         S        Stress   Stiffness      p         Es*h     Lat. Load
   feet      inches      in-lbs      lbs       radians      psi*     lb-in^2     lb/in     lb/inch     lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
      0.00     0.1418   2364000.  8500.0000  -0.002898      0.000  1.828E+11      0.000      0.000      0.000
   0.10000     0.1384   2374279.  8490.9154  -0.002883      0.000  1.828E+11   -15.1410   131.3226      0.000
     0.200     0.1349   2384536.  8463.5142  -0.002864      0.000  1.316E+11   -30.5276   271.5468      0.000
     0.300     0.1315   2394748.  8417.5285  -0.002841      0.000  1.119E+11   -46.1151   420.8813      0.000
     0.400     0.1281   2404893.  8352.7438  -0.002813      0.000  9.532E+10   -61.8595   579.5323      0.000
     0.500     0.1247   2414949.  8268.9974  -0.002780      0.000  8.210E+10   -77.7178   747.6968      0.000
     0.600     0.1214   2424891.  8166.1777  -0.002744      0.000  8.119E+10   -93.6484   925.5544      0.000
     0.700     0.1181   2434698.  8044.2235  -0.002708      0.000  8.115E+10  -109.6086  1113.2902      0.000
     0.800     0.1149   2444345.  7903.1245  -0.002672      0.000  8.112E+10  -125.5565  1311.0980      0.000
     0.900     0.1117   2453811.  7742.9202  -0.002636      0.000  8.109E+10  -141.4507  1519.1740      0.000
     1.000     0.1086   2463073.  7563.6996  -0.002600      0.000  8.106E+10  -157.2503  1737.7163      0.000
     1.100     0.1055   2472107.  7365.6006  -0.002563      0.000  8.103E+10  -172.9147  1966.9251      0.000
     1.200     0.1024   2480890.  7148.8093  -0.002526      0.000  8.100E+10  -188.4040  2207.0020      0.000
     1.300     0.0994   2489402.  6913.5597  -0.002489      0.000  8.097E+10  -203.6787  2458.1497      0.000
     1.400     0.0965   2497619.  6660.1325  -0.002453      0.000  8.094E+10  -218.6999  2720.5712      0.000
     1.500     0.0935   2505520.  6392.5251  -0.002415      0.000  8.091E+10  -227.3123  2916.0000      0.000
     1.600     0.0907   2513093.  6115.1310  -0.002378      0.000  8.089E+10  -235.0113  3110.4000      0.000
     1.700     0.0878   2520327.  5828.9832  -0.002341      0.000  8.086E+10  -241.9016  3304.8000      0.000
     1.800     0.0850   2527211.  5535.0391  -0.002303      0.000  8.084E+10  -248.0053  3499.2000      0.000
     1.900     0.0823   2533737.  5234.2291  -0.002266      0.000  8.082E+10  -253.3447  3693.6000      0.000
     2.000     0.0796   2539897.  4927.4570  -0.002228      0.000  8.080E+10  -257.9422  3888.0000      0.000
     2.100     0.0770   2545685.  4615.5997  -0.002190      0.000  8.078E+10  -261.8199  4082.4000      0.000
     2.200     0.0744   2551095.  4299.5075  -0.002153      0.000  8.077E+10  -265.0004  4276.8000      0.000
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   2.300     0.0718   2556121.  3980.0036  -0.002115      0.000  8.075E+10  -267.5061  4471.2000      0.000
   2.400     0.0693   2560762.  3657.8842  -0.002077      0.000  8.073E+10  -269.3595  4665.6000      0.000
   2.500     0.0668   2565014.  3333.9187  -0.002038      0.000  8.072E+10  -270.5831  4860.0000      0.000
   2.600     0.0644   2568875.  3008.8492  -0.002000      0.000  8.071E+10  -271.1994  5054.4000      0.000
   2.700     0.0620   2572345.  2683.3910  -0.001962      0.000  8.070E+10  -271.2310  5248.8000      0.000
   2.800     0.0597   2575423.  2358.2320  -0.001924      0.000  8.069E+10  -270.7006  5443.2000      0.000
   2.900     0.0574   2578110.  2034.0332  -0.001886      0.000  8.068E+10  -269.6307  5637.6000      0.000
   3.000     0.0552   2580408.  1711.4286  -0.001847      0.000  8.067E+10  -268.0438  5832.0000      0.000
   3.100     0.0530   2582318.  1391.0247  -0.001809      0.000  8.067E+10  -265.9626  6026.4000      0.000
   3.200     0.0508   2583845.  1073.4013  -0.001770      0.000  8.066E+10  -263.4097  6220.8000      0.000
   3.300     0.0487   2584991.   759.1108  -0.001732      0.000  8.066E+10  -260.4077  6415.2000      0.000
   3.400     0.0467   2585762.   448.6789  -0.001693      0.000  8.066E+10  -256.9789  6609.6000      0.000
   3.500     0.0446   2586161.   142.6038  -0.001655      0.000  8.065E+10  -253.1461  6804.0000      0.000
   3.600     0.0427   2586194.  -158.6428  -0.001616      0.000  8.065E+10  -248.9316  6998.4000      0.000
   3.700     0.0408   2585869.  -454.6166  -0.001578      0.000  8.066E+10  -244.3580  7192.8000      0.000
   3.800     0.0389   2585190.  -744.8999  -0.001540      0.000  8.066E+10  -239.4475  7387.2000      0.000
   3.900     0.0371   2584165. -1029.1020  -0.001501      0.000  8.066E+10  -234.2227  7581.6000      0.000
   4.000     0.0353   2582802. -1250.9244  -0.001463      0.000  8.067E+10  -135.4813  4606.3678      0.000
   4.100     0.0336   2581243. -1411.4457  -0.001424      0.000  8.067E+10  -132.0543  4721.5678      0.000
   4.200     0.0319   2579492. -1567.7667  -0.001386      0.000  8.068E+10  -128.4806  4836.7678      0.000
   4.300     0.0302   2577556. -1719.7188  -0.001347      0.000  8.068E+10  -124.7731  4951.9678      0.000
   4.400     0.0286   2575439. -1867.1497  -0.001309      0.000  8.069E+10  -120.9450  5067.1678      0.000
   4.500     0.0271   2573146. -2009.9222  -0.001271      0.000  8.070E+10  -117.0093  5182.3678      0.000
   4.600     0.0256   2570685. -2147.9153  -0.001233      0.000  8.070E+10  -112.9791  5297.5678      0.000
   4.700     0.0241   2568059. -2281.0232  -0.001194      0.000  8.071E+10  -108.8675  5412.7678      0.000
   4.800     0.0227   2565275. -2409.1561  -0.001156      0.000  8.072E+10  -104.6873  5527.9678      0.000
   4.900     0.0214   2562340. -2532.2394  -0.001118      0.000  8.073E+10  -100.4515  5643.1678      0.000
   5.000     0.0200   2559259. -2650.2140  -0.001080      0.000  8.074E+10   -96.1730  5758.3678      0.000
   5.100     0.0188   2556039. -2763.0367  -0.001042      0.000  8.075E+10   -91.8647  5873.5678      0.000
   5.200     0.0175   2552685. -2870.6792  -0.001004      0.000  8.076E+10   -87.5394  5988.7678      0.000
   5.300     0.0164   2549204. -2973.1288  -0.000966      0.000  8.077E+10   -83.2099  6103.9678      0.000
   5.400     0.0152   2545602. -3070.3881  -0.000928      0.000  8.078E+10   -78.8890  6219.1678      0.000
   5.500     0.0141   2541886. -3162.4751  -0.000891      0.000  8.080E+10   -74.5893  6334.3678      0.000
   5.600     0.0131   2538061. -3249.4229  -0.000853      0.000  8.081E+10   -70.3236  6449.5678      0.000
   5.700     0.0121   2534134. -3331.2797  -0.000815      0.000  8.082E+10   -66.1045  6564.7678      0.000
   5.800     0.0111   2530111. -3408.1092  -0.000778      0.000  8.083E+10   -61.9445  6679.9678      0.000
   5.900     0.0102   2525997. -3479.9897  -0.000740      0.000  8.085E+10   -57.8563  6795.1678      0.000
   6.000   0.009352   2521799. -3547.0149  -0.000703      0.000  8.086E+10   -53.8524  6910.3678      0.000
   6.100   0.008531   2517523. -3609.2934  -0.000665      0.000  8.087E+10   -49.9451  7025.5678      0.000
   6.200   0.007755   2513173. -3666.9488  -0.000628      0.000  8.089E+10   -46.1471  7140.7678      0.000
   6.300   0.007024   2508756. -3720.1194  -0.000591      0.000  8.090E+10   -42.4706  7255.9678      0.000
   6.400   0.006337   2504277. -3768.9585  -0.000554      0.000  8.092E+10   -38.9280  7371.1678      0.000
   6.500   0.005695   2499741. -3813.6343  -0.000516      0.000  8.093E+10   -35.5316  7486.3678      0.000
   6.600   0.005098   2495153. -3854.3295  -0.000479      0.000  8.095E+10   -32.2937  7601.5678      0.000
   6.700   0.004545   2490517. -3891.2416  -0.000442      0.000  8.096E+10   -29.2266  7716.7678      0.000
   6.800   0.004036   2485838. -3924.5830  -0.000406      0.000  8.098E+10   -26.3423  7831.9678      0.000
   6.900   0.003572   2481120. -3954.5802  -0.000369      0.000  8.100E+10   -23.6531  7947.1678      0.000
   7.000   0.003151   2476367.    -11531.  -0.000332      0.000  8.101E+10    -12604.   4800000.      0.000
   7.100   0.002775   2453463.    -25753.  -0.000296      0.000  8.109E+10    -11099.   4800000.      0.000
   7.200   0.002442   2414576.    -38273.  -0.000260      0.000  8.123E+10 -9767.1874   4800000.      0.000
   7.300   0.002152   2361623.    -49297.  -0.000224      0.000  8.176E+10 -8606.9391   4800000.      0.000
   7.400   0.001903   2296275.    -59029.  -0.000201      0.000  2.189E+11 -7613.0586   4800000.      0.000
   7.500   0.001670   2219963.    -67605.  -0.000191      0.000  3.714E+11 -6679.6083   4800000.      0.000
   7.600   0.001445   2134033.    -75081.  -0.000184      0.000  3.717E+11 -5780.5886   4800000.      0.000
```

```
     7.700   0.001229   2039779.    -81498.  -0.000177      0.000  3.719E+11 -4914.6429   4800000.      0.000
     7.800   0.001020   1938448.    -86895.  -0.000171      0.000  3.722E+11 -4080.2863   4800000.      0.000
     7.900   0.000819   1831240.    -91309.  -0.000165      0.000  3.726E+11 -3275.9250   4800000.      0.000
     8.000   0.000625   1719316.    -94774.  -0.000159      0.000  3.729E+11 -2499.8750   4800000.      0.000
     8.100   0.000438   1603791.    -97324.  -0.000154      0.000  3.733E+11 -1750.3826   4800000.      0.000
     8.200   0.000256   1485745.    -98990.  -0.000149      0.000  3.736E+11 -1025.6395   4800000.      0.000
     8.300  8.095E-05   1366223.    -99800.  -0.000144      0.000  3.740E+11  -323.8033   4800000.      0.000
     8.400 -8.925E-05   1246234.    -99780.  -0.000140      0.000  3.743E+11   356.9894   4800000.      0.000
     8.500  -0.000255   1126759.    -98954.  -0.000136      0.000  3.747E+11  1018.6044   4800000.      0.000
     8.600  -0.000416   1008751.    -97346.  -0.000133      0.000  3.750E+11  1662.8968   4800000.      0.000
     8.700  -0.000573    893137.    -94973.  -0.000130      0.000  3.753E+11  2291.6947   4800000.      0.000
     8.800  -0.000727    780823.    -91854.  -0.000127      0.000  3.756E+11  2906.7865   4800000.      0.000
     8.900  -0.000877    672695.    -88004.  -0.000125      0.000  3.760E+11  3509.9055   4800000.      0.000
     9.000  -0.001026    569621.    -83436.  -0.000123      0.000  3.762E+11  4102.7186   4800000.      0.000
     9.100  -0.001172    472455.    -78162.  -0.000121      0.000  3.765E+11  4686.8106   4800000.      0.000
     9.200  -0.001316    382038.    -72192.  -0.000120      0.000  3.767E+11  5263.6754   4800000.      0.000
     9.300  -0.001459    299201.    -65533.  -0.000118      0.000  3.769E+11  5834.6983   4800000.      0.000
     9.400  -0.001600    224765.    -58192.  -0.000118      0.000  3.771E+11  6401.1482   4800000.      0.000
     9.500  -0.001741    159547.    -50172.  -0.000117      0.000  3.771E+11  6964.1648   4800000.      0.000
     9.600  -0.001881    104358.    -41479.  -0.000117      0.000  3.771E+11  7524.7444   4800000.      0.000
     9.700  -0.002021     60004.    -32114.  -0.000116      0.000  3.771E+11  8083.7300   4800000.      0.000
     9.800  -0.002160     27291.    -22079.  -0.000116      0.000  3.771E+11  8641.7990   4800000.      0.000
     9.900  -0.002300  7021.8592    -11374.  -0.000116      0.000  3.771E+11  9199.4512   4800000.      0.000
    10.000  -0.002439      0.000      0.000  -0.000116      0.000  3.771E+11  9756.9961   2400000.      0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.


Output Summary for Load Case No. 1:

Pile-head deflection             =      0.1418245 inches
Computed slope at pile head      =     -0.0028984 radians
Maximum bending moment           =       2586194. inch-lbs
Maximum shear force              =        -99800. lbs
Depth of maximum bending moment  =      3.6000000 feet below pile head
Depth of maximum shear force     =      8.3000000 feet below pile head
Number of iterations             =             39
Number of zero deflection points =              1



--------------------------------------------------------------------------------
            Pile-head Deflection vs. Pile Length for Load Case 1
--------------------------------------------------------------------------------

Boundary Condition Type 1, Shear and Moment

Shear      =           8500.  lb
Moment     =        2364000. in- lb
Axial Load =          22800.  lb
```

```
    Pile       Pile Head       Maximum       Maximum
   Length      Deflection      Moment         Shear
    feet         inches        ln-lbs          lbs
------------  ------------  ------------  ------------
    10.0000     0.1418245      2586194.       -99800.
     9.5000     0.1481464      2580696.      -119082.
     9.0000     0.1613611      2572312.      -143582.
     8.5000     0.1919757      2562089.      -181424.
     8.0000     0.3404894      2546278.      -221391.
     7.5000     1.5848167      2515354.      -177721.


--------------------------------------------------------------------------------
                           Summary of Pile Response(s)
--------------------------------------------------------------------------------


Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

               Pile-head      Pile-head                                      Maximum        Maximum
Load  Load    Condition 1    Condition 2        Axial        Pile-head       Moment          Shear        Pile-head
Case  Type    V(lbs) or     in-lb, rad.,       Loading      Deflection       in Pile        in Pile       Rotation
 No.   No.    y(inches)     or in-lb/rad.        lbs          inches         in-lbs           lbs          radians
----  ----  --------------  --------------  -------------  -------------  -------------  -------------  -------------
  1     1   V =  8500.0000  M =   2364000.         22800.     0.14182449       2586194.        -99800.    -0.00289843

The analysis ended normally.
```

```
===============================================================================
                 LPile Plus for Windows, Version 2013-07.004

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

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===============================================================================

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-------------------------------------------------------------------------------
                           Files Used for Analysis
-------------------------------------------------------------------------------

Path to file locations:        \\BOSFIL10\Group\INFRASTRUCTURE\GEOTECHNICAL\Maine Turnpike Authority - York
Plaza\Geotechnical\New Toll Location\Analysis\Gantry LPILE\
Name of input data file:       Deep Rock Profile.lp7d
Name of output report file:    Deep Rock Profile.lp7o
Name of plot output file:      Deep Rock Profile.lp7p
Name of runtime messeage file: Deep Rock Profile.lp7r


-------------------------------------------------------------------------------
                          Date and Time of Analysis
-------------------------------------------------------------------------------

              Date:  July 21, 2016     Time:   8:25:48


-------------------------------------------------------------------------------
                              Problem Title
-------------------------------------------------------------------------------

Project Name: York Toll Plaza


Job Number: E2X71602


Client: Maine Turnpike
```

```
Engineer: Jacobs Engineering


Description: Gantry Foundation - Soil Profile




--------------------------------------------------------------------------------
                           Program Options and Settings
--------------------------------------------------------------------------------

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed                =          500
- Deflection tolerance for convergence                =   1.0000E-05 in
- Maximum allowable deflection                        =     100.0000 in
- Number of pile increments                           =          100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of pile
   (only if nonlinear pile properties are input)
 - Use of p-y modification factors for p-y curves not selected
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------

Total number of pile sections                         =          1

Total length of pile                                  =      20.00 ft

Depth of ground surface below top of pile             =       0.00 ft
```

```
Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point         Depth              Pile
                X              Diameter
                ft                in
-----       ---------        -----------
  1           0.00000         36.0000000
  2         20.000000         36.0000000


Input Structural Properties:
----------------------------

Pile Section No. 1:

   Section Type                                        = Drilled Shaft (Bored Pile)
   Section Length                                      =     20.00000 ft
   Section Diameter                                    =     36.00000 in


--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
--------------------------------------------------------------------------------

Ground Slope Angle                                     =        0.000 degrees
                                                       =        0.000 radians

Pile Batter Angle                                      =        0.000 degrees
                                                       =        0.000 radians


--------------------------------------------------------------------------------
                       Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer           =       0.0000 ft
   Distance from top of pile to bottom of layer        =      4.00000 ft
   Effective unit weight at top of layer               =    125.00000 pcf
   Effective unit weight at bottom of layer            =    125.00000 pcf
   Friction angle at top of layer                      =     34.00000 deg.
   Friction angle at bottom of layer                   =     34.00000 deg.
   Subgrade k at top of layer                          =    135.00000 pci
   Subgrade k at bottom of layer                       =    135.00000 pci


Layer 2 is sand, p-y criteria by Reese et al., 1974
```

```
   Distance from top of pile to top of layer          =      4.00000 ft
   Distance from top of pile to bottom of layer       =     21.00000 ft
   Effective unit weight at top of layer              =     63.00000 pcf
   Effective unit weight at bottom of layer           =     63.00000 pcf
   Friction angle at top of layer                     =     34.00000 deg.
   Friction angle at bottom of layer                  =     34.00000 deg.
   Subgrade k at top of layer                         =     80.00000 pci
   Subgrade k at bottom of layer                      =     80.00000 pci


Layer 3 is strong rock (vuggy limestone)

   Distance from top of pile to top of layer          =     21.00000 ft
   Distance from top of pile to bottom of layer       =     50.00000 ft
   Effective unit weight at top of layer              =    103.00000 pcf
   Effective unit weight at bottom of layer           =    103.00000 pcf
   Uniaxial compressive strength at top of layer      =   4000.00000 psi
   Uniaxial compressive strength at bottom of layer   =   4000.00000 psi


   (Depth of lowest soil layer extends   30.00 ft below pile tip)


--------------------------------------------------------------------------------
                           Summary of Soil Properties
--------------------------------------------------------------------------------

                      Layer                     Layer      Effective    Angle of      Uniaxial
Layer               Soil Type                   Depth       Unit Wt.    Friction        qu          kpy
 Num.         (p-y Curve Criteria)               ft           pcf          deg.         psi         pci
-----   ----------------------------------   ----------   ----------   ----------   ----------   ----------
  1     Sand (Reese, et al.)                       0.00      125.000       34.000       --         135.000
                                                  4.000      125.000       34.000       --         135.000
  2     Sand (Reese, et al.)                      4.000       63.000       34.000       --          80.000
                                                 21.000       63.000       34.000       --          80.000
  3     Vuggy Limestone                          21.000      103.000       --         4000.000       --
                                                 50.000      103.000       --         4000.000       --


--------------------------------------------------------------------------------
                                 Loading Type
--------------------------------------------------------------------------------

Static loading criteria were used when computing p-y curves for all analyses.



--------------------------------------------------------------------------------
               Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified = 1
```

```
Load    Load         Condition               Condition            Axial Thrust            Compute
 No.    Type            1                       2                Force, lbs      Top y vs. Pile Length
-----   ----   --------------------   -----------------------   ----------------   ---------------------
   1     1     V =   8500.00000 lbs   M =     2364000. in-lbs            22800.            Yes

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.


--------------------------------------------------------------------------------
    Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile):
--------------------------------------------------------

Length of Section                                      =     20.00000 ft
Shaft Diameter                                         =     36.00000 in
Concrete Cover Thickness                               =      3.00000 in
Number of Reinforcing Bars                             =           11 bars
Yield Stress of Reinforcing Bars                       =       60000. psi
Modulus of Elasticity of Reinforcing Bars              =    29000000. psi
Gross Area of Shaft                                    =   1017.87602 sq. in.
Total Area of Reinforcing Steel                        =     11.00000 sq. in.
Area Ratio of Steel Reinforcement                      =         1.08 percent
Edge-to-Edge Bar Spacing                               =      7.00618 in
Maximum Concrete Aggregate Size                        =      0.75000 in
Ratio of Bar Spacing to Aggregate Size                 =         9.34
Offset of Center of Rebar Cage from Center of Pile     =       0.0000 in

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     4083.379 kips
Tensile Load for Cracking of Concrete                  =     -455.573 kips
Nominal Axial Tensile Capacity                         =     -660.000 kips


Reinforcing Bar Dimensions and Positions Used in Computations:

     Bar          Bar Diam.      Bar Area          X              Y
    Number         inches         sq. in.        inches         inches
```

```
  ----------     ----------     ----------     ----------     ----------
      1             1.12800        1.00000       14.43600        0.00000
      2             1.12800        1.00000       12.14434        7.80469
      3             1.12800        1.00000        5.99693       13.13145
      4             1.12800        1.00000       -2.05446       14.28906
      5             1.12800        1.00000       -9.45357       10.91000
      6             1.12800        1.00000      -13.85124        4.06709
      7             1.12800        1.00000      -13.85124       -4.06709
      8             1.12800        1.00000       -9.45357      -10.91000
      9             1.12800        1.00000       -2.05446      -14.28906
     10             1.12800        1.00000        5.99693      -13.13145
     11             1.12800        1.00000       12.14434       -7.80469


NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero =      7.00618 inches between Bars 8 and 9

Spacing to aggregate size ratio =      9.34158


Concrete Properties:
--------------------

Compressive Strength of Concrete                      =   4000.00000 psi
Modulus of Elasticity of Concrete                     =     3604997. psi
Modulus of Rupture of Concrete                        =   -474.34164 psi
Compression Strain at Peak Stress                     =      0.00189
Tensile Strain at Fracture of Concrete                =   -0.0001154
Maximum Coarse Aggregate Size                         =      0.75000 in


Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

   Number     Axial Thrust Force
                    kips
   ------     ------------------
      1              22.800


Definitions of Run Messages and Notes:
--------------------------------------

   C = concrete in section has cracked in tension.
   Y = stress in reinforcing steel has reached yield stress.
   T = ACI 318-08 criteria for tension-controlled section met, tensile strain in
       reinforcement exceeds 0.005 while simultaneously compressive strain in
       concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
   Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.
```

```
Axial Thrust Force =     22.800 kips

    Bending       Bending       Bending       Depth to      Max Comp      Max Tens    Max Concrete   Max Steel     Run
   Curvature      Moment       Stiffness       N Axis        Strain        Strain        Stress        Stress      Msg
    rad/in.       in-kip        kip-in2          in          in/in         in/in          ksi           ksi
 ------------- ------------- ------------- ------------- ------------- ------------- ------------- -------------  ---

   0.000000625   235.6838122    377094099.    25.9694342     0.0000162  -0.000006269     0.0680688     0.4674335
   0.000001250   470.6899938    376551995.    21.9936791     0.0000275    -0.0000175     0.1148086     0.7907459
   0.000001875   704.8294056    375909016.    20.6686561     0.0000388    -0.0000287     0.1612707     1.1140707
   0.000002500   938.0967930    375238717.    20.0062051     0.0000500    -0.0000400     0.2074540     1.4373999
   0.000003125  1170.4914908    374557277.    19.6087649     0.0000613    -0.0000512     0.2533581     1.7607318
   0.000003750  1402.0133299    373870221.    19.3438249     0.0000725    -0.0000625     0.2989830     2.0840660
   0.000004375  1632.6622588    373179945.    19.1545979     0.0000838    -0.0000737     0.3443288     2.4074021
   0.000005000  1862.4382453    372487649.    19.0126903     0.0000951    -0.0000849     0.3893952     2.7307401
   0.000005625  2091.3412857    371794006.    18.9023291     0.0001063    -0.0000962     0.4341824     3.0540799
   0.000006250  2319.3713730    371099420.    18.8140500     0.0001176    -0.0001074     0.4786904     3.3774215
   0.000006875  2319.3713730    337363109.    11.4269519     0.0000786    -0.0001689     0.3212178    -4.8633639  C
   0.000007500  2319.3713730    309249516.    11.2397800     0.0000843    -0.0001857     0.3440631    -5.3461978  C
   0.000008125  2319.3713730    285461092.    11.0790729     0.0000900    -0.0002025     0.3667608    -5.8295809  C
   0.000008750  2319.3713730    265071014.    10.9401933     0.0000957    -0.0002193     0.3893478    -6.3132509  C
   0.000009375  2319.3713730    247399613.    10.8169295     0.0001014    -0.0002361     0.4117552    -6.7977098  C
     0.0000100  2319.3713730    231937137.    10.7093287     0.0001071    -0.0002529     0.4341031    -7.2820946  C
     0.0000106  2319.3713730    218293776.    10.6144266     0.0001128    -0.0002697     0.4563828    -7.7664673  C
     0.0000113  2319.3713730    206166344.    10.5273375     0.0001184    -0.0002866     0.4784705    -8.2517311  C
     0.0000119  2319.3713730    195315484.    10.4496337     0.0001241    -0.0003034     0.5004993    -8.7369199  C
     0.0000125  2319.3713730    185549710.    10.3799080     0.0001297    -0.0003203     0.5224693    -9.2220333  C
     0.0000131  2319.3713730    176714009.    10.3170211     0.0001354    -0.0003371     0.5443804    -9.7070713  C
     0.0000138  2319.3713730    168681554.    10.2600408     0.0001411    -0.0003539     0.5662324   -10.1920337  C
     0.0000144  2319.3713730    161347574.    10.2062295     0.0001467    -0.0003708     0.5879146   -10.6777405  C
     0.0000150  2319.3713730    154624758.    10.1570787     0.0001524    -0.0003876     0.6095385   -11.1633707  C
     0.0000156  2319.3713730    148439768.    10.1120307     0.0001580    -0.0004045     0.6311040   -11.6489236  C
     0.0000163  2319.3713730    142730546.    10.0706126     0.0001636    -0.0004214     0.6526111   -12.1343988  C
     0.0000169  2319.3713730    137444230.    10.0324215     0.0001693    -0.0004382     0.6740596   -12.6197962  C
     0.0000175  2319.3713730    132535507.     9.9971119     0.0001749    -0.0004551     0.6954496   -13.1051157  C
     0.0000181  2319.3713730    127965317.     9.9643861     0.0001806    -0.0004719     0.7167810   -13.5903570  C
     0.0000188  2319.3713730    123699807.     9.9339862     0.0001863    -0.0004887     0.7380536   -14.0755199  C
     0.0000194  2319.3713730    119709490.     9.9056873     0.0001919    -0.0005056     0.7592675   -14.5606044  C
     0.0000200  2319.3713730    115968569.     9.8784741     0.0001976    -0.0005224     0.7803601   -15.0460850  C
     0.0000206  2319.3713730    112454370.     9.8528343     0.0002032    -0.0005393     0.8013780   -15.5316109  C
     0.0000213  2319.3713730    109146888.     9.8288342     0.0002089    -0.0005561     0.8223375   -16.0170558  C
     0.0000219  2319.3713730    106028406.     9.8063337     0.0002145    -0.0005730     0.8432388   -16.5024195  C
     0.0000225  2319.3713730    103083172.     9.7852081     0.0002202    -0.0005898     0.8640816   -16.9877017  C
     0.0000231  2319.3713730    100297140.     9.7653462     0.0002258    -0.0006067     0.8848659   -17.4729022  C
     0.0000238  2319.3713730     97657742.     9.7466485     0.0002315    -0.0006235     0.9055917   -17.9580208  C
     0.0000244  2319.3713730     95153697.     9.7290258     0.0002371    -0.0006404     0.9262588   -18.4430573  C
     0.0000256  2319.3713730     90512054.     9.6966919     0.0002485    -0.0006740     0.9674167   -19.4128833  C
     0.0000269  2319.3713730     86302191.     9.6677904     0.0002598    -0.0007077     1.0083391   -20.3823783  C
     0.0000281  2319.3713730     82466538.     9.6418657     0.0002712    -0.0007413     1.0490253   -21.3515407  C
     0.0000294  2388.7526621     81319240.     9.6185399     0.0002825    -0.0007750     1.0894746   -22.3203688  C
     0.0000306  2480.5518296     80997611.     9.5974966     0.0002939    -0.0008086     1.1296864   -23.2888608  C
     0.0000319  2572.2660045     80698541.     9.5784693     0.0003053    -0.0008422     1.1696601   -24.2570149  C
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0.0000331  2663.8947982      80419466.      9.5612315     0.0003167    -0.0008758      1.2093949    -25.2248294  C
0.0000344  2755.4378184      80158191.      9.5455900     0.0003281    -0.0009094      1.2488903    -26.1923024  C
0.0000356  2846.8885536      79912661.      9.5310098     0.0003395    -0.0009430      1.2880996    -27.1598129  C
0.0000369  2938.2495131      79681343.      9.5175300     0.0003510    -0.0009765      1.3270419    -28.1272038  C
0.0000381  3029.5241958      79462930.      9.5052592     0.0003624    -0.0010101      1.3657452    -29.0942352  C
0.0000394  3120.7121839      79256182.      9.4940840     0.0003738    -0.0010437      1.4042088    -30.0609052  C
0.0000406  3211.8127031      79060005.      9.4839050     0.0003853    -0.0010772      1.4424319    -31.0272128  C
0.0000419  3302.8260735      78873458.      9.4746347     0.0003968    -0.0011107      1.4804141    -31.9931537  C
0.0000431  3393.7514663      78695686.      9.4661958     0.0004082    -0.0011443      1.5181544    -32.9587271  C
0.0000444  3484.5884475      78525937.      9.4585196     0.0004197    -0.0011778      1.5556523    -33.9239307  C
0.0000456  3575.3365791      78363541.      9.4515450     0.0004312    -0.0012113      1.5929069    -34.8887625  C
0.0000469  3665.9954187      78207902.      9.4452175     0.0004427    -0.0012448      1.6299175    -35.8532203  C
0.0000481  3756.5645195      78058484.      9.4394883     0.0004543    -0.0012782      1.6666834    -36.8173020  C
0.0000494  3847.0434304      77914804.      9.4343134     0.0004658    -0.0013117      1.7032038    -37.7810053  C
0.0000506  3937.4316957      77776429.      9.4296533     0.0004774    -0.0013451      1.7394780    -38.7443280  C
0.0000519  4027.7288555      77642966.      9.4254722     0.0004889    -0.0013786      1.7755052    -39.7072679  C
0.0000531  4117.9344450      77514060.      9.4217379     0.0005005    -0.0014120      1.8112847    -40.6698226  C
0.0000544  4208.0479949      77389388.      9.4184209     0.0005121    -0.0014454      1.8468156    -41.6319900  C
0.0000556  4298.0690314      77268657.      9.4154946     0.0005237    -0.0014788      1.8820973    -42.5937677  C
0.0000569  4387.9970754      77151597.      9.4129347     0.0005354    -0.0015121      1.9171289    -43.5551533  C
0.0000581  4477.8316436      77037964.      9.4107188     0.0005470    -0.0015455      1.9519096    -44.5161445  C
0.0000594  4567.5722474      76927533.      9.4088267     0.0005586    -0.0015789      1.9864386    -45.4767389  C
0.0000606  4657.2183933      76820097.      9.4072397     0.0005703    -0.0016122      2.0207152    -46.4369340  C
0.0000619  4746.7695828      76715468.      9.4059407     0.0005820    -0.0016455      2.0547385    -47.3967275  C
0.0000631  4836.2253121      76613470.      9.4049140     0.0005937    -0.0016788      2.0885077    -48.3561167  C
0.0000644  4925.5850726      76513943.      9.4041449     0.0006054    -0.0017121      2.1220220    -49.3150993  C
0.0000656  5014.8483499      76416737.      9.4036201     0.0006171    -0.0017454      2.1552805    -50.2736727  C
0.0000669  5104.0146245      76321714.      9.4033273     0.0006288    -0.0017787      2.1882824    -51.2318344  C
0.0000681  5193.0833716      76228747.      9.4032550     0.0006406    -0.0018119      2.2210268    -52.1895816  C
0.0000694  5282.0540606      76137716.      9.4033925     0.0006524    -0.0018451      2.2535129    -53.1469119  C
0.0000706  5370.9261553      76048512.      9.4037301     0.0006641    -0.0018784      2.2857398    -54.1038226  C
0.0000719  5459.6991140      75961031.      9.4042585     0.0006759    -0.0019116      2.3177067    -55.0603109  C
0.0000731  5548.3723890      75875178.      9.4049693     0.0006877    -0.0019448      2.3494126    -56.0163743  C
0.0000744  5636.9454268      75790863.      9.4058545     0.0006996    -0.0019779      2.3808568    -56.9720099  C
0.0000794  5990.2236230      75467384.      9.4109991     0.0007470    -0.0021105      2.5039968    -60.0000000  CY
0.0000844  6341.8528073      75162700.      9.4184243     0.0007947    -0.0022428      2.6228743    -60.0000000  CY
0.0000894  6690.8601455      74862771.      9.4273883     0.0008426    -0.0023749      2.7373358    -60.0000000  CY
0.0000944  6977.7262799      73936173.      9.4105973     0.0008881    -0.0025094      2.8414948    -60.0000000  CY
0.0000994  7190.6621680      72358865.      9.3647469     0.0009306    -0.0026469      2.9344925    -60.0000000  CY
0.0001044  7384.2590722      70747392.      9.3167554     0.0009724    -0.0027851      3.0221703    -60.0000000  CY
0.0001094  7534.2984354      68885014.      9.2547731     0.0010122    -0.0029253      3.1020493    -60.0000000  CY
0.0001144  7666.4108298      67028729.      9.1916678     0.0010513    -0.0030662      3.1770864    -60.0000000  CY
0.0001194  7797.4728941      65319145.      9.1325684     0.0010902    -0.0032073      3.2485690    -60.0000000  CY
0.0001244  7916.4440151      63649801.      9.0730370     0.0011285    -0.0033490      3.3156739    -60.0000000  CY
0.0001294  8002.5858493      61855736.      9.0029369     0.0011648    -0.0034927      3.3763582    -60.0000000  CY
0.0001344  8083.2450884      60154382.      8.9365021     0.0012008    -0.0036367      3.4338929    -60.0000000  CY
0.0001394  8163.4216992      58571636.      8.8757364     0.0012371    -0.0037804      3.4888344    -60.0000000  CY
0.0001444  8243.1078008      57095119.      8.8200645     0.0012734    -0.0039241      3.5411556    -60.0000000  CY
0.0001494  8321.7145145      55710223.      8.7658054     0.0013094    -0.0040681      3.5901834    -60.0000000  CY
0.0001544  8393.2468768      54369211.      8.7121995     0.0013449    -0.0042126      3.6358768    -60.0000000  CY
0.0001594  8446.7448746      52999184.      8.6528756     0.0013791    -0.0043584      3.6771285    -60.0000000  CY
0.0001644  8491.5566804      51659660.      8.5932027     0.0014125    -0.0045050      3.7151651    -60.0000000  CY
0.0001694  8535.4209478      50393629.      8.5373774     0.0014460    -0.0046515      3.7508767    -60.0000000  CY
0.0001744  8578.9410474      49198228.      8.4854055     0.0014796    -0.0047979      3.7843093    -60.0000000  CY
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    0.0001794  8621.7603410     48065563.     8.4353517     0.0015131    -0.0049444     3.8151739   -60.0000000  CY
    0.0001844  8663.8696026     46990479.     8.3869624     0.0015463    -0.0050912     3.8434941   -60.0000000  CY
    0.0001894  8705.6432006     45970393.     8.3417509     0.0015797    -0.0052378     3.8695508   -60.0000000  CY
    0.0001944  8747.0757230     45001033.     8.2994818     0.0016132    -0.0053843     3.8933196   -60.0000000  CY
    0.0001994  8788.1614476     44078553.     8.2599436     0.0016468    -0.0055307     3.9147753   -60.0000000  CY
    0.0002044  8827.2151106     43191267.     8.2218639     0.0016803    -0.0056772     3.9337715   -60.0000000  CY
    0.0002094  8862.0960192     42326429.     8.1837114     0.0017135    -0.0058240     3.9501884   -60.0000000  CY
    0.0002144  8891.7260894     41477439.     8.1447277     0.0017460    -0.0059715     3.9640462   -60.0000000  CY
    0.0002194  8914.6381409     40636527.     8.1038703     0.0017778    -0.0061197     3.9753844   -60.0000000  CY
    0.0002244  8935.0185551     39821810.     8.0613589     0.0018088    -0.0062687     3.9843752   -60.0000000  CY
    0.0002294  8954.4227112     39038355.     8.0204151     0.0018397    -0.0064178     3.9913186   -60.0000000  CY
    0.0002344  8973.5850811     38287296.     7.9816900     0.0018707    -0.0065668     3.9962507   -60.0000000  CY
    0.0002394  8992.5024154     37566590.     7.9450516     0.0019018    -0.0067157     3.9991491   -60.0000000  CY
    0.0002444  9011.1612396     36874317.     7.9103905     0.0019331    -0.0068644     3.9991086   -60.0000000  CY
    0.0002494  9029.4881516     36208474.     7.8776786     0.0019645    -0.0070130     3.9964192   -60.0000000  CY
    0.0002544  9047.5781949     35567875.     7.8466906     0.0019960    -0.0071615     3.9991417   -60.0000000  CY
    0.0002594  9065.4199571     34951017.     7.8173428     0.0020276    -0.0073099     3.9995956   -60.0000000  CY
    0.0002644  9082.8763801     34356034.     7.7897110     0.0020594    -0.0074581     3.9952788   -60.0000000  CY
    0.0002694  9100.1165843     33782335.     7.7634998     0.0020913    -0.0076062     3.9984262   -60.0000000  CY
    0.0002744  9117.1124390     33228656.     7.7385110     0.0021233    -0.0077542     3.9998886    60.0000000  CY
    0.0003044  9210.8317861     30261460.     7.6026723     0.0023141    -0.0086434     3.9952069    60.0000000  CY
    0.0003344  9276.4419328     27742630.     7.4851178     0.0025028    -0.0095347     3.9976729    60.0000000  CY
    0.0003644  9310.7636545     25552696.     7.3726918     0.0026864    -0.0104311     3.9969033    60.0000000  CY
    0.0003944  9337.2509089     23676072.     7.2714768     0.0028677    -0.0113298     3.9921814    60.0000000  CY
    0.0004244  9361.5339473     22059579.     7.1899404     0.0030512    -0.0122263     3.9939968    60.0000000  CYT
    0.0004544  9383.8234286     20652156.     7.1239499     0.0032369    -0.0131206     3.9982269    60.0000000  CYT
    0.0004844  9404.5033819     19415749.     7.0700898     0.0034246    -0.0140129     3.9842776    60.0000000  CYT
    0.0005144  9423.9454477     18321158.     7.0256118     0.0036138    -0.0149037     3.9988750    60.0000000  CYT
    0.0005444  9441.3502558     17343468.     6.9849145     0.0038024    -0.0157951     3.9829507    60.0000000  CYT


---------------------------------------------------------------------------------
   Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1
---------------------------------------------------------------------------------

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

 Load           Axial Thrust        Nominal Mom. Cap.      Max. Comp.
  No.               kips                 in-kip              Strain
 ----         ----------------     ------------------     ------------
   1               22.800               9354.756           0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
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bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

 Axial     Resistance          Nominal           Ultimate (Factored)     Ultimate (Factored)     Bending Stiffness
 Load        Factor         Moment Capacity          Axial Thrust           Moment Capacity       at Ult. Mom. Cap.
  No.      for Moment           in-kip                  kips                    in-kip               kip-in^2
 -----     ----------     -------------------     -------------------     -------------------     -------------------
   1          0.65                9354.756                  14.820                6080.591            75389081.367

   1          0.70                9354.756                  15.960                6548.329            74985258.862

   1          0.75                9354.756                  17.100                7016.067            73652166.347



--------------------------------------------------------------------------------
                 Computed Values of Pile Loading and Deflection
                   for Lateral Loading for Load Case Number 1
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Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head                               =       8500.0 lbs
Applied moment at pile head                            =    2364000.0 in-lbs
Axial thrust load on pile head                         =      22800.0 lbs

   Depth     Deflect.    Bending    Shear       Slope       Total    Bending   Soil Res.  Soil Spr.   Distrib.
     X          y        Moment     Force         S        Stress   Stiffness      p         Es*h     Lat. Load
    feet     inches      in-lbs      lbs       radians      psi*     lb-in^2     lb/in     lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
      0.00     0.1702   2364000.  8500.0000  -0.002977      0.000  8.172E+10      0.000      0.000      0.000
     0.200     0.1632   2384561.  8461.5023  -0.002907      0.000  8.172E+10   -32.0814   471.9089      0.000
     0.400     0.1563   2404933.  8344.7659  -0.002837      0.000  8.126E+10   -65.1988  1001.3635      0.000
     0.600     0.1495   2424926.  8147.7021  -0.002765      0.000  8.119E+10   -99.0211  1589.1971      0.000
     0.800     0.1430   2444345.  7869.0086  -0.002693      0.000  8.112E+10  -133.2235  2236.0675      0.000
     1.000     0.1366   2462992.  7508.1541  -0.002621      0.000  8.106E+10  -167.4885  2942.4121      0.000
     1.200     0.1304   2480671.  7065.3601  -0.002548      0.000  8.100E+10  -201.5065  3708.3956      0.000
     1.400     0.1244   2497185.  6541.5803  -0.002474      0.000  8.094E+10  -234.9766  4533.8491      0.000
     1.600     0.1185   2512341.  5937.5182  -0.002399      0.000  8.089E+10  -268.4085  5434.4198      0.000
     1.800     0.1129   2525948.  5253.0998  -0.002325      0.000  8.085E+10  -301.9401  6420.3933      0.000
     2.000     0.1074   2537811.  4489.1530  -0.002249      0.000  8.081E+10  -334.6822  7480.4191      0.000
     2.200     0.1021   2547742.  3651.0001  -0.002174      0.000  8.078E+10  -363.7786  8553.6000      0.000
     2.400     0.0969   2555573.  2762.1656  -0.002098      0.000  8.075E+10  -376.9168  9331.2000      0.000
     2.600     0.0920   2561230.  1844.8644  -0.002022      0.000  8.073E+10  -387.5008     10109.      0.000
     2.800     0.0872   2564650.   905.0118  -0.001946      0.000  8.072E+10  -395.7097     10886.      0.000
     3.000     0.0827   2565787.   -51.9068  -0.001870      0.000  8.072E+10  -401.7224     11664.      0.000
     3.200     0.0783   2564605. -1020.8346  -0.001793      0.000  8.072E+10  -405.7174     12442.      0.000
     3.400     0.0741   2561083. -1997.1417  -0.001717      0.000  8.073E+10  -407.8719     13219.      0.000
     3.600     0.0700   2555207. -2976.6228  -0.001641      0.000  8.075E+10  -408.3624     13997.      0.000
     3.800     0.0662   2546975. -3955.4938  -0.001565      0.000  8.078E+10  -407.3635     14774.      0.000
     4.000     0.0625   2536392. -4731.9962  -0.001490      0.000  8.081E+10  -239.7219  9204.2256      0.000
     4.200     0.0590   2524424. -5304.8884  -0.001415      0.000  8.085E+10  -237.6882  9665.0256      0.000
     4.400     0.0557   2511083. -5872.2041  -0.001340      0.000  8.090E+10  -235.0749     10126.      0.000
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     4.600      0.0526    2496384. -6432.6714  -0.001266       0.000  8.094E+10  -231.9811      10587.       0.000
     4.800      0.0496    2480345. -6985.2541  -0.001192       0.000  8.100E+10  -228.5044      11047.       0.000
     5.000      0.0469    2462986. -7529.1488  -0.001119       0.000  8.106E+10  -224.7412      11508.       0.000
     5.200      0.0443    2444328. -8063.7815  -0.001046       0.000  8.112E+10  -220.7861      11969.       0.000
     5.400      0.0418    2424394. -8588.8037  -0.000974       0.000  8.119E+10  -216.7324      12430.       0.000
     5.600      0.0396    2403208. -9104.0888  -0.000903       0.000  8.127E+10  -212.6718      12891.       0.000
     5.800      0.0375    2380793. -9609.7278  -0.000832       0.000  8.145E+10  -208.6940      13351.       0.000
     6.000      0.0356    2357172.     -10106.  -0.000763       0.000  8.183E+10  -204.8859      13812.       0.000
     6.200      0.0339    2332368.     -10593.  -0.000694       0.000  8.228E+10  -201.3299      14273.       0.000
     6.400      0.0323    2306400.     -11073.  -0.000653       0.000  3.711E+11  -198.1052      14734.       0.000
     6.600      0.0307    2279290.     -11544.  -0.000638       0.000  3.712E+11  -194.4990      15195.       0.000
     6.800      0.0292    2251058.     -12006.  -0.000623       0.000  3.713E+11  -190.5289      15655.       0.000
     7.000      0.0277    2221729.     -12458.  -0.000609       0.000  3.714E+11  -186.2123      16116.       0.000
     7.200      0.0263    2191326.     -12899.  -0.000594       0.000  3.715E+11  -181.5662      16577.       0.000
     7.400      0.0249    2159877.     -13329.  -0.000580       0.000  3.716E+11  -176.6071      17038.       0.000
     7.600      0.0235    2127410.     -13747.  -0.000566       0.000  3.717E+11  -171.3508      17499.       0.000
     7.800      0.0222    2093955.     -14151.  -0.000553       0.000  3.718E+11  -165.8128      17959.       0.000
     8.000      0.0208    2059544.     -14542.  -0.000539       0.000  3.719E+11  -160.0081      18420.       0.000
     8.200      0.0196    2024211.     -14919.  -0.000526       0.000  3.720E+11  -153.9511      18881.       0.000
     8.400      0.0183    1987990.     -15281.  -0.000513       0.000  3.721E+11  -147.6557      19342.       0.000
     8.600      0.0171    1950918.     -15628.  -0.000501       0.000  3.722E+11  -141.1352      19803.       0.000
     8.800      0.0159    1913032.     -15958.  -0.000488       0.000  3.723E+11  -134.4024      20263.       0.000
     9.000      0.0148    1874372.     -16272.  -0.000476       0.000  3.724E+11  -127.4696      20724.       0.000
     9.200      0.0136    1834977.     -16570.  -0.000464       0.000  3.726E+11  -120.3485      21185.       0.000
     9.400      0.0125    1794888.     -16850.  -0.000452       0.000  3.727E+11  -113.0501      21646.       0.000
     9.600      0.0115    1754147.     -17112.  -0.000441       0.000  3.728E+11  -105.5851      22107.       0.000
     9.800      0.0104    1712797.     -17357.  -0.000430       0.000  3.729E+11   -97.9634      22567.       0.000
    10.000    0.009400    1670882.     -17582.  -0.000419       0.000  3.731E+11   -90.1944      23028.       0.000
    10.200    0.008408    1628448.     -17789.  -0.000408       0.000  3.732E+11   -82.2870      23489.       0.000
    10.400    0.007440    1585538.     -17977.  -0.000398       0.000  3.733E+11   -74.2493      23950.       0.000
    10.600    0.006498    1542201.     -18146.  -0.000388       0.000  3.734E+11   -66.0890      24411.       0.000
    10.800    0.005579    1498482.     -18294.  -0.000378       0.000  3.736E+11   -57.8132      24871.       0.000
    11.000    0.004683    1454430.     -18423.  -0.000369       0.000  3.737E+11   -49.4285      25332.       0.000
    11.200    0.003809    1410093.     -18531.  -0.000359       0.000  3.738E+11   -40.9406      25793.       0.000
    11.400    0.002958    1365519.     -18619.  -0.000351       0.000  3.740E+11   -32.3550      26254.       0.000
    11.600    0.002127    1320758.     -18687.  -0.000342       0.000  3.741E+11   -23.6765      26715.       0.000
    11.800    0.001317    1275861.     -18733.  -0.000334       0.000  3.742E+11   -14.9092      27175.       0.000
    12.000    0.000526    1230877.     -18758.  -0.000326       0.000  3.744E+11    -6.0569      27636.       0.000
    12.200   -0.000246    1185858.     -18762.  -0.000318       0.000  3.745E+11     2.8773      28097.       0.000
    12.400   -0.000999    1140855.     -18744.  -0.000310       0.000  3.746E+11    11.8908      28558.       0.000
    12.600   -0.001735    1095920.     -18705.  -0.000303       0.000  3.747E+11    20.9816      29019.       0.000
    12.800   -0.002454    1051106.     -18643.  -0.000296       0.000  3.749E+11    30.1481      29479.       0.000
    13.000   -0.003157    1006465.     -18560.  -0.000290       0.000  3.750E+11    39.3893      29940.       0.000
    13.200   -0.003845     962050.     -18454.  -0.000283       0.000  3.752E+11    48.7046      30401.       0.000
    13.400   -0.004518     917916.     -18326.  -0.000277       0.000  3.753E+11    58.0940      30862.       0.000
    13.600   -0.005176     874116.     -18175.  -0.000272       0.000  3.754E+11    67.5579      31323.       0.000
    13.800   -0.005822     830705.     -18002.  -0.000266       0.000  3.755E+11    77.0970      31783.       0.000
    14.000   -0.006454     787737.     -17805.  -0.000261       0.000  3.756E+11    86.7128      32244.       0.000
    14.200   -0.007075     745269.     -17585.  -0.000256       0.000  3.758E+11    96.4068      32705.       0.000
    14.400   -0.007684     703356.     -17342.  -0.000252       0.000  3.759E+11   106.1812      33166.       0.000
    14.600   -0.008282     662054.     -17076.  -0.000247       0.000  3.760E+11   116.0385      33627.       0.000
    14.800   -0.008870     621420.     -16785.  -0.000243       0.000  3.761E+11   125.9814      34087.       0.000
    15.000   -0.009449     581512.     -16471.  -0.000239       0.000  3.762E+11   136.0132      34548.       0.000
    15.200     -0.0100     542387.     -16132.  -0.000236       0.000  3.763E+11   146.1372      35009.       0.000
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    15.400    -0.0106    504104.    -15769.  -0.000232      0.000  3.764E+11   156.3574     35470.      0.000
    15.600    -0.0111    466721.    -15382.  -0.000229      0.000  3.766E+11   166.6775     35931.      0.000
    15.800    -0.0117    430297.    -14969.  -0.000226      0.000  3.766E+11   177.1021     36391.      0.000
    16.000    -0.0122    394894.    -14531.  -0.000224      0.000  3.767E+11   187.6355     36852.      0.000
    16.200    -0.0128    360572.    -14068.  -0.000221      0.000  3.767E+11   198.2823     37313.      0.000
    16.400    -0.0133    327391.    -13579.  -0.000219      0.000  3.768E+11   209.0473     37774.      0.000
    16.600    -0.0138    295415.    -13065.  -0.000217      0.000  3.769E+11   219.9355     38235.      0.000
    16.800    -0.0143    264705.    -12524.  -0.000215      0.000  3.770E+11   230.9519     38695.      0.000
    17.000    -0.0148    235325.    -11956.  -0.000214      0.000  3.771E+11   242.1016     39156.      0.000
    17.200    -0.0154    207340.    -11361.  -0.000212      0.000  3.771E+11   253.3896     39617.      0.000
    17.400    -0.0159    180814.    -10739.  -0.000211      0.000  3.771E+11   264.8211     40078.      0.000
    17.600    -0.0164    155814.    -10090.  -0.000210      0.000  3.771E+11   276.4010     40539.      0.000
    17.800    -0.0169    132406. -9412.5254  -0.000209      0.000  3.771E+11   288.1342     40999.      0.000
    18.000    -0.0174    110657. -8706.7335  -0.000208      0.000  3.771E+11   300.0257     41460.      0.000
    18.200    -0.0179     90636. -7972.2068  -0.000208      0.000  3.771E+11   312.0799     41921.      0.000
    18.400    -0.0184     72413. -7208.5491  -0.000207      0.000  3.771E+11   324.3015     42382.      0.000
    18.600    -0.0189     56058. -6415.3541  -0.000207      0.000  3.771E+11   336.6944     42843.      0.000
    18.800    -0.0194     41642. -5592.2057  -0.000206      0.000  3.771E+11   349.2626     43303.      0.000
    19.000    -0.0199     29238. -4738.6789  -0.000206      0.000  3.771E+11   362.0097     43764.      0.000
    19.200    -0.0203     18919. -3854.3410  -0.000206      0.000  3.771E+11   374.9386     44225.      0.000
    19.400    -0.0208     10759. -2938.7519  -0.000206      0.000  3.771E+11   388.0522     44686.      0.000
    19.600    -0.0213  4835.2223 -1991.4661  -0.000206      0.000  3.771E+11   401.3526     45147.      0.000
    19.800    -0.0218  1222.8681 -1012.0333  -0.000206      0.000  3.771E+11   414.8414     45607.      0.000
    20.000    -0.0223      0.000      0.000  -0.000206      0.000  3.771E+11   428.5196     23034.      0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.


Output Summary for Load Case No. 1:

Pile-head deflection             =      0.1702188 inches
Computed slope at pile head      =     -0.0029770 radians
Maximum bending moment           =       2565787. inch-lbs
Maximum shear force              =        -18762. lbs
Depth of maximum bending moment  =      3.0000000 feet below pile head
Depth of maximum shear force     =     12.2000000 feet below pile head
Number of iterations             =            166
Number of zero deflection points =              1



--------------------------------------------------------------------------------
            Pile-head Deflection vs. Pile Length for Load Case 1
--------------------------------------------------------------------------------

Boundary Condition Type 1, Shear and Moment

Shear      =          8500.  lb
Moment     =       2364000. in- lb
Axial Load =         22800.  lb
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    Pile       Pile Head       Maximum       Maximum
   Length      Deflection      Moment         Shear
    feet         inches        ln-lbs          lbs
------------  ------------  ------------  ------------
    20.0000     0.1702188      2565787.       -18762.
    19.0000     0.1712345      2565078.       -19922.
    18.0000     0.1774297      2563302.       -21254.
    17.0000     0.1891458      2561011.       -22923.
    16.0000     0.2071683      2558120.       -24876.
    15.0000     0.2365739      2554379.       -27032.
    14.0000     0.2844692      2549752.       -29761.
    13.0000     0.3613484      2544203.       -33080.
    12.0000     0.4812585      2538230.       -36961.
    11.0000     0.7210078      2530871.       -41951.
    10.0000     1.3275387      2519813.       -48220.
     9.0000     3.1756282      2528294.       -57031.


--------------------------------------------------------------------------------
                           Summary of Pile Response(s)
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians


                Pile-head      Pile-head                                    Maximum        Maximum
Load  Load     Condition 1    Condition 2        Axial        Pile-head     Moment          Shear         Pile-head
Case  Type     V(lbs) or      in-lb, rad.,      Loading      Deflection     in Pile        in Pile        Rotation
 No.   No.     y(inches)      or in-lb/rad.       lbs          inches       in-lbs           lbs           radians
----  ----  --------------  --------------  -------------  -------------  -------------  -------------  -------------
  1     1   V =  8500.0000  M =   2364000.         22800.     0.17021883       2565787.        -18762.    -0.00297696

The analysis ended normally.
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APPENDIX 4

MAINE TURNPIKE AUTHORITY GENERAL PERMIT

STATE OF MAINE

DEPARTMENT OF ENVIRONMENTAL PROTECTION

SITE LOCATION OF DEVELOPMENT ACT

General Permit for the
Maine Turnpike Authority

Bureau of Land Resources

I. General Permit Coverage

A. Basis: The Department of Environmental Protection (DEP) recognizes that the Maine Turnpike Authority (MTA) has established environmental procedures and standard practices that meet or exceed the requirements of the Site Location of Development Act (Site Law). MTA conducts environmental reviews of its proposed projects using professional staff and qualified consultants to ensure compliance with State and Federal environmental requirements and various initiatives including, but not limited to, the National Environmental Policy Act, Federal and State wetland permitting requirements, the Maine Department of Transportation's Best Management Practices for Erosion and Sediment Control (BMP's), the MaineDOT Waterway and Wildlife Crossing Policy and Design Guide, and the Memorandum of Agreement for Stormwater Management. MTA licensed engineering staff and consultants design projects in accordance with applicable standards including, but not limited to, the State of Maine Department of Transportation Standard Specifications for Highways and Bridges, and the American Association of State Highway and Transportation Officials (AASHTO) Design Standards. MTA has licensed engineers, land surveyors, planners, environmental compliance and legal staff, and supplements its internal staff through consulting contracts with several recognized engineering firms and an environmental compliance firm. MTA procedures and policies (as amended from time to time) relevant to meeting Site Law standards are listed below under sections specific to the standards.

B. Purpose: This General Permit for the Maine Turnpike Authority, hereinafter described as the MTA General Permit for Site Location of Development projects (GP), authorizes the MTA to construct or cause to be constructed or operate or cause to be operated all developments under MTA's authority for which approval is required pursuant to the Site Law, 38 M.R.S.A. §§ 481-490, after the approval by the DEP of a Notice of Intent as set forth in 38 M.R.S.A. § 486-B(3).

C. Authorization: This GP is authorized by 38 M.R.S.A. § 486-B. This permit does not affect requirements under other applicable Maine statutes such as the Natural Resources Protection Act, 38 M.R.S.A. § 480-A through 480-JJ (NRPA).

D. Effective period: This GP is effective date , and authorized through, date . The DEP intends subsequent re-issuance of this GP. Performance and compliance under this GP will be assessed on an annual basis by MTA and DEP.

II. Standards

A development authorized by this GP is required to meet all applicable requirements of the Site Law pursuant to 38 M.R.S.A. § 484, the specific conditions listed in this section, and any conditions attached to an approval of a Notice of Intent.

A. Financial Capacity (38 M.R.S.A. § 484(1)): The MTA shall have the financial capacity and technical ability to develop a project in a manner consistent with state environmental standards and consistent with the Site Law. Funding commitments are authorized by the MTA's board through the MTA's Four Year Capital Investment Plan, Thirty Year Financial Plan, and annual Reserve Maintenance Deposit requirements.

Link to MTA Projects: http://www.maineturnpike.com/getattachment/project-and-planning/Transportation-Planning/4-Year-Capital-Plan-12-18-2014.pdf.aspx

B. No Adverse Effect on the Natural Environment (38 M.R.S.A. § 484(3)): In its construction and operation of the project, the MTA shall not adversely affect existing uses, scenic character, air quality, water quality or other natural resources in the municipality.

1. MTA staff and expert design consultants will review all projects for potential impacts to wetlands, vernal pools, streams, significant wildlife habitats, rare, threatened, and endangered species and unusual natural areas; coordinate with state and federal natural resource agencies; and incorporate agency recommendations as appropriate and practicable to minimize impacts to affected resources. When state and federal natural resource agencies and MTA cannot agree on recommendations to minimize impacts, MTA shall abide by DEP's requirements.

2. MTA will file NRPA permit applications with the DEP when appropriate or document exempt activities.

3. MTA will file applications with the U.S. Army Corps of Engineers (ACOE) in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

4. MTA will design and construct all stream crossings in accordance with the *MaineDOT Waterway and Wildlife Crossing Policy and Design Guide for Aquatic Organism, Wildlife Habitat and Hydrologic Connectivity*, dated July 1, 2008. This document was developed by MaineDOT in cooperation with state and federal agencies; including DEP, Maine Department of Marine Resources (DMR), Maine Inland Fish &Wildlife (IF&W), National Marine Fisheries Service (NMFS), ACOE, United States Fish and Wildlife Service (USFWS), and Environmental Protection Agency (EPA).

   Link to 2008 Waterway and Wildlife Crossing Policy and Design Guide:
   http://digitalmaine.com/mdot_docs/59/

5. MTA will review projects for impacts to historic and cultural resources by consulting with the Maine State Historic Preservation Officer (SHPO) in compliance with the process that is described in Section 4 of the Programmatic Agreement between Federal Highway Administration (FHWA), Federal Transit Administration (FTA), the Advisory Council on Historic Preservation (ACHP), SHPO, and MaineDOT, dated November 2004. However, because the MTA does not normally receive federal funds, the MTA will consult with the federal agency, if any, that is responsible for permitting the MTA project at issue rather than with FHWA or FTA. In almost all cases, this agency would be the ACOE. In all cases, the results of the consultation will be subject to review and approval from DEP. This process will be utilized on all projects that trigger the Site Law.

   Link to Section 106 Programmatic Agreement:
   http://www.maine.gov/mdot/env/docs/Section106ProgrammaticAgreement.pdf

6. If the applicable MTA project is included in a MaineDOT Statewide Transportation Improvement Program (STIP) that has undergone an air quality analysis, the project "will not significantly affect the ambient air quality" for permitting purposes. If the applicable MTA project is not included in a MaineDOT STIP, the MTA will comply with Chapter 375, Section 1 of the DEP rules which may require, among other things, modeling of non-point sources of air pollution and the submittal of the results with the Notice of Intent for review by the DEP.

   Link to MaineDOT Statewide Transportation Improvement Program:
   http://www.maine.gov/mdot/stip/

7. MTA has adopted a statewide Noise Policy, effective January 2015, which is identical in all important respects to the FHWA-approved MaineDOT noise policy, and serves to guide decision-makers on all noise related matters associated with transportation. In addition, all projects will meet the noise standards of Chapter 375 §10 of the DEP Rules, as applicable.

   Link to MTA Noise Policy:
   http://www.maineturnpike.com/getattachment/Business-With-MTA/Neighbors-Abutters/Noise-Policy/NoisePolicy2015Final.pdf.aspx

8. MTA will hold public meetings on all proposed projects to allow public input, per Section II(I) of this GP. These meetings are an opportunity for the public to identify issues of local interest including areas with unique or scenic character.

   Professional landscape architects will review site plans and design landscape plans as appropriate for the type of project, its surrounding area, and any identified scenic resource. The MTA has a licensed landscape architect on staff.

   The MTA right-of-way department and planning staff will identify all public parks, recreation areas, public wildlife and waterfowl refuges, and land of significant historic properties associated with a transportation project and will avoid and minimize impacts to these categories of resources in consultation with DEP.

C. **Soil Types (38 M.R.S.A. § 484(4)):** MTA developments shall be built on soil types that are suitable to the nature of the undertaking. MTA employs or contracts with geotechnical engineers that are part of the design team for all projects to evaluate the suitability of existing soils and determine the need for engineering practices to address soil limitations.

MTA employs or contracts with licensed site evaluators that design new or replacement septic systems in accordance with the Maine State Plumbing Code and the Maine Subsurface Wastewater Disposal Rules. These systems are reviewed and permitted by the Maine Department of Health and Human Services (DHHS) and/or the applicable municipality.

D. **Storm Water Management and Erosion Control (38 M.R.S.A. § 484(4-A)):** MTA shall comply with the Storm Water Management and Erosion Control Standard of the Site Law through implementation of the requirements outlined below. The definitions included in the *Memorandum of Agreement for Stormwater Management between the Maine Department of Transportation, Maine Turnpike Authority, and the Maine Department of Environmental Protection*, effective November 2007, are incorporated in this GP.

Link to MaineDOT/MTA/DEP's MOA on Stormwater:
http://www.maine.gov/mdot/env/docs/StormwaterMOA.pdf

1. Basic Standards: MTA requires an Erosion Control Plan (developed by the contractor and approved by MTA) for all projects in accordance with the *Maine Department of Transportation's Best Management Practices for Erosion and Sediment Control (BMP's)*, dated February 2008. All projects meeting this GP shall comply with the Basic Standards of the DEP Stormwater Rules.

Link to MaineDOT's Best Management Practices for Erosion and Sediment Control:
http://www.maine.gov/mdot/env/docs/bmp/BMP2008full.pdf

2. General Standards: For projects that are large enough to trigger the General Standard threshold in the DEP's Chapter 500 Stormwater Management Rules, MTA shall meet the General Standards for all projects as follows:

   a) A linear portion of a project associated with an existing travel corridor shall meet the General Standards to the extent practicable using existing available right of way as determined through consultation with, and agreement by, DEP.
   b) A linear portion of a project that is not associated with an existing travel corridor shall meet the General Standards to the extent practicable as determined through consultation with, and agreement by, DEP.
   c) A non-linear portion of a project shall meet the General Standards, except that redevelopment of existing impervious area may qualify for the exception in DEP's Chapter 500 § 4(C)(2)(d).

3. Phosphorus Standard. Projects triggering the Phosphorus Standard shall instead apply the General Standards in accordance with Section D(2) above of this GP.

4. Urban impaired stream standard. A linear or non-linear portion of a project that is not associated with an existing travel corridor, is located within the watershed of an urban impaired stream and triggers the Urban Impaired Stream Standard shall meet the Urban Impaired Stream Standard in Chapter 500 § 4(E) to the extent practicable as determined through consultation with, and agreement by, DEP. MTA may use mitigation credit measures within the same watershed as that portion of a project in order meet the requirements of Chapter 501 § 3(A) of the DEP Rules.

5. Flooding Standard. For a state transportation system project that triggers the thresholds of the Flooding Standard, MTA shall apply design and engineering measures to the extent practicable such that project drainage avoids adverse impacts to offsite property resulting from project-related peak flows.

E. **Groundwater (38 M.R.S.A. § 484(5)):** MTA shall construct and operate the development project in a manner that will not pose an unreasonable risk that a discharge to a significant groundwater aquifer will occur. MTA engineering staff and consultants will develop viable and sustainable water extraction practices for both potable and production systems. The MTA's Environmental Coordinator, in conjunction with its environmental consulting firm, has developed and continuously updates sound management practices for, and training in, the storage of hazardous materials. These actions are directed toward minimizing impacts to waters recharging the groundwater regime. In the event of a release of hazardous materials, contingencies are in place to undertake prompt response actions to minimize environmental harm.

MTA's Maintenance facilities comply with relevant sections of DEP's Spill Prevention, Control and Countermeasures (SPCC) Plan requirements as applicable. Facilities that exceed regulatory petroleum storage thresholds have site specific plans and perform required training and inspections. This initiative focusing on the proper management and response to releases and discharges is further supported by MTA's internal procedures related to spill prevention and response.

F. **Infrastructure (38 M.R.S.A. § 484(6)):** MTA developments shall make adequate provisions for utilities, including water supplies, sewerage facilities and solid waste disposal required for the development, and developments shall not have an unreasonable adverse effect on the existing or proposed utilities in the municipality or area served by those services.

In locations where a subsurface wastewater disposal facility may be constructed, it must be designed, installed and operated in accordance with relevant sections of Maine DHHS's subsurface disposal system regulations to ensure effluent emanating from the systems is readily attenuated thereby minimizing groundwater quality concerns.

The MTA's right-of-way department will identify all utilities within a project area and will be responsible for coordinating with municipal and private utilities to ensure no unreasonable burden on, disruption of, or interference with, service.

MTA's Environmental Coordinator reviews projects to ensure that all solid, special, universal, and hazardous wastes associated with transportation projects are managed in accordance with State and Federal Requirements.

G. **Flooding (38 M.R.S.A. § 484(7)):** MTA developments shall not unreasonably cause or increase the flooding of the alteration area or adjacent properties nor create an unreasonable flood hazard to any structure. MTA will design all projects to meet this criterion through consultation with DEP.

MTA will evaluate potential impacts of a proposed development to flood zones and adjacent properties and will design, construct and operate the development to avoid or mitigate such impacts. Presidential Executive Order 11988 applies to MTA projects requiring a federal permit.

Link to Presidential Executive Order 11988:
http://www.archives.gov/federal-register/codification/executive-order/11988.html

H. **Blasting (38 M.R.S.A. § 484(9)):** MTA shall conduct any blasting for developments in accordance with the standards in 38 M.R.S.A. § 490-Z (14). MTA Standard Specifications for contractors (Section 105.2.7) provides detailed requirements for blasting which meet or exceed the statutory requirements. These standard specifications require that the contractor submit a detailed blasting plan for approval prior to blasting, and require consultation with the MTA, State Police and owners of nearby utilities prior to blasting. MTA specifications require pre- and post-blast surveys of structures in the area, including pre-blast water quality tests of private wells. MTA specifications contain detailed safety procedures to be observed during blasting, require that a qualified vibration and blasting expert monitor all blasting and require that seismographic recordings are taken in the blast vicinity and supplied to MTA personnel within 2 days of every blast. MTA specifications incorporate by reference the Bureau of Mines ground vibrations limits contained in the Bureau of Mines Report #8507.

Link to MTA Standard Specifications for Blasting:
http://www.maineturnpike.com/getattachment/project-and-planning/Construction-Contracts/Special-Provisions-Use-of-Explosives.pdf.aspx

I. **Public Involvement:** MTA will treat every project under this GP as a "Substantial Public Interest Project" under its existing Public Participation Plan, effective May 2010, and will include at least one preliminary public meeting and one final public meeting on every project, depending on the scope of the project and anticipated level of public interest. Project details must be presented at all public meetings.

MTA will notify the public in accordance with Chapter 2, the DEP's Rule Concerning the Processing of Applications and Other Administrative Matters for all projects performed under this GP.

Link to MTA's Public Participation Plan:
http://www.maineturnpike.com/getattachment/Construction-Info/Transportation-Planning/Public-Participation-Policy-Board-Approved-June-17-2010.pdf.aspx

III. Submittals

A. **Notice of Intent Form:** The Notice of Intent (NOI) form shall be completely filled out and signed by the Executive Director of the MTA.

B. **Location Map:** A map showing the location and extent of the project shall be submitted. A U.S.G.S. topographic map or Maine Atlas and Gazetteer map are acceptable for this purpose.

C. **Plans:** MTA shall submit site plans of the proposed development with the NOI. Plans shall include, at a minimum, existing and proposed structures, permanent erosion and sedimentation measures, stormwater management structures, best management practices and buffers, clearing limits, and impervious areas. Other information may be required by the DEP as described in section 2(B)(6) above or on a case by case basis.

IV. Conditions of Approval

The DEP may attach reasonable conditions to the approval of the NOI to ensure compliance with standards under the Site Law in addition to the following conditions:

A. **Retention of Records:** MTA shall retain copies of all reports, certifications and approvals required by this GP, and records of all data used to complete the NOI of the project to be covered by this GP, for a period of at least three (3) years from the date the NOI is filed. The DEP may extend the time of record retention at any time.

B. **Accessibility:** MTA shall make a copy of the NOI and all supporting data available to the public.

C. **Inspection and Entry:** Employees and Agents of the DEP may enter any property that is the subject of the NOI at reasonable hours in order to determine compliance.

D. **Approval of Variations from Plans:** The granting of this approval is dependent upon and limited to the proposals and plans contained in the NOI and supporting documents submitted by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

E. **Transfer of Development:** In the event that the ownership of a project that is subject to this General Permit is transferred to a new owner, the MTA shall notify the DEP of a change in ownership. Subsequent development of the project by other parties is not covered under this GP.

F. **Time frame for approvals:** If the construction or operation of the project is not begun within four years, this approval shall lapse and the MTA must submit a new NOI to the DEP for approval. The MTA may not begin construction or operation of the development until a new NOI is approved. A new NOI may include information submitted in the initial NOI by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the MTA must submit a new NOI, and receive approval prior to continuing construction.

V. Review

The DEP will approve a proposed MTA development upon receipt and review of a completed NOI, acceptable for processing, for a project determined to be in compliance with the standards of this GP. The DEP reserves the right to require additional documentation or adjustments to procedure to ensure that all requirements of this GP will be met.

VI. Procedure

A. **Notice of Intent:** An NOI must be submitted by MTA for a proposed development with submittals as described in Section III above. By submitting the NOI MTA agrees to comply with the terms and conditions of this GP.

B. **NOI Submission:** MTA shall file the NOI on a form provided by the DEP. The NOI shall contain all information required in this GP and the NOI form.

C. **Deficient NOI:** If any portion of the NOI does not meet one or more of the minimum requirements, or if the DEP requests additional information to ensure compliance with standards of the Site Law, the applicant will be notified of the deficiency within fourteen (14) calendar days. It is the responsibility of the MTA to make all required changes and resubmit the NOI or submit the required additional information. A new review period will begin when the revised NOI or supplemental information is received by the DEP.

D. **Processing the NOI:** Prior to the authorization of a development pursuant to this GP, an NOI must be reviewed and approved by the DEP within thirty (30) calendar days of receipt unless the DEP approves or denies the NOI prior to that date. If MTA does not receive correspondence from the DEP within the thirty (30) calendar day period after the submission of an NOI, then MTA is authorized to carry out the activity. If an NRPA permit is required for any portion of the development, the NOI and the NRPA application shall be submitted together. Excepting those situations where only a Permit by Rule Notification is required to satisfy an NRPA permitting requirement, the NOI review period will run concurrently with the NRPA permit review period and the length of the NOI review period will be the same as the review period for the NRPA permit application.

E. **Where to Submit:** A completed and signed NOI must be submitted to:

Director
Bureau of Land Resources
Maine Department of Environmental Protection
17 State House Station
Augusta, Maine 04333-0017

VII. Approval

An MTA development is considered to be authorized under this GP upon approval of an NOI in accordance with Section VI of this GP.

VIII. Fee

The DEP will not charge a fee for processing and approval of an NOI under this GP in accordance with M.R.S.A. 38 § 486-B (6).

IX. Modification of General Permit and NOI

The DEP may modify this GP and/or the NOI at any time with notification to the MTA.

X. Right to Appeal

All final license or permit decisions made by the Commissioner may be appealed to the Board of Environmental Protection pursuant to M.R.S.A. 38 § 341-D (4).

DONE AND DATED AT AUGUSTA, MAINE, THIS ________DAY OF ____________, 2016.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:____
For: Avery T. Day, Acting Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of Public Notice:

Date filed with Board of Environmental Protection:

This Order prepared by Michael K. Mullen, BUREAU OF LAND RESOURCES

Chapter 375: NO ADVERSE ENVIRONMENTAL EFFECT STANDARD OF THE SITE LOCATION LAW

SUMMARY: These regulations describe the scope of review of the Board in determining a developer's compliance with the "no adverse effect on the natural environment" standard of the Site Location Law (38 M.R.S.A. Section 484(3)); the information which shall be submitted, when appropriate, within an application for approval; and, the terms and conditions which the Board may impose on the approval of an application to ensure compliance with the standard.

NOTE: In determining whether the developer has made adequate provision for fitting the development harmoniously into the existing natural environment and that the development will not adversely affect existing uses, scenic character, or natural resources in the municipality or in neighboring municipalities, the Board has identified several specific areas of concern which are dealt with in detail below.

1. No Unreasonable Adverse Effect On Air Quality

A. **Preamble**. The Board recognizes that point source emissions from certain types of commercial and industrial developments and solid waste disposal facilities and non-point source emissions deriving from industrial, commercial, and governmental developments can have an unreasonable adverse effect on air quality.

B. **Scope of Review**. In determining whether the proposed development will have an unreasonable adverse effect on ambient air quality, through point or non-point sources of chemical pollutants or particulate matter, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) The best practicable treatment of point sources of air pollution will be utilized and that point source emissions meet state ambient air quality standards and state emissions standards.

(2) The amount of air pollution produced from either point or non-point sources of air emissions will be consistent with the Board's "Policy on Air Quality Use," adopted March 28, 1979.

C. **Submissions**. Applications for approval of proposed industrial, commercial and governmental developments and solid waste disposal facilities shall include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on air quality, including information such as the following, when appropriate:

(1) Evidence that an Air Emission License has been or will be obtained.

(2) Evidence that increased traffic generated by the development will not significantly effect the ambient air quality. Modeling of the effect of non-point sources of air pollution on ambient air quality may be requested.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the proposed development will have no unreasonable adverse effect on air quality, such as requiring that:

(1) Emissions from point sources of pollution be monitored.

(2) The size of the parking lots be limited in order to limit the amount of non-point source pollutants generated by the development.

2. No Unreasonable Alteration of Climate

A. Preamble. The Board recognizes the potential of large-scale, heavy industrial facilities, such as power generating plants, to affect the climate in the vicinity of their location by causing changes in climatic characteristics such as rainfall, fog, and relative humidity patterns.

B. Scope of Review. In determining whether the proposed development will cause an unreasonable alteration of climate, the Board shall consider all relevant evidence to that effect.

C. Submissions. Applications for approval of large-scale, heavy industrial developments, such as power generating plants, shall include evidence that affirmatively demonstrates that there will be no unreasonable alteration of climate, including information such as the following, when appropriate:

(1) Evidence that the proposed development will not unreasonably alter the existing cloud cover, fog, or rainfall characteristics of the area.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the proposed development will not cause an unreasonable alteration of climate.

3. No Unreasonable Alteration of Natural Drainage Ways

A. Scope of Review. In determining whether the proposed development will cause an unreasonable alteration of natural drainage ways, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) Where a development site is traversed by a natural water course, drainage way, channel, or stream, a drainage right-of-way will be provided that substantially conforms with the lines of such natural water courses. Such rights-of-way shall be at least thirty feet in width.

(2) Any grading or other construction activity on the site will cause no unreasonable alteration of natural drainage ways such that drainage, other than that which occurred prior to development, will adversely affect adjacent parcels of land and that drainage ways flowing from adjacent parcels of land to the development site will be impeded.

B. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable alteration of natural drainage ways, including information such as the following, when appropriate.

(1) A plan showing all existing water courses, drainage ways, channels, or streams to be affected by the development, and the nature, width and location of proposed easements, rights-of-way, culverts, catch basins or other means of channeling surface water within the development and over adjacent parcels of land.

(2) Deed covenants which establish the easements or rights-of-way and provide for their continued maintenance.

C. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that there will by no unreasonable alteration of natural drainage ways.

4. No Unreasonable Effect on Runoff/Infiltration Relationships

A. Preamble. The Board recognizes that same developments cause unreasonable increases in stormwater runoff by decreasing the infiltrative capacity of the soils on a development site. The Board also recognizes that increases in stormwater runoff cause increased danger of flooding, the pollution of surface water bodies, and the depletion of groundwater resources.

B. Scope of Review. In determining whether the proposed development will have an unreasonable effect on runoff/infiltration relationships, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) A stormwater management system will infiltrate, detain, or retain water falling on the site during a storm of an intensity equal to a twenty-five year, twenty-four hour storm such that the rate of flow of stormwater from the development does not exceed the rate of outflow of stormwater from the site prior to the undertaking of the development.

(a) Developments which convey stormwater directly into the ocean (excluding estuarine tidewaters) exclusively in manmade piped or open drainage systems are exempt from the requirements of this subsection.

(2) The physical, biological, and chemical properties of the receiving waters will not be unreasonably degraded by the stormwater runoff from the development site.

(3) The peak discharge of the receiving waters will not be increased as the result of the stormwater runoff from the development site for storms up to a level of intensity of a twenty-five year, twenty-four hour storm.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable effect on runoff/infiltration relationships, including information such as the following, when appropriate:

(1) Evidence that the proposed stormwater management system has been designed by a professional engineer or other person duly qualified to undertake the design. The designer of the system will evaluate the effectiveness of various stormwater methods and develop and

make available for review the hydraulic computations based on accepted engineering practices to demonstrate that the standards established under subsection B, above, will be met.

(2) Evidence that the stormwater management system will take into consideration the upstream runoff which must pass over or through the development site. The system will be designed to pass upstream flows generated by a twenty-five year frequency through the proposed development without overloading the system or flooding areas not specifically planned for such flooding.

(3) Evidence that the design of piped or open channel systems will be based on a ten year flow frequency without overloading or flooding beyond channel limits. In addition, the areas expected to be flooded by runoff of a twenty-five year frequency will be designated, and no structures will be planned within such area.

(4) Evidence that, where permanent embankment-type storage or retention basins are planned, the basins will be designed in accordance with good engineering practice, such as outlined in the Soil Conservation Service Engineering Field Manual or other appropriate references.

(5) Evidence that rights-of-way or easements will be designated for all components of the stormwater management system lying outside of established street lines.

(6) Evidence that the developer will maintain all components of the stormwater management system until it is formally accepted by the municipality or a quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system. The charter of such an association must be acceptable to the Board.

(7) Evidence that the stormwater management system will be fully coordinated with project site plans, including consideration of street patterns, pedestrian ways, open space, building siting, parking areas, recreational facilities, and other utilities, especially sanitary wastewater disposal facilities.

(8) When the construction of a development is to occur in phases, the planning of the stormwater management system should encompass the entire site which may ultimately be developed, and not limited to an initial or limited phases of the development.

NOTE: The following references may be of assistance to a developer in making the necessary computations and in designing the stormwater management system:

"Urban Hydrology for Small Watersheds", Technical Release No. 55, USDA, Soil Conservation Service, University of Maine, Orono, Maine.

"Water Resources Protection Measures in Land Development - A Handbook", Tourbier and Westmacott, University of Delaware Water Resources Center, Newark, Delaware.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that there will be no unreasonable effect on runoff/infiltration relationships.

5. Erosion and Sedimentation Control

A. Preamble. The Board recognizes the importance of controlling erosion and sedimentation to protect water quality and wildlife and fisheries habitat. Additionally, the Board considers topsoil to be a natural resource which should be properly managed. Control of erosion and sedimentation is a concern both during and after construction activities.

B. Scope of Review. In determining whether the developer has made adequate provision for controlling erosion and sedimentation, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) All earth changes will be designed, constructed, and completed in such a manner so that the exposed area of any disturbed land will be limited to the shortest period of time possible.

(2) Sediment caused by accelerated soil erosion will be removed from runoff water before it leaves the development site.

(3) Any temporary or permanent facility designed and constructed for the conveyance of water around, through, or from the development site will be designed to limit the water flow to a non-erosive velocity.

(4) Permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area will be completed within fifteen calendar days after final grading has been completed. When it is not possible or practical to permanently stabilize disturbed land, temporary erosion control measures will be implemented within thirty calendar days of the exposure of soil.

(5) When vegetative cover will be established as a temporary or permanent erosion control measure:

(a) Plant species to be used and the seeding rates will take into account soil, slope, climate, and duration and use of the vegetative cover.

(b) Mulch will be provided at rates appropriate to ensure a minimum of soil and seed loss until an acceptable "catch" of seed is obtained.

(c) Reseeding will be done within a reasonable period of time if there is not an acceptable "catch".

(6) All development plans will incorporate building designs and street layouts that fit and utilize existing topography and desirable natural surroundings to the fullest extent possible.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that adequate provision will be made to control erosion and sedimentation, including information such as the following when appropriate:

(1) A comprehensive erosion and sedimentation control plan, designed in accordance with the "Maine Environmental Quality Handbook", the U.S.D.A., Soil Conservation Service's

"Engineering Field Manual", or another appropriate reference, which includes the following information:

(a) A description and location of the limits of all proposed construction activities which result in the disturbance of the land.

(b) A description and location of all existing and proposed on-site drainage.

(c) The timing and sequence of all proposed land disturbances.

(d) A description and location of all proposed temporary and permanent erosion and sedimentation control measures, including the timing and sequence of their completion.

(e) A proposed program for the maintenance of all erosion and sedimentation control facilities which will remain after the project is completed, including a designation of the responsible party.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the developer will make adequate provision to control erosion and sedimentation, such as requiring that:

(1) Erosion control devices be in place before the commencing of other construction activities.

(2) Construction activity be limited to certain times of the year, particularly when soil type, slope, and the extent of area to be stripped pose serious potential for erosion and sedimentation.

6. No Unreasonable Adverse Effect on Surface Water Quality

A. Preamble. The Board recognizes that developments have the potential to cause the pollution of surface waters through both point and non-point sources of pollution.

B. Scope of Review. In determining whether the proposed development will have an unreasonable adverse effect on surface water quality, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) The development or reasonably foreseeable consequences of the development will not discharge any water pollutants which affect the state classification of a surface water body (38 M.R.S.A. Section 363 et seq.).

(2) The best practicable treatment of point sources of water pollutants will be utilized.

(3) The total phosphorous concentrations in all tributaries to great ponds will not exceed the standard established in Department Regulation 583.1 as the result of the proposed development.

(4) Any effect on surface water temperature will be in compliance with all appropriate standards established in Department Regulations 582.1 - 582.8.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on surface water quality, including information such as the following, when appropriate:

(1) Where sewage disposal is to be handled off-site by a municipal or quasi-municipal sewage treatment facility, a letter from the authorized agent of the facility stating that there is adequate capacity to ensure satisfactory treatment.

(2) Evidence that a waste discharge license, as required by 38 M.R.S.A. Sections 413 et seq., has been or will be obtained.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the proposed development will have no unreasonable adverse effect on surface water quality.

7. No Unreasonable Adverse Effect on Ground Water Quality

A. Preamble. The Board recognizes the importance of protecting ground water resources in order to promote the future health, safety, and welfare of the citizens of Maine through the maintenance of an adequate supply of safe drinking water.

B. Scope of Review. In determining whether the proposed development will have an unreasonable adverse effect on ground water quality, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) The development will not result in the existing ground water quality becoming inferior to the physical, biological, chemical, and radiological levels for raw and untreated drinking water supply sources specified in the Maine State Drinking Water Regulations, pursuant to 22 M.R.S.A. Section 601. If the existing ground water quality is inferior to the State Drinking Water Regulations, the developer will not degrade the water quality any further.

C. Rebuttable Presumption Against Disposal of Waste in Certain Areas. The Board operates under the rebuttable presumption that the storage and/or disposal of solid wastes, hazardous wastes, and leachable or liquid wastes, including petroleum products and septage, pose serious threats to public health, safety, and welfare through the potential pollution of the ground water when such storage and/or disposal occurs on or above sand and gravel aquifers or the recharge areas of sand and gravel aquifers.

NOTE: Maps of sand and gravel aquifers and their recharge areas are available for portions of the state from the Bureau of Geology, Department of Conservation, Augusta.

(1) An applicant seeking approval for a development which involves one or more of the activities specified above, must overcome this presumption by persuasive evidence that the development is unique in some way that allows for compliance with the intent of this subsection.

D. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on ground water quality, including information such as the following, when appropriate:

(1) A comprehensive list, including physical and chemical characteristics and projected quantities of wastes to be disposed of or stored within the proposed development which may potentially contaminate the ground water.

(2) Methods for preventing ground water pollution as the result of the disposal and/or storage of wastes.

(3) An evaluation of the geological, hydrologic, and soils conditions of the development site.

(4) Data establishing background ground water quality.

(5) Proposed plan of action, and alternatives, to be followed in the event the proposed development results in ground water contamination.

E. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the proposed development will have no unreasonable adverse effect on ground water quality, such as requiring that:

(1) A ground water monitoring program be established and reports be filed with the Department at designated intervals.

(2) Specified wastes not be disposed of or stored within the proposed development.

8. No Unreasonable Adverse Effect on Ground Water Quantity

A. Preamble. The Board recognizes the importance of maintaining an adequate supply of ground water for drinking purposes. The Board also recognizes that the depletion of ground water resources can result in the intrusion of salt water into potable ground water supplies and can affect the hydrologic characteristics of surface water bodies (peak flows, low flows and water levels) resulting in adverse effects on their assimilative capacity and recreational use, as well as on certain wildlife habitats. Additionally, new wells can cause a lowering of the ground water supply to the point where existing wells run dry, particularly during the late summer and early fall.

B. Scope of Review. In determining whether the proposed development will have an unreasonable adverse effect on ground water quantity, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) The quantity of water to be taken from ground water sources will not substantially lower the found water table, cause salt water intrusion, cause undesirable changes in ground water flow patterns, or cause unacceptable ground subsidence.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on ground water quantity, including information such as the following, where appropriate:

(1) Estimates of the quantity of ground water to be used by the proposed development.

(2) In the areas where salt water intrusion, the lowering of the ground water level, or land subsidence have been or can be reasonably be expected to be a problem, a report by a duly qualified person addressing the potential effects of ground water use by the proposed development.

D. Terms and Conditions. The Board may, as a term or condition of approval establish any reasonable requirement to ensure that there will be no unreasonable adverse effect on ground water quantity, such as requiring that:

(1) A development obtain its water from a surface water source, public community supply, or utility.

(2) Wells in the surrounding area be monitored to determine the effect of the development on ground water levels.

(3) People in the surrounding area, whose wells are adversely affected by the development, be provided with new wells or another source of potable water for their use and consumption.

9. Buffer Strips

A. Preamble. The Board recognizes the importance of natural buffer strips in protecting water quality and wildlife habitat. The Board also recognizes that buffer strips can serve as visual screens which can serve to lessen the visual impact of incompatible or undesirable land uses. The width and nature of buffer strips, if required, shall be determined by the Board on a case-by-case basis.

B. Scope of Review. In determining whether the developer has made adequate provision for buffer strips, when appropriate, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) Water bodies within or adjacent to the development will be adequately protected from sedimentation and surface runoff by buffer strips.

(2) Buffer strips will provide adequate space for movement of wildlife between important habitats.

(3) Buffer strips will shield adjacent uses from unsightly developments and lighting.

NOTE: The following GUIDELINES should be considered in establishing visual buffer strips.

(1) Plant materials used in the screen planting will be at least four feet high when planted and be of such evergreen species as will produce ultimately a dense visual screen at least eight feet high. Alternatively, a six-foot high wooden fence, without openings wider than 1", may be substituted.

(2) The screen will be maintained permanently, and any plant material which does not live will be replaced within one year.

(3) Screen planting will be so placed that at maturity it will be no closer than three feet away from any street or property line.

(4) The screen will be broken only at points of vehicular or pedestrian access.

(5) Fencing and screening will be so located within the developer's property line to allow access for maintenance on both sides without intruding upon abutting properties.

C. **Excavations for Sand, Gravel, Clay, Silt, Topsoil, or Rock** -- Buffer strips associated with an excavation for sand, gravel, clay, silt, topsoil, or rock must meet the buffer strip standards specified in Performance Standards for Excavations, 38 M.R.S.A. § 490-D, and Performance Standards for Quarries, 38 M.R.S.A. § 490-Z. These standards apply in lieu of Section 9(B) (1)-(3).

A gravel pit previously licensed under the Site Location of Development Law, 38 M.R.S.A § 484, may apply for a modification of the buffer strip requirements in such a permit. The Department may approve such modification if the buffer strip at least meets the minimum standards of §§ 490-D and 490-Z and the proposed excavation will not result in an unreasonable adverse impact on the natural environment.

D. **Submissions**. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that adequate provision of buffer strips, when appropriate, will be made, including information such as the following:

(1) The location and width of all natural buffer strips to be retained.

(2) The nature, location, width, and height of all vegetative buffer strips or architectural screens to be established.

(3) Legal provisions for the maintenance of all buffer strips and architectural screens.

E. **Terms and Conditions**. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the developer has made adequate provision for the establishment of buffer strips, such as requiring:

(1) The maintenance of existing vegetation as a natural buffer strip, which shall remain as a permanent feature of the landscape.

(2) The incorporation of buffer strip maintenance into deed covenants in projects where deed transfers of property to the general public are contemplated.

(3) Written permission of the Department of Environmental Protection for activities which may adversely affect a body of water or wildlife habitat protected by a natural buffer strip, such as: removal of live trees, stump and hot systems, and the displacement of rocks, topsoil and similar activities which would cause or allow increased soil erosion.

(4) The establishment of particular species of vegetation.

(5) The use of particular materials, colors, and styles in the construction of architectural screens.

10. Control of Noise

A. Preamble. The Board recognizes that the construction, operation and maintenance of developments may cause excessive noise that could degrade the health and welfare of nearby neighbors. It is the intent of the Board to require adequate provision for the control of excessive environmental noise from developments proposed after the effective date of this regulation.

B. Applicability

(1) This regulation applies to proposed developments within municipalities without a local quantifiable noise standard and in unorganized areas of the State. When a proposed development is located in a municipality which has duly enacted by ordinance an applicable quantifiable noise standard, which (1) contains limits that are not higher than the sound level limits contained in this regulation by more than 5 dBA, and (2) limits or addresses the various types of noises contained in this regulation or all the types of noises generated by the development, that local standard, rather than this regulation, shall be applied by the Board within that municipality for each of the types of sounds the ordinance regulates. This regulation applies to developments located within one municipality when the noise produced by the development is received in another municipality and, in these cases, the Board will also take into consideration the municipalities' quantifiable noise standards, if any.

(2) This regulation applies to expansions and modifications of developments when such expansions and modifications are proposed after the effective date of this regulation and subject to site location approval, but only to the noise produced by the proposed expansion or modification of the development, unless (1) the existing development was constructed since 1-1-70 and (2) at the time of construction, the existing development was too small to require site location approval. In situations where conditions (1) and (2) above apply, then this regulation applies to the whole development (both existing facility and proposed expansion or modification). This regulation also applies to expansions and modifications of existing developments when such expansions and modifications require an amendment to the development's Site Law permit, but only to the noise produced by the expansion or modification.

(3) This regulation does not apply to existing developments or portions of existing developments constructed prior to 1-1-70 or approved under the Site Law prior to the effective date of this regulation. This regulation does not apply to relicensing of existing solid waste facilities previously approved under the Site Law.

(4) The sound level limits contained in this regulation apply only to areas that are defined as protected locations, and to property lines of the proposed development or contiguous property owned by the developer, whichever are farther from the proposed development's regulated sound sources.

(5) The sound level limits contained in this regulation do not apply to noise received within the development boundary.

NOTE: The Board will reconsider the effect and operation of the regulation one year from its effective date.

C. Sound Level Limits

(1) Sound From Routine Operation of Developments

(a) Except as noted in subsections (b) and (c) below, the hourly sound levels resulting from routine operation of the development and measured in accordance with the measurement procedures described in subsection H shall not exceed the following limits:

(i) At any property line of the development or contiguous property owned by the developer, whichever is farther from the proposed development's regulated sound sources:

75 dBA at any time of day.

(ii) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial;

60 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
50 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit").

(iii) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:

70 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
60 dBA between 7:00 p.m. and 7:00 a.m.
(the 'nighttime hourly limit').

(iv) For the purpose of determining whether the use of an unzoned area is predominantly commercial, transportation, or industrial (e.g. non-residential in nature), the Department shall consider the municipality's comprehensive plan, if any. Furthermore, the usage of properties abutting each protected location shall be determined, and the limits applied for that protected location shall be based upon the usage occurring along the greater portion of the perimeter of that parcel; in the event the portions of the perimeter are equal in usage, the limits applied for that protected location shall be those for a protected location in an area for which the use is not predominantly commercial, transportation, or industrial.

(v) When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level at a protected location is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level at a protected location is equal to or less than 35 dBA, the hourly sound levels resulting from routine operation of the development and measured in accordance with the measurement procedures described in subsection H shall not exceed the following limits at that protected location:

55 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
45 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit").

For the purpose of determining whether a protected location has a daytime or nighttime pre-development ambient hourly sound level equal to or less than 45 dBA or 35 dBA, respectively, the developer may make sound level measurements in accordance with the procedures in subsection H or may estimate the sound-level based upon the population density and proximity to local highways. If the resident population within a circle of 3,000 feet radius around a protected location is greater than 300 persons, or the hourly sound level from highway traffic at a protected location is predicted to be greater than 45 dBA in the daytime or 35 dBA at night (as appropriate for the anticipated operating schedule of the development), then the developer may ,estimate the daytime or nighttime pre-development ambient hourly sound level to be greater than 45 dBA or 35 dBA, respectively.

NOTE: Highway traffic noise can be predicted using the nomograph method of FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978.

(vi) Notwithstanding the above, the developer need not measure or estimate the pre-development ambient hourly sound levels at a protected location if he demonstrates, by estimate or example, that the hourly sound levels resulting from routine operation of the development will not exceed 50 dBA in the daytime or 40 dBA at night.

(b) If the developer chooses to demonstrate by measurement that the daytime and/or nighttime pre-development ambient sound environment at any protected location near the development site exceeds the daytime and/or nighttime limits in subsection 1(a)(ii) or 1(a)(iii) by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.

(c) For any protected location near an existing development, the hourly sound level limit for routine operation of the existing development and all future expansions of that development shall be the applicable hourly sound level limit of 1(a) or l(b) above, or, at the developer's election, the existing hourly sound level from routine operation of the existing development plus 3 dBA.

(d) For the purposes of determining compliance with the above sound level limits, 5 dBA shall be added to the observed levels of any tonal sounds that result from routine operation of the development.

(e) When routine operation of a development produces short duration repetitive sound, the following limits shall apply:

(i) For short duration repetitive sounds, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits.

(ii) For short duration repetitive sounds resulting from scrap metal, drop forge and metal fabrication operations or developments which the Board determines, due to their character and/or duration, are particularly annoying or pose a threat to the health and welfare of nearby neighbors, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits, and the maximum sound level of the short duration repetitive sounds shall not exceed the following limits:

(a) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial:

65 dBA between 7:00 a.m. and 7:00 p.m., and
55 dBA between 7:00 p.m. and 7:00 a.m.

(b) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:

75 dBA between 7:00 a.m. and 7:00 p.m., and
65 dBA between 7:00 p.m. and 7:00 a.m.

(c) The methodology described in subsection 1(a)(iv) shall be used to determine whether the use of an unzoned area is predominantly commercial, transportation, or industrial.

(d) If the developer chooses to demonstrate by measurement that the pre-development ambient hourly sound level at any protected location near the development site exceeds 60 dBA between 7:00 a.m. and 7:00 p.m., and/or 50 dBA between 7:00 p.m. and 7:00 a.m., then the maximum sound level limit for short duration repetitive sound shall be 5 dBA greater than the measured pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.

(e) For any protected location near an existing development, the maximum sound level limit for short duration repetitive sound resulting from routine operation of the existing development and all future expansions and modifications of that development shall be the applicable maximum sound level limit of (e)(ii)(a) or (e)(ii)(b) above, or, at the developer's election, the existing maximum sound level of the short duration repetitive sound resulting from routine operation of the existing development plus 3 dBA.

NOTE: The maximum sound level of the short duration repetitive sound shall be measured using the fast response [L_{AFmax}]. See the definition of maximum sound level.

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(2) **Sound From Construction of Developments**

(a) The sound from construction activities between 7:00 p.m. and 7:00 a.m. is subject to the following limits:

(i) Sound from nighttime construction activities shall be subject to the nighttime routine operation sound level limits contained in subsections l(a) and 1(b).

(ii) If construction activities are conducted concurrently with routine operation, then the combined total of construction and routine operation sound shall be subject to the nighttime routine operation sound level limits contained in subsections 1(a) and 1(b).

(iii) Higher levels of nighttime construction sound are permitted when a duly issued permit authorizing nighttime construction sound in excess of these limits has been granted by:

1. the local municipality when the duration of the nighttime construction activity is less than or equal to 90 days,

2. the local municipality and the Board when the duration of the nighttime construction activity is greater than 90 days.

(b) Sound from construction activities between 7:00 a.m. and 7:00 p.m. shall not exceed the following limits at any protected location:

Duration of Activity	**Hourly Sound Level Limit**
12 hours	87 dBA
8 hours	90 dBA
6 hours	92 dBA
4 hours	95 dBA
3 hours	97 dBA
2 hours	100 dBA
1 hour or less	105 dBA

(c) All equipment used in construction on development sites shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition, as originally provided with the equipment by its manufacturer.

(3) Sound From Maintenance Activities

(a) Sound from routine, ongoing maintenance activities shall be considered part of the routine operation of the development and the combined total of the routine maintenance and operation sound shall be subject to the routine operation sound level limits contained in subsection 1.

(b) Sound from occasional, major, scheduled overhaul activities shall be subject to the construction sound level limits contained in subsection 2. If overhaul activities are conducted concurrently with routine operation and/or construction activities, the combined total of the overhaul, routine operation and construction sound shall be subject to the construction sound level limits contained in subsection 2.

(4) Sound From Production Blasting

Sound exceeding the limits of subsection 1 and resulting from production blasting at a mine or quarry shall be limited as follows:

(a) Blasting shall not occur in the period between sundown and sunrise the following day or in the period between the hours of 7:00 p.m. and 7:00 a.m., whichever is greater. In addition, no routine production blasting shall be allowed in the daytime on Sundays.

(b) Blasting shall not occur more frequently than four times per day.

(c) Sound from blasting shall not exceed the following limits at any protected location:

Number of Blasts Per Day	**Sound Level Limit**
1	129 dBL
2	126 dBL
3	124 dBL
4	123 dBL.

Blast sound shall be measured in peak linear sound level (dBL) with a linear response down to 5 Hz.

NOTE: See Bureau of Mines Report of Investigations 8485 for information on airblast sound levels and pertinent scaled distances.

(5) Exemptions

Sound associated with the following shall be exempt from regulation by the Board:

(a) Railroad equipment which is subject to federal noise regulations.

(b) Aircraft operations which are subject to federal noise regulations.

(c) Registered and inspected vehicles:

  - (i) while operating on public ways, or
  - (ii) which enter the development to make a delivery or pickup and which are moving, starting or stopping, but not when they are parked for over 60 minutes in the development.

(d) Watercraft while underway.

(e) Residential developments, except during construction of such developments.

(f) Bells, chimes and carillons.

(g) occasional sporting, cultural, religious or public events allowed by the local municipality where the only affected protected locations are contained within that municipality.

(h) The unamplified human voice and other sounds of natural origin.

(i) Firming, fishing and aquacultural activity.

(j) Forest management, harvesting and transportation activities.

(k) Making, maintaining and grooming snow where the only affected protected locations are contained within the general boundaries of a ski area development.

(1) Snow removal, landscaping and street sweeping activities.

(m) Emergency maintenance and repairs.

(n) Warning signals and alarms.

(o) Safety and protective devices installed in accordance with code requirements.

(p) Test operations of emergency equipment occurring in the daytime and no more frequently than once per week.

(q) Boiler start-up, testing and maintenance operations occurring no more frequently than once per month.

(r) Major concrete pours that must extend after 7:00 p.m., when started before 3:00 p.m.

(s) Sounds from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location. This exemption shall only be for the specific noise, land and term covered by the easement.

(t) A force majeure event and other causes not reasonably within the control of the owners or operators of the development.

(6) **Noise Abatement Structures**

Noise abatement structures of a non-permanent nature in any one location for a duration of less than one year and erected for the sole purpose of noise control shall not be considered structures as defined in 38 MRSA subsection 482(6).

D. Submissions

(1) **Developments with Minor Sound Impact**

An applicant for a proposed development with minor sound impact may choose to file as part of the site location application a statement attesting to the minor nature of the anticipated sound impact of their development. An applicant proposing an expansion or modification of an existing development with minor sound impact may follow the same procedure as described above. For the purpose of this regulation, a development or an expansion or modification of an existing development with minor sound impact means a development where the developer demonstrates, by estimate or example, that the regulated sound from routine operation of the development will not exceed 5 dBA less than the applicable limits established under subsection C. It is the intent of this subsection that an applicant need not conduct sound level measurements to demonstrate that the development or an expansion or modification of an existing development will have a minor sound impact.

NOTE: Examples include subdivisions without structures, office buildings, storage buildings which will not normally be accessed at night, and golf courses.

(2) **Other Developments**

Technical information shall be submitted describing the applicant's plan and intent to make adequate provision for the control of sound. The applicant's plan shall contain information such as the following, when appropriate:

(a) Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the development.

(b) A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed development, including their locations within the proposed development.

(c) A description of the daytime and nighttime hourly sound levels and, for short duration repetitive sounds, the maximum sound levels expected to be produced by these sound sources at protected locations near the proposed development.

(d) A description of the protected locations near the proposed development.

(e) A description of proposed major sound control measures, including their locations and expected performance.

(f) A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.

(g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.

E. Terms and Conditions

The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the developer has made adequate provision for the control of noise from the development and to reduce the impact of noise on protected locations. Such conditions may include, but are not limited to, enclosing equipment or operations, imposing limits on hours of operation, or requiring the employment of specific design technologies, site design, modes of operation, or traffic patterns.

The sound level limits prescribed in this regulation shall not preclude the Board under Chapter 375.15 from requiring a developer to demonstrate that sound levels from a development will not unreasonably disturb wildlife or adversely affect wildlife populations. In addition, the sound level limits shall not preclude the Board, as a term or condition of approval, from requiring that lower sound level limits be met to ensure that the developer has made adequate provision for the protection of wildlife.

F. Variance From Sound Level Limits

The Board recognizes that there are certain developments or activities associated with development for which noise control measures are not reasonably available. Therefore, the Board or Commissioner may grant a variance from any of the sound level limits contained in this rule upon (1) a showing by the applicant that he or she has made a comprehensive assessment of the available technologies for the development and that the sound level limits cannot practicably be met with any of these available technologies, and (2) a finding by the Board that the proposed development will not have an unreasonable impact on protected locations. In addition, a variance may be granted by the Board or Commissioner if (1) a development is deemed necessary in the interest of national defense or public safety and the applicant has shown that the sound level limits cannot practicably be met without unduly limiting the development's intended function, and (2) a finding is made by the Board or Commissioner that the proposed development will not have an unreasonable impact on protected locations. The Board or Commissioner shall consider the request for a variance as part of the review of a completed Site Location of Development Law application. In granting a variance, the Board or Commissioner may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

G. Definitions

Terms used herein are defined below for the purpose of this noise regulation.

(1) **AMBIENT SOUND**: At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific development of interest.

(2) **CONSTRUCTION**: Activity and operations associated with the development or expansion of a project or its site.

(3) **EMERGENCY**: An unforeseen combination of circumstances which calls for immediate action.

(4) **EMERGENCY MAINTENANCE AND REPAIRS**: Work done in response to an emergency.

(5) **ENERGY SUM OF A SERIES OF LEVELS**: Ten times the logarithm of the arithmetic sum of the antilogarithms of one-tenth of the levels. [Note: See Section H(4.2).]

(6) **EXISTING DEVELOPMENT**: A development constructed before 1-1-70 or a development approved under the Site Law prior to the effective date of this regulation or a proposed development for which the site location application is complete for processing on or before the effective date of this regulation. Any development with a site location approval which has been remanded to the Board by a court of competent jurisdiction for further proceedings relating to noise limits or noise levels prior to the effective date of these regulations shall not be deemed an existing development and these regulations shall apply to the existing noise sources at that development.

(7) **EXISTING HOURLY SOUND LEVEL**: The hourly sound level resulting from routine operation of an existing development prior to the first expansion that is subject to this regulation.

(8) **EQUIVALENT SOUND LEVEL**: The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period.

NOTE: For convenience, a one hour equivalent sound level should begin approximately on the hour.

(9) **HISTORIC AREAS**: Historic sites administered by the Bureau of Parks and Recreation of the Maine Department of Conservation, with the exception of the Arnold Trail.

(10) **HOURLY SOUND LEVEL**: The equivalent sound level for one hour measured or computed in accordance with this regulation.

(11) **LOCALLY-DESIGNATED PASSIVE RECREATION AREA**: Any site or area designated by a municipality for passive recreation that is open and maintained for public use and which:

(a) has fixed boundaries,

(b) is owned in fee simple by a municipality or is accessible by virtue of public easement,

(c) is identified and described in a local comprehensive plan, and

(d) has been identified and designated at least nine months prior to the filing of the applicant's Site Location of Development application.

(12) **MAXIMUM SOUND LEVEL**: Ten times the common logarithm of the square of the ratio of the maximum sound to the reference sound of 20 micropascals. Symbol: L_{AFmax}.

(13) **MAXIMUM SOUND**: Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit: pascal (Pa).

(14) **RESIDENCE**: A building or structure, including manufactured housing, maintained for permanent or seasonal residential occupancy providing living, cooking and sleeping facilities and having permanent indoor or outdoor sanitary facilities, excluding recreational vehicles, tents and watercraft.

(15) **PRE-DEVELOPMENT AMBIENT**: The ambient sound at a specified location in the vicinity of a development site prior to the construction and operation of the proposed development or expansion.

(16) **PROTECTED LOCATION**: Any location, accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time a Site Location of Development application is submitted; or any location within a State Park, Baxter State Park, National Park, Historic Area, a nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy, The Appalachian Trail, the Moosehorn National Wildlife Refuge, federally-designated wilderness area, state wilderness area designated by statute (such as the Allagash Wilderness Waterway), or locally-designated passive recreation area; or any location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a protected location.

At protected locations more than 500 feet from living and sleeping quarters within the above noted buildings or areas, the daytime hourly sound level limits shall apply regardless of the time of day.

Houses of worship, academic schools, libraries, State and National Parks without camping areas, Historic Areas, nature preserves, the Moosehorn National Wildlife Refuge, federally-designated wilderness areas without camping areas, state wilderness areas designated by statute without camping areas, and locally-designated passive recreation areas without camping areas are considered protected locations only during their regular hours of operation and the daytime hourly sound level limits shall apply regardless of the time of day.

Transient living accommodations are generally not considered protected locations; however, in certain special situations where it is determined by the Board that the health and welfare of the guests and/or the economic viability of the establishment will be unreasonably impacted, the Board may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations.

This term does not include buildings and structures located on leased camp lots, owned by the applicant, used for seasonal purposes.

For purposes of this definition, (1) a residence is considered planned when the owner of the parcel of land on which the residence is to be located has received all applicable building and land use permits and the time for beginning construction under such permits has not expired, and (2) a residential subdivision is considered approved when the developer has received all applicable land use permits for the subdivision and the time for beginning construction under such permits has not expired.

(17) **QUANTIFIABLE NOISE STANDARD**: A numerical limit governing noise from developments that has been duly enacted by ordinance by a local municipality.

(18) **ROUTINE OPERATION**: Regular and recurrent operation of regulated sound sources associated with the purpose of the development and operating on the development site.

(19) **SHORT DURATION REPETITIVE SOUNDS**: A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten seconds in duration, and which are inherent to the process or operation of the development and are foreseeable.

(20) **SOUND COMPONENT**: The measurable sound from an audibly identifiable source or group of sources.

(21) **SOUND LEVEL**: Ten times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this regulation, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.

(22) **SOUND PRESSURE**: Root-mean-square of the instantaneous sound pressures in a stated frequency band and during a specified time interval. Unit: pascal (Pa).

(23) **SOUND PRESSURE LEVEL**: Ten times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.

(24) **TONAL SOUND**: for the purpose of this regulation, a tonal sound exists if, at a protected location, the one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz.

Additional acoustical terms used in work associated with this regulation shall be used in accordance with the following American National Standards Institute (ANSI) standards:

ANSI S12.9-1988 - American National Standard Quantities and Procedures for Description and Measurements of Environmental Sound, Part 1;

ANSI S3.20-1973 - American National Standard Psychoacoustical Terminology;

ANSI S1.1-1960 - American National Standard Acoustical Terminology.

H. Measurement Procedures

(1) **Scope**. These procedures specify measurement criteria and methodology for use, with applications, compliance testing and enforcement. They provide methods for measuring the ambient sound and the sound from routine operation of the development, and define the information to be reported. The same methods shall be used for measuring the sound of construction, maintenance and production blasting activities. For measurement of the sound of production blasting activities for comparison with the limits of subsection C(4)(c), these same methods shall be used with the substitution of the linear sound level for the A-weighted sound level.

(2) Measurement Criteria

2.1 Measurement Personnel

Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the Board or Commissioner.

2.2 Measurement Instrumentation

(a) A sound level meter or alternative sound level measurement system used shall meet all of the Type 1 or 2 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983.

(b) An integrating sound level meter (or measurement system) shall also meet the Type 1 or 2 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 804 (1985).

(c) A filter for determining the existence of tonal sounds shall meet all the requirements of-American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11-1986 for Order 3, Type 3-D performance.

(d) An acoustical calibrator shall be used of a type recommended by the manufacturer of the sound level meter and that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40-1984.

(e) A microphone windscreen shall be used of a type recommended by the manufacturer of the sound level meter.

2.3 Calibration

(a) The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Bureau of Standards.

(b) Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

2.4 Measurement Location, Configuration and Environment

(a) Except as noted in subsection (b) below, measurement locations shall be at nearby protected locations that are most likely affected by the sound from routine operation of the development.

(b) For determining compliance with the 75 dBA property line hourly sound level limit described in subsection C(l)(a)(i), measurement locations shall be selected at the property lines of the proposed development or contiguous property owned by the developer, as appropriate.

(c) The microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.

(d) Measurement locations should be selected so that no vertical reflective surface exceeding the microphone height is located within 30 feet. When this is not possible, the measurement location may be closer than 30 feet to the reflective surface, but under no circumstances shall it be closer than 6 feet.

(e) When possible, measurement locations should be at least 50 feet from any regulated sound source on the development.

(f) Measurement periods shall be avoided when the local wind speed exceeds 12 mph and/or precipitation would affect the measurement results.

2.5 **Measurement Plans**. Plans for measurement of pre-development ambient sound or post-development sound may be discussed with the Department staff.

(3) Measurement of Ambient Sound

3.1 Pre-Development Ambient Sound

Measurements of the pre-development ambient sound are required only when the developer elects to establish the sound level limit in accordance with subsections C(1)(b) and C(1)(e)(ii)(d) for a development in an area with high ambient sound levels, such as near highways, airports, or pre-existing developments; or when the developer elects to establish that the daytime and nighttime ambient hourly sound levels at representative protected locations exceed 45 dBA and 35 dBA, respectively.

(a) Measurements shall be made at representative protected locations for periods of time sufficient to adequately characterize the ambient sound. At a minimum, measurements shall be made on three different weekdays (Monday through Friday) during all hours that the development will operate. If the proposed development will operate on Saturdays and/or Sundays, measurements shall also be made during all hours that the development will operate.

(b) Measurement periods with particularly high ambient sounds, such as during holiday traffic activity, significant insect activity or high coastline waves, should generally be avoided.

(c) At any measurement location the daytime and nighttime ambient hourly sound level shall be computed by arithmetically averaging the daytime and nighttime values of the measured one hour equivalent sound levels. Multiple values, if they exist, for any specific hour on any specific day shall first be averaged before the computation described above.

3.2 Post-Development Ambient Sound

(a) Measurements of the post-development ambient one hour equivalent sound levels and, if short duration repetitive sounds are produced by the development, the maximum sound levels made at nearby protected locations and during representative routine operation of the development that are not greater than the applicable limits of subsection C clearly indicate compliance with those limits.

(b) Compliance with the limits of subsection C(l)(b) may also be demonstrated by showing that the post-development ambient hourly sound level, measured in accordance with the procedures of subsection 3.1 above during routine operation of the development, does not exceed the pre-development ambient hourly sound level by more than one decibel, and that the sound from routine operation of the development is not characterized by either tonal sounds or short duration repetitive sounds.

(c) Compliance with the limits of subsection C(1)(e)(ii)(d) may also be demonstrated by showing that the post development maximum sound level of any short duration repetitive sound, measured in accordance with the procedures of subsection 3.1 above, during routine operation of the development, does not exceed the pre-development ambient hourly sound level by more than five decibels.

(d) If any of the conditions in (a), (b) or (c) above are not met, compliance with respect to the applicable limits must be determined by measuring the sound from routine operation of the development in accordance with the procedures described in subsection 4.

(4) Measurement of the Sound from Routine Operation of Developments.

4.1 General

(a) Measurements of the sound from routine operation of developments are generally necessary only for specific compliance testing purposes in the event that community complaints result from operation of the development, for validation of an applicant's calculated sound levels when requested by the Board or Commissioner, for determination of existing hourly sound levels for an existing development or for enforcement by the Department.

(b) Measurements shall be obtained during representative weather conditions when the development sound is most clearly noticeable. Preferable weather conditions for sound measurements at distances greater than about 500 feet from the sound source include overcast days when the measurement location is downwind of the development and inversion periods (which most commonly occur at night).

(c) Measurements of the development sound shall be made so as to exclude the contribution of sound from development equipment that is exempt from this regulation.

4.2 Measurement of the Sound Levels Resulting from Routine Operation of the Development

(a) When the ambient sound levels are greater than the sound level limits, additional measurements can be used to determine the hourly sound level that results from routine operation of the development. These additional measurements may include diagnostic measurements such as measurements made close to the development and extrapolated to the protected location, special checkmark measurement techniques that include the separate identification of audible sound sources, or the use of sound level meters with pause capabilities that allow the operator to exclude non-development sounds.

(b) For the purposes of computing the hourly sound level resulting from routine operation of the development, sample diagnostic measurements may be made to obtain the one hour equivalent sound levels for each sound component.

(c) Identification of tonal sounds produced by the routine operation of a development for the purpose of adding the 5 dBA penalty in accordance with subsection C(l)(d) requires aural perception by the measurer, followed by use of one-third octave band spectrum analysis instrumentation. If one or more of the sounds of routine operation of the development are found to be tonal sounds, the hourly sound level component for tonal sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds.

(d) Identification of short duration repetitive sounds produced by routine operation of a development requires careful observations. For the sound to be classified as short duration repetitive sound, the source(s) must be inherent to the process or operation of the development and not the result of an unforeseeable occurrence. If one or more of the sounds of routine operation of the development are found to be short duration repetitive sounds, the hourly sound level component for short duration repetitive sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds. If required, the maximum sound levels of short duration repetitive sounds shall be measured using the fast response [L_{AFmax}]. The duration and the frequency of occurrence of the events shall also be measured. In some cases, the sound exposure levels of the events may be measured. The one hour equivalent sound level of a short duration repetitive sound may be determined from measurements of the maximum sound level during the events, the duration and frequency of occurrence of the events, and their sound exposure levels.

(e) The daytime or nighttime hourly sound level resulting from routine operation of a development is the energy sum of the hourly sound level components from the development, including appropriate penalties, (see (c) and (d) above). If the energy sum does not exceed the appropriate daytime or nighttime sound level limit, then the development is in compliance with that sound level limit at that protected location.

(5) **Reporting Sound Measurement Data**. The sound measurement data report should include the following:

(a) The dates, days of the week and hours of the day when measurements were made.

(b) The wind direction and speed, temperature, humidity and sky condition.

(c) Identification of all measurement equipment by make, model and serial number.

(d) The most recent dates of laboratory calibration of sound level measuring equipment.

(e) The dates, times and results of all field calibrations during the measurements.

(f) The applicable sound level limits, together with the appropriate hourly sound levels and the measurement data from which they were computed, including data relevant to either tonal or short duration repetitive sounds.

(g) A sketch of the site, not necessarily to scale, orienting the development, the measurement locations, topographic features and relevant distances, and containing sufficient information for another investigator to repeat the measurements under similar conditions.

(h) A description of the sound from the development and the existing environment by character and location.

I. Sound Level Standards for Wind Energy Developments

(1) Applicability

This subsection applies to grid-scale wind energy developments as defined by 35-A M.R.S.A. § 3451(6) and small-scale wind energy developments governed by 35-A M.R.S.A. §3456, hereinafter referred to as "wind energy developments." The provisions in Section 10(C)(1), 10(D)(2), 10(F), and 10(H) of this Rule do not apply to wind energy developments.

(2) Sound Level Limits for Routine Operation of Wind Energy Developments

The sound levels resulting from routine operation of a wind energy development measured in accordance with the measurement procedures described in subsection I(8) shall not exceed the following limits:

(a) 75 dBA at any time of day at any property line of the wind energy development or contiguous property owned or controlled by the wind energy developer, whichever is farther from the proposed wind energy development's regulated sound sources; and

(b) 55 dBA between 7:00 a.m. and 7:00 p.m. (the "daytime limit"), and 42 dBA between 7:00 p.m. and 7:00 a.m. (the "nighttime limit") at any protected location.

(3) Tonal Sounds

For the purposes of this subsection, a tonal sound exists if, at a protected location, the 10 minute equivalent average one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz. 5 dBA shall be added to any average 10 minute sound level ($Leq_{A\ 10\text{-min}}$) for which a tonal sound occurs that results from routine operation of the wind energy development.

(4) Short Duration Repetitive Sounds ("SDRS")

For the purposes of this subsection SDRS is defined as a sequence of repetitive sounds that occur within a 10-minute measurement interval, each clearly discernible as an event resulting from the development and causing an increase in the sound level of 5 dBA or greater on the fast meter response above the sound level observed immediately before and after the event, each typically ±1 second in duration, and which are inherent to the process or operation of the development.

(a) When routine operation of a wind energy development produces short duration repetitive sound, a 5 dBA penalty shall be arithmetically added to each average 10-minute sound level ($Leq_{A\ 10\text{-min}}$) measurement interval in which greater than 5 SDRS events are present.

(5) Compliance with the Sound Level Limits

A wind energy development shall determine compliance with the sound level limits as set forth in subsection I(2) of this rule in accordance with the following:

(a) Sound level data shall be aggregated in 10-minute measurement intervals within a given compliance measurement period (daytime: 7:00 am to 7:00 pm or nighttime: 7:00 pm to 7:00 am) under the conditions set forth in subsection I(8) of this rule.

(b) Compliance will be demonstrated when the arithmetic average of the sound level of, at a minimum, twelve, 10-minute measurement intervals in a given compliance measurement period is less than or equal to the sound level limit set forth in subsection I(2).

(c) Alternatively, if a given compliance measurement period does not produce a minimum of twelve, 10-minute measurement intervals under the atmospheric and site conditions set forth in subsection I(8) of this rule, the wind energy development may combine six or more contiguous 10-minute measurement intervals from one 12 hour (7:00 am to 7:00 pm daytime or 7:00 pm to 7:00 am nighttime) compliance measurement period with six or more contiguous 10-minute intervals from another compliance measurement period. Compliance will be demonstrated when the arithmetic average of the combined 10-minute measurement intervals is less than or equal to the sound level limit set forth in subsection I(2).

(6) Variance from Sound Level Limits

A variance may be granted by the Department if: (1) a development is deemed necessary in the interest of national defense or public safety and the applicant has shown that the sound level limits cannot practicably be met without unduly limiting the development's intended function, and (2) a finding is made by the Department that the proposed development will not have an unreasonable impact on protected locations. The Department shall consider the request for a variance as part of the review of a completed Site Location of Development Law application or a request for certification for a small-scale wind energy development. In granting a variance, the Department may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

(7) Submissions

Technical information shall be submitted describing the wind energy developer's plan and intent to make adequate provision for the control of sound. The wind energy developer's plan shall contain the following:

(a) A map depicting the location of all proposed sound sources associated with the wind energy development, property boundaries for the proposed wind energy development, property boundaries of all adjacent properties within one mile of the proposed wind energy development, and the location of all protected locations located within one mile of the proposed wind energy development;

(b) A description of the major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed wind energy development;

(c) A description of the equivalent noise levels expected to be produced by the sound sources at protected locations located within one mile of the proposed wind energy development. The description shall include a full-page isopleths map depicting the modeled decay rate of the predicted sound pressure levels expected to be produced by the wind energy development at each clearly identified protected location within one mile of the proposed wind energy development. The predictive model used to generate the equivalent noise levels expected to be produced by the sound sources shall be designed to represent the "predictable worst case" impact on adjacent properties and shall include, at a minimum, the following:

1. The maximum rated sound power output (IEC 61400-11) of the sound sources operating during nighttime stable atmospheric conditions with high wind shear above the boundary layer and consideration of other conditions that may affect in-flow airstream turbulence;
2. Attenuation due to geometric spreading, assuming that each turbine is modeled as a point source at hub height;
3. Attenuation due to air absorption;
4. Attenuation due to ground absorption/reflection;
5. Attenuation due to three dimensional terrain;
6. Attenuation due to forestation;
7. Attenuation due to meteorological factors such as but not limited to relative wind speed and direction (wind rose data), temperature/vertical profiles and relative humidity, sky conditions, and atmospheric profiles;
8. Inclusion of an "uncertainty factor" adjustment to the maximum rated output of the sound sources based on the manufacturer's recommendation; and
9. Inclusion, at the discretion of the Department, of an addition to the maximum rated output of the sound sources to account for uncertainties in the modeling of sound propagation for wind energy developments. This discretionary uncertainty factor of up to 3 dBA may be required by the Department based on the following conditions: inland or coastal location, the extent and specificity of credible evidence of meteorological operating conditions, and the extent of evaluation and/or prior specific experience for the proposed wind turbines. Subject to the Department's discretion based on the information available, there is a rebuttable

presumption of an uncertainty factor of 2 to 3 dBA for coastal developments and of 0 to 2 dBA for inland developments.

(d) A description of the protected locations near the proposed wind energy development.

(e) A description of proposed major sound control measures, including their locations and expected performance.

(f) A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.

(g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.

(h) A description and map identifying one or more compliance testing locations on or near the proposed wind energy development site. The identified compliance testing locations shall be selected to take advantage of prevailing downwind conditions and be able to meet the site selection criteria outlined in subsection I(8)(d)(2).

(i) A description of the compliance measurement protocol as required by subsection 8 below.

(j) A description of the complaint response protocol proposed for the wind energy development. The complaint response protocol shall adequately provide for, at a minimum:

1. A 24-hour contact for complaints;

2. A complaint log accessible by the Department;

3. For those complaints that include sufficient information to warrant an investigation, the protocol must provide for an analysis as set forth in (a) through (c) below. Sufficient information includes, at a minimum: the name and address of the complainant; the date, time and duration of the sound event; a description of the sound event, indoor or outdoor, specific location and a description of any audible sounds from other sources outside or inside the dwelling of the complainant. Analysis of the complaint by the licensee must include:

(a) documentation of the location of the nearest turbines to the complaint location and ground conditions in the area of the complaint location;

(b) weather conditions at the time of the complaint and surface and hub height wind speed and direction;

(c) power output and direction of nearest turbines; and

(d) notification of complaint findings to the Department and the complainant;

4. A plotting of complaint locations and key information on a project area map to evaluate complaints for a consistent pattern of site, operating and weather conditions; and

5. A comparison of these patterns to the compliance protocol to determine whether testing under additional site and operating conditions is necessary and, if so, a testing plan that addresses the locations and the conditions under which a pattern of complaints had occurred.

(8) Measurement Procedures

These procedures specify measurement criteria and methodology for use with wind energy development applications, compliance and complaint response. They provide methods for measuring the sound from operation of the wind energy development and set forth the information to be reported.

(a) Measurement Criteria

1. Measurement Personnel

Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the Department.

(b) Measurement Instrumentation

1. A sound level meter or alternative sound level measurement system used shall meet all of the Type 0 or 1 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4.

2. An integrating sound level meter (or measurement system) shall also meet the Type 0 or 1 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 61672-1 and ANSI 1.43.

3. A filter for determining the existence of tonal sounds shall meet all the requirements of the American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11 and IEC 61260, Type 3-D performance.

4. The acoustical calibrator used shall be of a type recommended by the manufacturer of the sound level meter and one that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40.

5. The microphone windscreen used shall be of a type recommended by the manufacturer of the sound level meter.

6. Anemometer(s) used for surface (10 meter (m)) (32.8 feet) wind speeds shall have a minimum manufacturer specified accuracy of ±1 mph providing data in one second integrations and 10 min. average/maximum values for the evaluation of atmospheric stability.

7. Audio recording devices shall be time stamped (hh:mm:ss) and at a minimum 16 bit digital, recording the sound signal output from the measurement microphone at a minimum sampling rate of 24 thousand (k) samples per second to be used for identifying events. Audio recording and compliance data collection shall occur through the same microphone/sound meter and bear the same time stamp.

(c) **Equipment Calibration**

1. The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Institute of Standards and Technology.

3. Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

4. Anemometer(s) and vane(s) shall be calibrated annually by the manufacturer to maintain stated specification.

(d) **Compliance Measurement Location, Configuration, and Environment**

1. Compliance measurement locations shall be at nearby protected locations that are most likely affected by the sound from routine operation of the wind energy development subject to permission from the respective property owner(s).

2. To the greatest extent possible, compliance measurement locations shall be at the center of unobstructed areas that are maintained free of vegetation and other structures or material that is greater than 2 feet in height for a 75-foot radius around the sound and audio monitoring equipment.

3. To the greatest extent possible, meteorological measurement locations shall be at the center of open flat terrain, inclusive of grass and a few isolated obstacles less than 6 feet in height for a 250-foot radius around the anemometer location. The meteorological data measurement location need not be coincident with the sound and audio measurement location provided

there is no greater than a 5 mile separation between the data collection points and the measurement locations have similar characterization, i.e. same side of the mountain ridge, etc.

4. Meteorological measurements of wind speed and direction shall be collected using anemometers at a 10-meter height (32.8 feet) above the ground. Results shall be reported, based on 1-second integration intervals, and shall be reported synchronously with hub level and sound level measurements at 10-minute measurement intervals. The wind speed average and maximum shall be reported.

5. The sound microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.

6. When possible, measurement locations should be at least 50 feet from any sound source other than the wind energy development's power generating sources.

(e) **Compliance Data Collection, Measurement and Retention Procedures**

1. Measurements of operational, sound, audio and meteorological data shall occur as set forth in subsection I(8)(e)(7 through 10).

2. All operational, sound and meteorological data collected shall be retained by the wind energy development for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.

3. All audio data collected shall be retained by the wind energy development for a period of four weeks from the date of collection unless subject to a complaint filed in accordance with the complaint protocol approved by the Department and is subject to inspection by the Department and submission to the Department upon request. Specific audio data collected that coincides with a complaint filed in accordance with the approved complaint protocol shall be retained by the wind energy developer for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.

4. Written notification of the intent to collect compliance data must be received by the Department prior to the collection of any sound level data for compliance purposes. The notification shall state the date and time of the compliance measurement period.

   Note: Notice received via electronic mail is sufficient regardless of whether it is received during business hours.

5. Compliance data from the operation of a wind energy development shall be submitted to the Department, at a minimum:

   (a) Once during the first year of facility operation;

   (b) Once during each successive fifth year thereafter until the facility is decommissioned;

   (c) In response to a complaint regarding operation of the wind energy development as set forth in subsection I(7)(j) of the rule and any subsequent enforcement by the Department; and

   (d) For validation of an applicant's calculated sound levels when requested by the Department.

6. All sound level, audio and meteorological data collected during a compliance measurement period for which the Department has been notified that meets or exceeds the specified wind speed parameters shall be submitted to the Department for review and approval. All data submittals shall be submitted to the Department within 30 days of notification of intent to collect compliance data.

7. Measurement shall be obtained during weather conditions when the wind turbine sound is most clearly noticeable, generally when the measurement location is downwind of the wind energy development and maximum surface wind speeds < 6 miles per hour (mph) with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the nearest wind turbines to the measurement location. A downwind location is defined as within 45^0 of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.

   [Note: These conditions typically occur during inversion periods usually between 11 pm and 5 am.]

8. In some circumstances, it may not be feasible to meet the wind speed and operations criteria due to terrain features or limited elevation change between the wind turbines and monitoring locations. In these cases, measurement periods are acceptable if the following conditions are met:

   (a) The difference between the L_{A90} and L_{A10} during any 10-minute period is less than 5 dBA; and

   (b) The surface wind speed (10 meter height) (32.8 feet) is 6 mph or less for 80% of the measurement period and does not exceed 10 mph at any time, or the turbines are shut down during the monitoring period and the difference in the observed L_{A50} after shut down is equal to or greater than 6 dBA; and

(c) Observer logs or recorded sound files clearly indicate the dominance of wind turbine(s).

9. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow, aircraft flyovers or other extraneous ambient noise sources that affect the ability to demonstrate compliance shall be excluded from all compliance report data. The intent is to obtain 10-minute measurement intervals that entirely meet the specific criteria.

10. Measurements of the wind energy development sound shall be made so as to exclude the contribution of sound from other development equipment that is exempt from this regulation.

(f) **Reporting of Compliance Measurement Data**

Compliance Reports shall be submitted to the Department within 30 days of notification of intent to collect compliance data or upon request by the Department and shall include, at a minimum, the following:

1. A narrative description of the sound from the wind energy development for the compliance measurement period result;

2. The dates, days of the week and hours of the day when measurements were made;

3. The wind direction and speed, temperature, humidity and sky condition;

4. Identification of all measurement equipment by make, model and serial number;

5. All meteorological, sound, windscreen and audio instrumentation specifications and calibrations;

6. All A-weighted equivalent sound levels for each 10-minute measurement interval;

7. All L_{A10} and L_{A90} percentile levels;

8. All 10 minute 1/3 octave band linear equivalent sound levels (dB);

9. All short duration repetitive events characterized by event amplitude. Amplitude is defined as the peak event amplitude minus the average minima sound level immediately before and after the event, as measured at an interval of 50 milliseconds (“ms”) or less, A-weighted and fast time response, i.e. 125 ms. For each 10-minute measurement interval short duration repetitive sound events shall be reported by number for each observed amplitude integer above 5 dBA.

10. Audio recording devices shall be time stamped (hh:mm:ss) and at a minimum 16 bit digital, recording the sound signal output from the measurement microphone at a minimum sampling rate of 24 thousand (k) samples per second to be used for identifying events. Audio recording and compliance data collection shall occur through the same microphone/sound meter and bear the same time stamp. Should any sound data collection be observed by a trained attendant, the attendant's notes and observations may be substituted for the audio files during the compliance measurement period;

11. All concurrent time stamped turbine operational data including the date, time and duration of any noise reduction operation or other interruptions in operations if present; and

12. All other information determined necessary by the Department.

11. Preservation of Historic Sites

A. **Preamble**. The Board recognizes the value to society of preserving sites of historic significance.

B. **Definition**. As used in this section, "historic site" means any site, structure, district or archaeological site which has been officially included on the National Register of Historic Places and/or on the Maine Historic Resource Inventory, or which is established by qualified testimony as being of historic significance.

C. **Scope of Review**. In determining whether a proposed development will have an adverse effect on the preservation of historic sites either on or near the development site, the Board shall consider all relevant evidence to that effect.

D. **Terms and Conditions**. The Board, may as a term or condition of approval, establish any reasonable requirement to ensure that a proposed development will not adversely affect preservation of any historic site.

12. Preservation of Unusual Natural Areas

A. **Preamble**. The Board recognizes the importance of preserving unusual natural areas for educational and scientific purposes.

B. **Definition**. As used in this section, "unusual natural area" means any land or water area, usually only a few acres in size, which is undeveloped and which contains natural features of unusual geological, botanical, zoological, ecological, hydrological, other scientific, educational, scenic, or recreational significance. By way of illustration, and not limitation, such are, as may include: rare or exemplary plant communities; individual plant species of unusual interest because of size, species or other reasons; unusual or exemplary bogs; unusually important wildlife habitats, particularly those of rare or endangered species; unusual land forms; fossils and other deposits of importance to geologists; outstanding scenic areas; and others of similar character.

C. Scope of Review. In determining whether a proposed development will have an adverse effect on the preservation of unusual natural areas either on or near the development site, the Board shall consider all relevant evidence to that effect.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that a proposed development will not adversely affect the preservation of natural areas.

13. Access to Direct Sunlight

A. Preamble. The Board recognizes that some existing structures utilize active or passive solar energy systems for purposes such as heating air or water, and that, in these instances, it may be an unreasonable effect on existing uses to deny access to direct sunlight.

B. Scope of Review. In determining whether a proposed development will have an adverse effect on access to direct sunlight, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) Structures within the proposed development will not block access to direct sunlight to structures utilizing solar energy through active or passive systems.

C. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that a proposed development will not block access to direct sunlight.

14. No Unreasonable Effect on Scenic Character

A. Preamble. The Board considers scenic character to be one of Maine's most important assets. The Board also feels that visual surroundings strongly influence people's behavior.

B. Scope of Review. In determining whether the proposed development will have an unreasonable adverse effect on the scenic character of the surrounding area, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) The design of the proposed development takes into account the scenic character of the surrounding area.

(2) A development which is not in keeping with the surrounding scenic character will be located, designed and landscaped to minimize its visual impact to the fullest extent possible.

(3) Structures will be designed and landscaped to minimize their visual impact on the surrounding area.

NOTE: The following are GUIDELINES for the landscaping of parking lots, which are structures pursuant to 38 M.R.S.A. Section 482(6) (B).

(a) Lighting will be shielded from adjacent highways and residential areas.

(b) Curbed planting strips will be utilized in parking areas of 2 acres or more. Planting strips will be a minimum of ten (10) feet wide and spaced between every second double bay parking aisle or 200 feet, whichever is less.

(c) When the parking lots are adjacent to a residential use, landscaping and/or architectural screens will be utilized to provide an effective perimeter separation area between property lines and the edge of the pavement and/or structures. There will be a minimum setback of fifteen (15) feet from the property line. The Board may require a similar provision when the parking lot is adjacent to other land uses.

(d) Planting and maintenance program specifications will be developed to provide the earliest establishment of landscape materials and their maintenance.

(e) Planting specifications:

(i) Shrubs will be planted with a 24" minimum size for those specified by spread.

(ii) Shrubs will be planted with a 36" minimum size for those specified by height.

(iii) Shade trees will be highcrowned species with ascending or lateral branching habit indigenous to the area, tolerant to existing soils and urbanized conditions, two-inch minimum caliper measured six inches up from the base, and planted a maximum of 30' on center.

(iv) Flowering and evergreen trees will be a minimum of 7' tall and planted a maximum of 20' on center.

(v) Selections for ground cover will reflect the project's function, expected foot traffic, exposure, and maintenance program.

(f) Provisions will be made to supply water to planted islands and other vegetated areas.

(4) The plans for the proposed development provide for the preservation of existing elements of the development site which contribute to the maintenance of scenic character.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on the scenic character of the surrounding area, including information such as the following, when appropriate:

(1) Sketches of the proposed development indicating how the development fits into the scenic character of the area.

(2) Landscaping plans for minimizing the visual impact of the parking lots, mining operations and other types of developments.

D. Terms and Conditions. The Board may, as **a** term or condition of approval, establish any reasonable requirement to ensure that the proposed development will have no unreasonable adverse effect on scenic character, such as requiring that:

(1) Illumination of the development be limited.

(2) Vegetative or architectural screens be established.

15. Protection of Wildlife and Fisheries

A. Preamble. The Board recognizes the need to protect wildlife and fisheries by maintaining suitable and sufficient habitat and the susceptibility of certain species to disruption and interference of lifecycles by construction activities.

B. Scope of Review. In determining whether the developer has made adequate provision for the protection of wildlife and fisheries, the Board shall consider all relevant evidence to that effect, such as evidence that:

(1) A buffer strip of sufficient area will be established to provide wildlife with travel lanes between areas of available habitat.

(2) Proposed alterations and activities will not adversely affect wildlife and fisheries lifecycles.

(3) There will be no unreasonable disturbance to:

(a) High and moderate value deer wintering areas.

(b) Habitat of any species declared threatened or endangered by the Commissioner, Maine Department of Inland Fisheries and Wildlife or the Director of the U.S. Fish and Wildlife Service.

(c) Seabird nesting islands;

(d) Significant vernal pools;

(e) High and moderate value waterfowl and wading bird habitat; and

(f) Shorebird nesting, feeding, and staging areas.

C. Submissions. Applications for approval of proposed developments shall include evidence that affirmatively demonstrates that the developer has made adequate provision for the protection of wildlife and fisheries, including information such as the following, when appropriate:

(1) The location of natural buffer strips and adequate provision for their maintenance.

(2) Plans to mitigate adverse effects on wildlife and fisheries through means that at a minimum include, but are not limited to, design considerations, pollution-abatement practices, the timing of construction activities, and on-site or off-site habitat improvements or preservation.

D. Terms and Conditions. The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that a developer has made adequate provision for the protection of wildlife and fisheries.

STATUTORY AUTHORITY: 38 M.R.S.A. Section 343

EFFECTIVE DATE:
November 1, 1979, filing 79-507

AMENDED:
November 21, 1989 – Section 10, filing 89-500
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AMENDED:
September 22, 2001 - Section 9, filing 2001-402
January 18, 2006 - Section 15, filing 2006-12
June 10, 2012 – Section 10, filing 2012-147 (Final adoption, major substantive)

APPENDIX 5

MAINE TURNPIKE AUTHORITY NOISE POLICY

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MAINE TURNPIKE AUTHORITY HIGHWAY TRAFFIC NOISE POLICY

January 22, 2015

This cancels and replaces the
Previous version approved in
November, 2011

CONTENTS

EXECUTIVE SUMMARY

The Maine Turnpike Authority (MTA) is an independent quasi-state agency receiving no state or federal funds for its construction and maintenance, and as such, the MTA is not subject to regulation by the Maine Department of Transportation (MEDOT) or Federal Highway Administration (FHWA). However, the MTA and MEDOT work closely with each other to provide consistent regulation of roadways. As a result, the MTA and MEDOT have developed a uniform noise policy that benefits users and abutters along their principle roadways and provides consistent and well defined actions as it relates to highway traffic noise.

This document serves as the Maine Turnpike Authority's policy on the evaluation and abatement of highway traffic noise impacts. The MTA's original highway traffic noise policy was adopted in 2000 and revised in 2008. This policy updates several areas of the 2008 policy including the reasonable cost threshold for abatement and sets a three year timeline for subsequent review.

Noise abatement measures are evaluated in two separate categories by FHWA. Type I highway noise evaluations are conducted for new highway or capacity adding projects (i.e. additional travel lanes) to existing highways. Type II noise evaluations may be conducted for noise abatement measures along existing highways in special circumstances. The Maine Turnpike Authority does not have a Type II Noise Abatement Program and thus Type II projects will not be discussed further in this document and will not be evaluated by the Authority.

The purpose of a highway traffic noise analysis is to identify impacted land uses (homes, schools, business, etc.) and determine the feasibility and reasonableness of abatement measures. The terms "feasibility" and "reasonableness" are terms commonly used in highway traffic noise analysis to determine, among other things, the effectiveness (in terms of noise reduction) and the acceptable cost for any noise abatement measure. All noise abatement measures are evaluated based on the feasibility and reasonableness criteria identified in this policy.

Appropriate land-use strategies along Maine's highways can be an effective means of avoiding highway traffic noise impacts. MTA encourages municipalities to establish appropriate land use controls over undeveloped lands adjacent to highways to prevent the development of incompatible activities along existing highways.

Appendix A provides useful information regarding the basics of sound, the fundamentals of highway traffic noise, and strategies for highway traffic noise abatement and control. Appendix B provides a glossary of specific terms used throughout the policy.

I. INTRODUCTION

This document details the Maine Turnpike Authority's (MTA's) policy on noise impacts as it relates to the Turnpike roadway. This policy mirrors federal and state noise policies, which are advisory for the MTA as the Authority does not receive state or federal funds, and provides foundation materials on the properties and nature of sound with regard to the Turnpike.

The MTA will use the following guidelines to determine the need, feasibility, and reasonableness of noise abatement or reduction measures along existing highways or proposed highway construction projects. This policy is based on established principles, practices, and procedures used by federal and state transportation agencies to assess highway-related noise levels.

The MTA will use the requirements of Title 23, Part 772 of the U.S. Code of Federal Regulations (23 CFR 772), the FHWA Highway Traffic Noise Analysis and Abatement Guidance, June 2010 (Revised January 2011), or the most recent version, and the noise related requirements of the National Environmental Policy Act (NEPA) of 1969 as guidelines to its interpretation of this policy.

Noise abatement measures are evaluated in two separate categories by FHWA. Type I highway noise evaluations are conducted for new highway or capacity adding projects (i.e. additional travel lanes) to existing highways. Type II noise evaluations review noise abatement measures along existing highways in special circumstances. The implementation of a Type II program is not required by federal or state statute or FHWA regulation. The Maine Turnpike Authority does not have a Type II Noise Abatement Program and thus Type II projects will not be discussed further in this document and will not be evaluated by the Authority.

MTA will review this policy every three years and adopt appropriate revisions when necessary. The MTA will also consider revisions to this policy whenever federal or state statutory, regulatory or policy changes make such a review appropriate.

II. HIGHWAY TRAFFIC NOISE ANALYSIS

MTA's Right of Way Department will perform or oversee the highway traffic noise analysis for noise abatement projects. Requirements for the analysis and abatement of highway construction noise are discussed in Section VIII. ***The purpose of a highway traffic noise analysis is to identify impacted land uses based on the Noise Abatement Criteria (NAC) and determine the feasibility and reasonableness of abatement measures.***

For Type I Projects, highway traffic noise analysis will be performed for developed lands, and for undeveloped lands that are permitted for development, prior to the approval of the highway project's environmental document, i.e. the date of the Categorical Exclusion (CE), Finding of No Significant Impact (FONSI), or Record of Decision (ROD) if applicable.

Subsequent to this date, MTA is not responsible for providing noise abatement for new development.

A highway traffic noise analysis will include the following steps:

A. Identification of Noise Sensitive Areas and Receptors

The first step in the highway traffic noise analysis it to identify areas with potential for noise impacts, the receptors of noise in each area, and the applicable Noise Abatement Criteria (NAC) for each receptor in the study area. The study area is defined as 500 feet from the *proposed* edge of pavement for Type I analysis. However, if highway traffic noise impacts are identified at 500 feet then the study area will be expanded to identify all potential impacts.

When determining the number of receptors in the study area the following rules apply:

NAC Activity Category B- Single family residential units are considered one receptor. Structures that contain multiple residential units (apartments, condominiums, and duplexes) are considered one receptor per residential unit.

NAC Activity Categories C, D, and E: A single structure is considered a single receptor. For outdoor noise-sensitive land uses (parks, campgrounds, cemeteries, trails, etc.) the number of receptors will be determined by dividing the frontage of the land use by the average lot frontage in the study area.

B. Determination of Existing Noise Levels.

Existing noise levels will be determined throughout the highway traffic noise study area through a combination of LEQ noise measurements and traffic noise modeling. All traffic noise modeling will be done using the most current readily available version of the FHWA Traffic Noise Model (FHWA TNM). Noise measurements and noise modeling will be conducted using equivalent continuous noise levels (LEQ) during the hour that is predicted to yield the greatest traffic noise levels.

C. Prediction of Future Noise Levels

Future highway traffic noise levels will be predicted for the design year, usually twenty years in the future, for each alternative under detailed study, including the "no-build" alternative, within the study area.

D. Determination of Impacts

All highway traffic noise impacts associated with the project will be identified during the highway traffic noise analysis. Type I project impacts occur when the predicted future highway traffic noise levels are within 1 dBA of, or exceed the NAC or when the predicted future highway traffic noise levels exceed the existing levels by at least 15 dBA (substantial increase). (See Appendix B, Table B-1 for the NAC).

In determining traffic noise impacts, primary consideration is to be given to exterior areas where frequent human use occurs, such as patios, porches, swimming pools, playgrounds, etc. If no exterior areas are present, the interior NAC will be used as the basis for determining noise impacts where applicable.

E. Evaluation of Abatement Measures

If a highway traffic noise impact is identified, the following abatement measures will be evaluated:

1. Traffic management measures such as traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
2. Alteration of the highway project's horizontal and vertical alignments.
3. Construction of noise barriers (including landscaping for aesthetic purposes and the acquisition of property rights) within or outside the highway right-of-way.
4. Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.
5. Noise insulation of Category D facilities only (See Table B-1)

F. Incorporation of Feasible and Reasonable Criteria

All type I noise abatement measures will be evaluated based upon Feasible and Reasonable criteria in Sections IV and V.

G. Selection of Abatement Measures

The last step of the analysis will include selection of the noise abatement measures to be used, if abatement has met all the necessary criteria.

H. Documentation

The noise analysis completed under this policy, including project description, existing and future noise levels, impacts, evaluations, and abatement considered, will be documented in the project files. A Statement of Likelihood will be included in the environmental document, since feasibility and reasonableness may change due to changes in project design after approval of the environmental document. The Statement of Likelihood will include the preliminary location and physical description of noise abatement measures determined feasible and reasonable in the preliminary analysis.

I. Completion of Follow up measures

After abatement is complete, follow-up noise measurements will be taken to determine the effectiveness of the abatement and to verify the noise model analysis. MTA will provide the necessary maintenance to ensure the effectiveness of any abatement measure. However, MTA will not pay for the maintenance or operational costs of noise insulation of Activity Category D facilities, or any other noise abatement measures not constructed by MTA.

III. NOISE ABATEMENT PROJECT REQUIREMENTS

A Type I project includes the following types of proposed highway projects as defined in 23 CFR 7725:

A. The construction of a highway on new location;

B. The physical alteration of an existing highway that:

1. Creates Substantial Horizontal Alteration- A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition, *or*
2. Creates Substantial Vertical Alteration- A project that changes the topography therefore exposing the line of sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor, *or*
3. Addition of a through traffic lane(s)- This includes the addition of a through traffic lane that functions as a HOV lane, High Occupancy Toll (HOT) lane, bus lane, or truck climbing lane, *or*
4. The addition of an auxiliary lane, except when the auxiliary lane is a turn lane, *or*
5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange, *or*
6. Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane, *or*
7. The construction of new or substantial capacity increases to existing weigh station, rest stop, ride share lot, or toll plaza.

If the project is determined to be a Type I project under this definition, or require an Army Corps of Engineers permit, the need for noise abatement will be evaluated. If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project. Noise abatement measures for Type I projects may be funded as part of the proposed highway project.

To be considered for funding, noise abatement must be reasonable and feasible as defined in Sections IV and V.

IV. FEASIBILITY CRITERIA

Feasibility is defined as the engineering and acoustical ability of abatement measures to provide effective noise reduction. When noise abatement measures are evaluated, feasibility criteria will include the following:

A. Noise Reduction

Can a 5dBA or greater noise reduction be achieved? Abatement measures are not feasible if a 5 dBA noise reduction cannot be achieved for a majority (greater than 50%) of impacted receptors.

B. Safety

Will the barrier, or other measure, create a safety issue? If so, the abatement measures are not feasible. Safety factors that should be considered in the design of the barrier include maintaining a clear recovery zone, redirection of crash vehicles, adequate sight distance, and emergency vehicle access. MTA will use the most recent version of the American Association of State Highway and Transportation Officials (AASHTO) publication entitled "A Policy on Geometric Design of Highways and Streets" when making safety determinations

C. Barrier Height

The maximum height of a noise barrier allowed under this policy is 20 feet based on safety and engineering considerations.

D. Other Considerations

Other issues including, but not limited to, maintenance, drainage, snow removal, right of way acquisition, access to adjacent land owners, and environmental impacts will also be considered when determining the feasibility of abatement. For any other considerations that may arise, MTA will make a feasibility determination based on best engineering practices. For example, it is possible that a noise barrier, or other abatement measure, may satisfy Parts A, B and C of this Section, but, not be feasible if wetland mitigation impacts and mitigation, other environmental impacts, or substantial fill and drainage were needed to complete the project.

V. REASONABLENESS CRITERIA

Reasonableness implies that common sense and good judgment have been applied in arriving at a decision. The overall noise abatement benefits must outweigh the overall adverse social, economic, and environmental effects and the costs of the abatement measures. When noise abatement measures are considered, reasonableness criteria will include the following:

A. Maximum Cost of Abatement

The maximum cost of abatement is $33,000 per benefited receptor. All receptors within the study area, as defined in Section II A, attaining at least a 5 dBA reduction will be counted as "benefited" and included in the cost calculation.

For the purposes of developing the total barrier cost, a cost of $33.00 per square foot for Preliminary Engineering (PE), ROW acquisition, and construction will be used, realizing that actual costs will vary. However, additional project costs, not included in the $33.00 per square foot figure, may occur as a result of unique physical or natural conditions when modeling and designing a noise abatement barrier or other measure. Section IV (D) of this policy addresses "other considerations" that will be evaluated when determining the feasibility of proposed noise abatement measures.

Abatement costs are estimated on recent construction costs and historical data provided by FHWA. Both the unit cost and cost per benefited receiver will be updated when the policy is reviewed as defined in Section I to reflect actual barrier costs.

B. Noise Reduction Design Goal

During a traffic noise modeling and design stage, MTA will attempt to reduce predicted noise levels at impacted receptors by 10 dBA. Various factors, including topography or the limitation of barrier height (see section IV C) may reduce the effectiveness of noise abatement for certain receptors. At a minimum, noise abatement measures will be designed to reduce noise levels at a majority (greater that 50%) of benefitted receptors by 7 dBA. Abatement measures are not Reasonable if the 7 dBA design goal cannot be achieved for a majority of benefitted receptors.

C. Third Party Funding

Third party funding is not allowed on projects if the noise abatement measure would require the additional funding from the third party for the project to be considered feasible and/or reasonable. Third party funding is acceptable on a project to make functional enhancements, such as adsorptive treatment, access doors, or aesthetic enhancements, to a noise abatement measure already determined to be reasonable and feasible.

D. Residents' Desires

A noise barrier will not be considered reasonable if fewer than 75% of the benefited receptors approve of the construction of a noise barrier. In the case of rental or leased properties, the views of both the owner and the residents will be solicited to determine reasonableness. The MTA will establish the approval rate of a noise barrier for benefited receivers by conducting a survey through certified or registered mail and a self-addressed stamped envelope.

VI. LOCAL COORDINATION & COMMUNITY INVOLVEMENT

Coordination with local agencies and community involvement is an important part of highway traffic noise control and the prevention of future impacts. Highway traffic noise impacts can be most effectively reduced through a program of shared responsibility. The Authority encourages local governments to use their power to regulate land development in such a way that particularly noise sensitive land uses are either prohibited from being located adjacent to a highway or that developments are planned, designed, and constructed so that highway traffic noise impacts are minimized.

Upon completion of the highway traffic noise analysis, information shall be provided to local government agencies within whose jurisdiction the highway project is located as to the implications of the project on that particular local community in the future. At a minimum, this will include modeled future highway traffic noise levels for both developed and undeveloped lands in the immediate vicinity of the project. The information will be disseminated through the distribution of highway project environmental documents and noise analysis reports and informational public meetings. The overall goal of this effort will be to prevent future highway traffic noise impacts on currently undeveloped lands and to promote noise compatible planning.

VII. LOCAL/PRIVATE PROJECTS

The use of MTA's right-of-way for local/private noise abatement projects is prohibited.

VIII. CONSTRUCTION NOISE

The following general steps are to be performed for all Type I projects:

> During the design phase of transportation projects, MTA will work with local public officials and community members to limit, minimize, or eliminate adverse construction noise related impacts to the community, as practicable. Construction noise control measures will be incorporated into the plans and specifications on a project by project basis

APPENDIX A. HIGHWAY NOISE FUNDAMENTALS

The Basics of Sound

The decibel (dB) is the unit of measurement for sound. The decibel scale audible to humans spans approximately 140 decibels. A level of 0 decibels corresponds to the threshold of human hearing, while 140 decibels produces a sensation more akin to pain than sound, similar to standing near a jet engine as it takes off. Table A-1 shows sound levels for some common noise sources.

Table A-1 Typical Sound Levels[1]

NOISE SOURCE OR ACTIVITY	SOUND LEVEL dBA
Jet engine at takeoff	140
Fire engine siren	130
Jackhammer	120
Rock Concert	110
Circular Saw	100
Heavy truck or motorcycle	90
Garbage disposal	80
Busy restaurant	70
Normal Speech	60
Background music	50
Bedroom, Bird song	40
Quiet library, soft whisper	30
Quiet basement w/o mechanical equipment	20
Human breathing	10
Threshold of Hearing	0

The decibel scale is logarithmic rather than arithmetic. Consequently, traffic sound levels cannot be added by ordinary arithmetic means. For instance, two noise sources, each producing 90 dBA, will combine to produce 93 dBA, not 180 dBA. In other words, a doubling of the noise source produces only a 3 dBA increase in the sound pressure level. Studies have shown that this increase is barely detectable by the human ear. Furthermore, an increase or decrease of 5 dB would result in a clearly noticeable change in the sound level. A change of 10 dB in the sound pressure level will be perceived by an observer to be a doubling or halving of the sound.

The "A" weighting scale for decibel measurement is widely used in environmental work because it closely resembles the ear's sensitivity to high frequency noise. Therefore the unit of measurement for highway traffic noise becomes dBA. The noise descriptor used for environmental analysis is the equivalent sound level, Leq. The equivalent sound level is the steady sound level that has the same acoustic energy as the time varying sound level over the same time period.

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[1] Actual sound levels may vary depending on a number of factors, including the distance between source and receiver, intensity of the particular activity, and the degree of background noise

Highway Traffic Noise

Sound can be either desirable or undesirable. Music is an example of desirable sound. Sound generated by motor vehicles traveling along highways is, generally, undesirable and is referred to in this policy as highway traffic noise.

Highway traffic noise is generated by four major sources: engine/drive train, exhaust, aerodynamics, and tire-to-pavement friction. Recent research indicates that tires are the dominant noise source at speeds greater than 20 mph for cars and 30 mph for trucks. Tire sound levels increase with vehicle speed but also depend upon road surface, vehicle weight, tread design and wear. Changes in any of these factors can vary highway traffic noise levels. At lower speeds especially in trucks and buses, the dominant noise source is the engine and related accessories.

The level of highway traffic noise depends on three things: (1) the volume of free flow traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of highway traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. The loudness of highway traffic noise can also be increased by defective or modified exhaust systems and other faulty equipment on vehicles. Any condition (such as a steep incline) that causes heavy laboring of motor vehicle engines will also increase highway traffic noise levels. Other physical and environmental factors, such as distance from source to receiver, terrain, vegetation, and natural and manmade obstacles, also affect the loudness of highway traffic noise.

Highway Traffic Noise Strategies

Highway traffic noise can be addressed by a number of different strategies including: motor vehicle control, land use control, highway planning and design, and abatement. The responsibilities for implementing these strategies are shared by all levels of government: federal, state, and local.

Motor Vehicle Control

The State of Maine requires[2] that all automobiles (excluding motorcycles) must be equipped with a muffler in good working order and prohibits amplification of exhaust noise above that emitted by the muffler originally installed on the vehicle. However, modifications are allowed if the muffler or exhaust system does not emit noise in excess of 95 decibels. In general, quieter vehicles would bring about a substantial reduction in highway traffic noise along Maine's roads and streets. MTA does not have the authority to regulate motor vehicles. The Environmental Protection Agency (EPA) has issued regulations that limit the noise levels for new trucks with a gross vehicle weight rating (GVWR) of more than 10,000 pounds. In addition, many local governments have passed some form of community noise ordinance.

Land Use Control

Proper land use control along Maine's highways is an effective means of controlling the

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[2] MRSA 29-A§ 1912

impacts of highway traffic noise. The MTA encourages municipalities to plan, design, and construct new development projects and roadways that minimize potential highway traffic noise impacts. More specifically, municipalities are encouraged to establish building setbacks and vegetative buffer zones along existing highways. Noise-compatible planning encourages the location of less noise-sensitive land uses near highways, promotes the use of berms and open space separating roads from developments, and suggests special construction techniques that minimize the impact of highway traffic noise.

According to FHWA, there are several hundred thousand miles of existing highways in this country bordered by vacant land which may someday be developed. Proper land use control can help to prevent many future highway traffic noise problems in these areas. For more information about noise compatible planning visit FHWA's website at http://www.fhwa.dot.gov/environment/comgrwth.htm .

Highway Planning and Design

Early in the highway planning and design stages, MTA evaluates highway traffic noise and construction noise as part of the NEPA process. The purpose of this study is to determine if any of the proposed project alternatives will create noise impacts. MTA will use the procedures outlined in Section II to identify noise impacts (if any) and evaluate potential abatement measures. Any noise abatement measures that satisfy all the requirements of this policy will be implemented as part of a Noise Abatement project.

Abatement

Noise barrier walls and earth berms are frequently used to provide abatement for highway traffic noise. Noise barriers are solid walls built between the highway and noise-sensitive land uses (such as homes and schools) along the highway. Barriers can be formed from earth mounds along the road (earth berms) or from high, vertical walls. MTA limits noise walls to a maximum of 20 feet in height for safety and structural concerns. Noise walls can be built from a variety of materials, including, but not limited to: wood, concrete, masonry, and metal.

Openings in noise walls for driveways, business entrances, or intersecting streets defeat the effectiveness of noise barriers. In many areas of Maine, homes are scattered too far apart to permit highway noise barriers to be built at a reasonable cost.

See Section II. D of this policy for the list of eligible noise abatement measures.

APPENDIX B. GLOSSARY

Abatement. A reduction in sound levels.

Benefited Receptor. A receptor that is expected to receive a minimum noise reduction of 5 dBA from the proposed abatement measure.

dBA. A-weighted decibel unit used to measure sound that best corresponds to the frequency response of the human ear.

Design Year. The future year used to estimate the probable traffic volume for which a highway is designed. For highway projects, the "Design Year" is determined to be 20 years from the completion date (construction complete) of the proposed project.

Existing Noise Level. The noise, resulting from the natural and mechanical sources and human activity, present in a particular area.

Highway Traffic Noise Impacts. Impacts which occur when the predicted highway traffic noise levels approach or exceed the noise abatement criteria (Table B-1 -above), or when the predicted highway traffic noise levels substantially exceed the existing noise levels.

Impacted Receptor. Any receiver which approaches (within 1 dBA) or exceeds the NAC for the corresponding land use category, or any receiver that exceeds existing noise levels by 15 dBA.

Leq. The equivalent steady -state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.

Leq (h). The hourly value of Leq.

National Environmental Policy Act (NEPA). Federal legislation that establishes environmental policy for the nation for federally funded projects. It provides an interdisciplinary framework to ensure that decision-makers adequately take environmental factors into account.

Noise. Any unwanted sound.

Noise Abatement Criteria (NAC). FHWA-determined noise levels for various land uses and activities used to identify traffic noise impacts. The NAC are listed in Table B-1.

Table B-1 Noise Abatement Criteria (NAC)

NOISE ABATEMENT CRITERIA (NAC)		
ACTIVITY CATEGORY	Leq(h) dBA	DESCRIPTION OF ACTIVITY CATEGORY
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Residential
C	67 Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	----------	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	----------	Undeveloped lands that are not permitted.

Noise Barrier. A natural or man-made object that interrupts the path of sound. A barrier could be a wall, an earth berm, or a combination of both.

Permitted. A definite commitment to develop land with an approved specific design of land use activities, as evidenced by the issuance of a building permit.

Receptor. The technical term used to describe the location of any properties included in the noise analysis. Only ground floor properties are counted as receptors.

Study Area. The study area is defined as 500 feet from the *proposed* edge of pavement for Type I analysis. However, if highway traffic noise impacts are identified at 500 feet then the study area will be expanded to identify all potential impacts.

Substantial Noise Increase. For a Type I project an increase in noise levels of 15 dBA increase in noise levels predicted in the design year over the existing noise level.

Type I Projects. A proposed highway project for:

A. The construction of a highway on new location;

B. The physical alteration of an existing highway that:

   1. Creates Substantial Horizontal Alteration- A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition, *or*

   2. Creates Substantial Vertical Alteration- A project that changes the topography therefore exposing the line of sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor, *or*

   3. Addition of a through traffic lane(s)- This includes the addition of a through traffic lane that functions as a HOV lane, High Occupancy Toll (HOT) lane, bus lane, or truck climbing lane, *or*

   4. The addition of an auxiliary lane, except when the auxiliary lane is a turn lane, *or*

   5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange, *or*

   6. Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane, *or*

   7. The construction of new or substantial capacity increases to existing weigh station, rest stop, ride share lot, or toll plaza. If a project is deemed to be a Type I project under this definition then the entire project area as defined in the environmental document is defined as a Type I project.

Type II Projects. A proposed project for noise abatement along an existing highway.

APPENDIX 6

JACOBS ENGINEERING NOISE STUDY

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YORK TOLL PLAZA

MAINE TURNPIKE AUTHORITY

NOISE ANALYSIS REPORT

September 27, 2016

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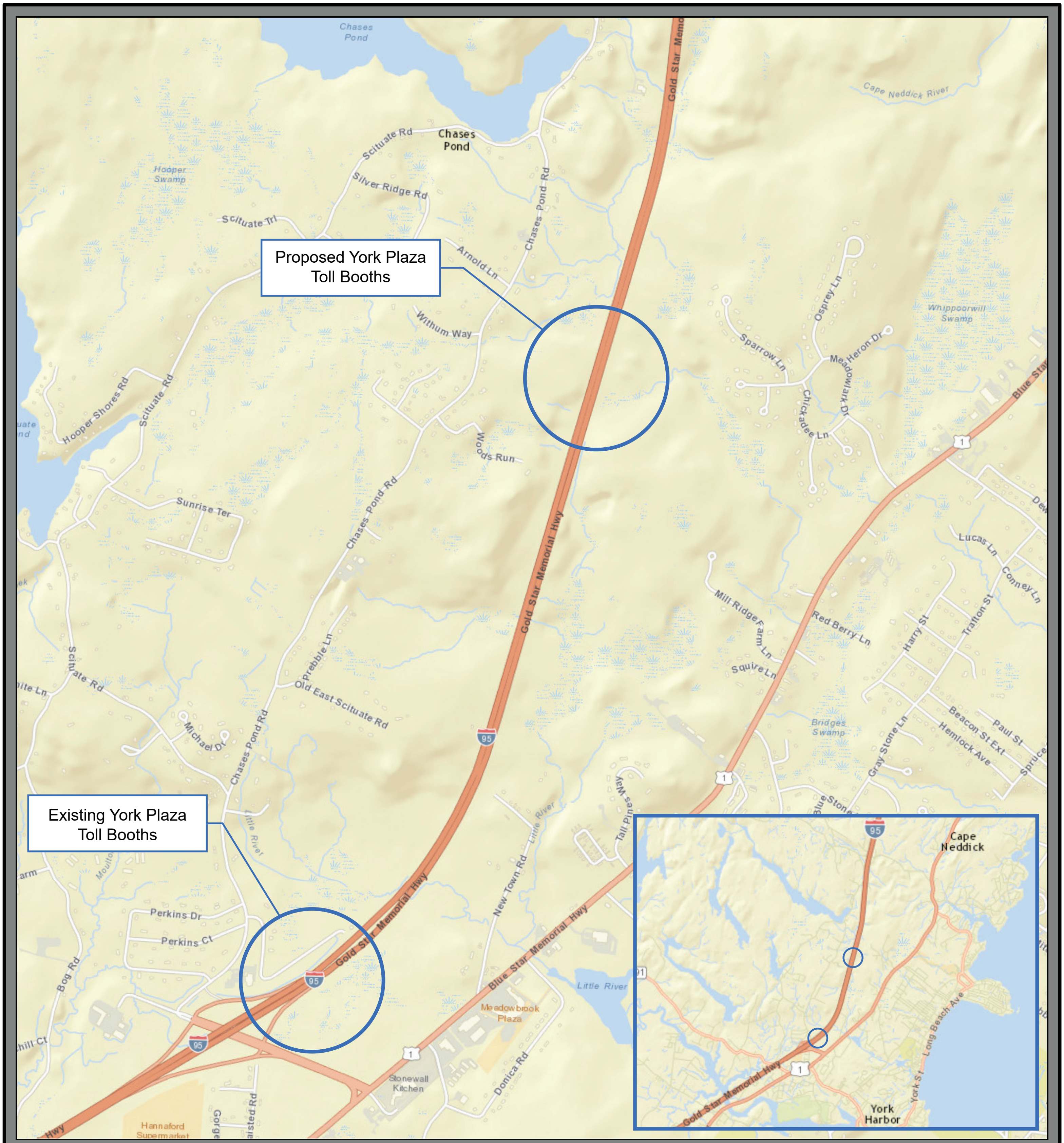
1.0 EXECUTIVE SUMMARY

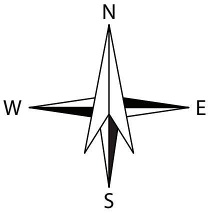
Although not required for environmental permitting, the Maine Turnpike Authority (MTA) asked Jacobs Engineering Group (Jacobs) to conduct a noise analysis to assess and document potential noise impacts associated with the Interstate 95 (I-95) York Toll Plaza Replacement Project in York, Maine. Although no significant noise impacts were expected, there have been concerns expressed by local residents, so the MTA decided to conduct this noise analysis. The proposed project would construct a new high speed ORT toll plaza at Mile 8.8 in York and demolish the existing barrier toll plaza at Mile 7.3. The study area contains a mix of residential and institutional land uses. A Type I noise analysis has been performed as outlined within the MTA Highway Traffic Noise Policy. A project location map is shown in ***Figure 1***. A detailed display of the modeling sites and project area are shown in ***Figures 2A, 2B, and 2C***. The conclusion of this noise analysis confirms the fact that there will be no perceptible noise impacts due to the relocation of the toll plaza to Mile 8.8.

This report documents predicted Existing Year (2015), Opening Year (2020) Build, Design Year (2043) No Build, and Design Year (2043) Build noise levels associated with the I-95 York Toll Plaza Replacement Project. Aerial photographs of the project corridor were examined to identify any noise sensitive properties adjacent to the project corridor. Noise monitoring was performed at five short-term (20-minute) and two long-term, (24-hour) locations throughout the corridor. These sites were chosen because they were considered representative of the noise characteristics within the monitored area. Noise modeling was performed for 11 sites in order to determine how the proposed improvements will affect noise levels throughout the project corridor. The 11 modeled noise receptors represent ten residences, and one institutional facility (the York District Court). The noise analysis in this document is focused on the Common Noise Environments, referred to as CNEs. All noise sensitive sites within approximately 500 feet of the proposed edge of pavement were evaluated for this study. Additionally, due to questions raised by local residents, sound levels within the Whippoorwill Subdivision were evaluated, specifically along Meadowlark Drive and Sparrow Lane (located approximately 1000 feet east of the proposed toll plaza) along Chases Pond Road near the intersection with Arnold Lane (located approximately 1000 feet west of the proposed toll plaza).

Traffic noise modeling was completed for Existing Year (2015), Opening Year (2020) Build, Design Year (2043) No Build, and Design Year (2043) Build conditions. With the toll plaza at Mile 7.3 under Existing (2015) conditions, the modeling results showed that seven receptors are currently impacted by traffic noise. With the toll plaza in place at Mile 8.8, no additional noise impacts would occur as a result of this project, as all impacts to receptors in the Opening Year Build and Design Year Build are already present in the Existing Year (2015). The ORT toll plaza at Mile 8.8 would not perceptibly worsen any existing noise impacts as the increase in traffic noise would be a maximum of 1 dB(A) under the Opening Year Build, Design Year No Build and Design Year Build scenarios. These noise increases are not considered to be perceptible because they are below 3 dB(A) which is considered by FHWA and NEPA to be the threshold of audible change perceivable by the typical human ear.

No considerable, long-term construction-related noise impacts are anticipated. Any noise impacts that would occur as a result of roadway construction measures are anticipated to be temporary in nature and will cease upon completion of the project construction phase.





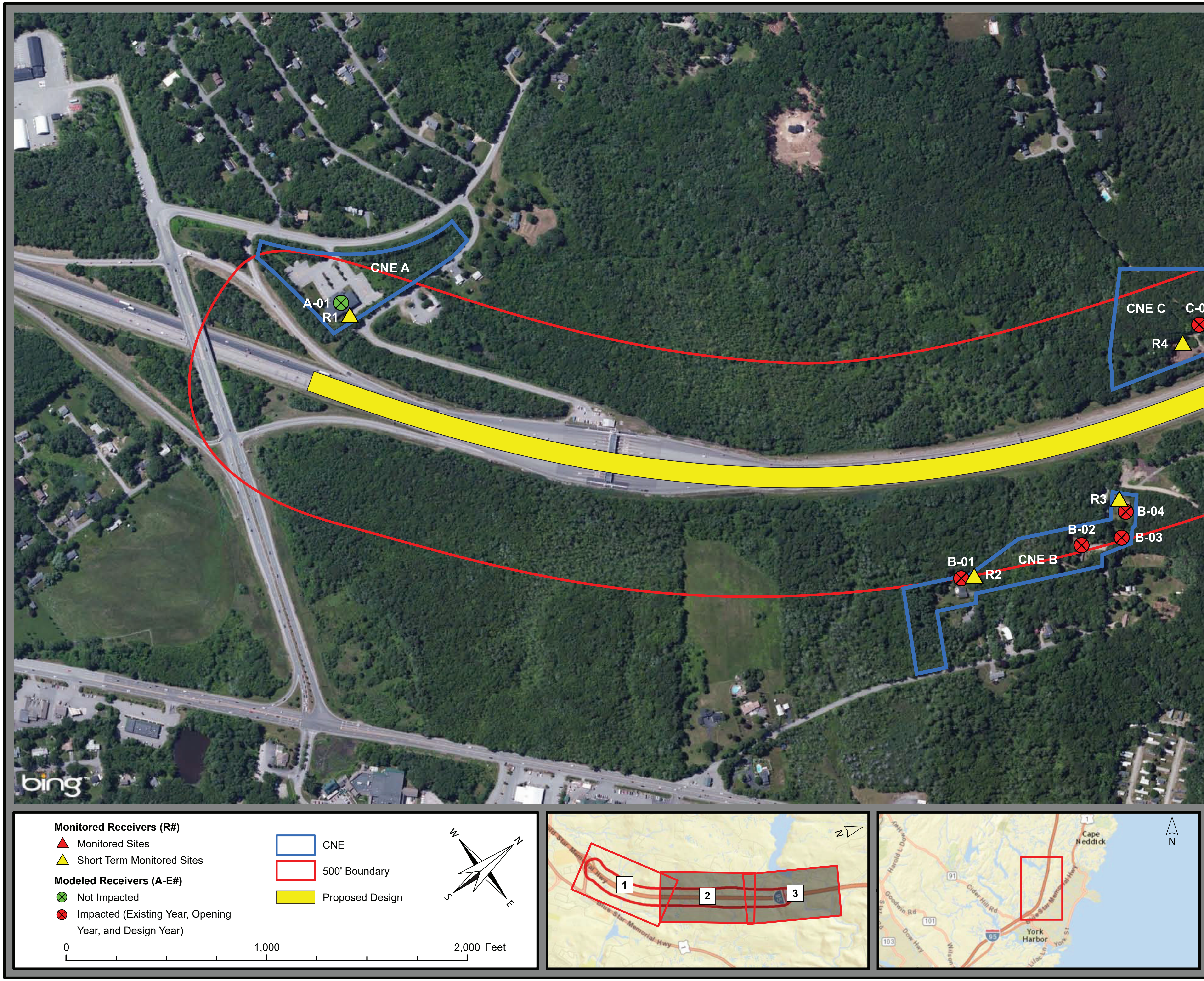
Interstate 95
York Toll Plaza Replacement

Noise Analysis

FIGURE 1
Regional Location Map

○ Toll Booths

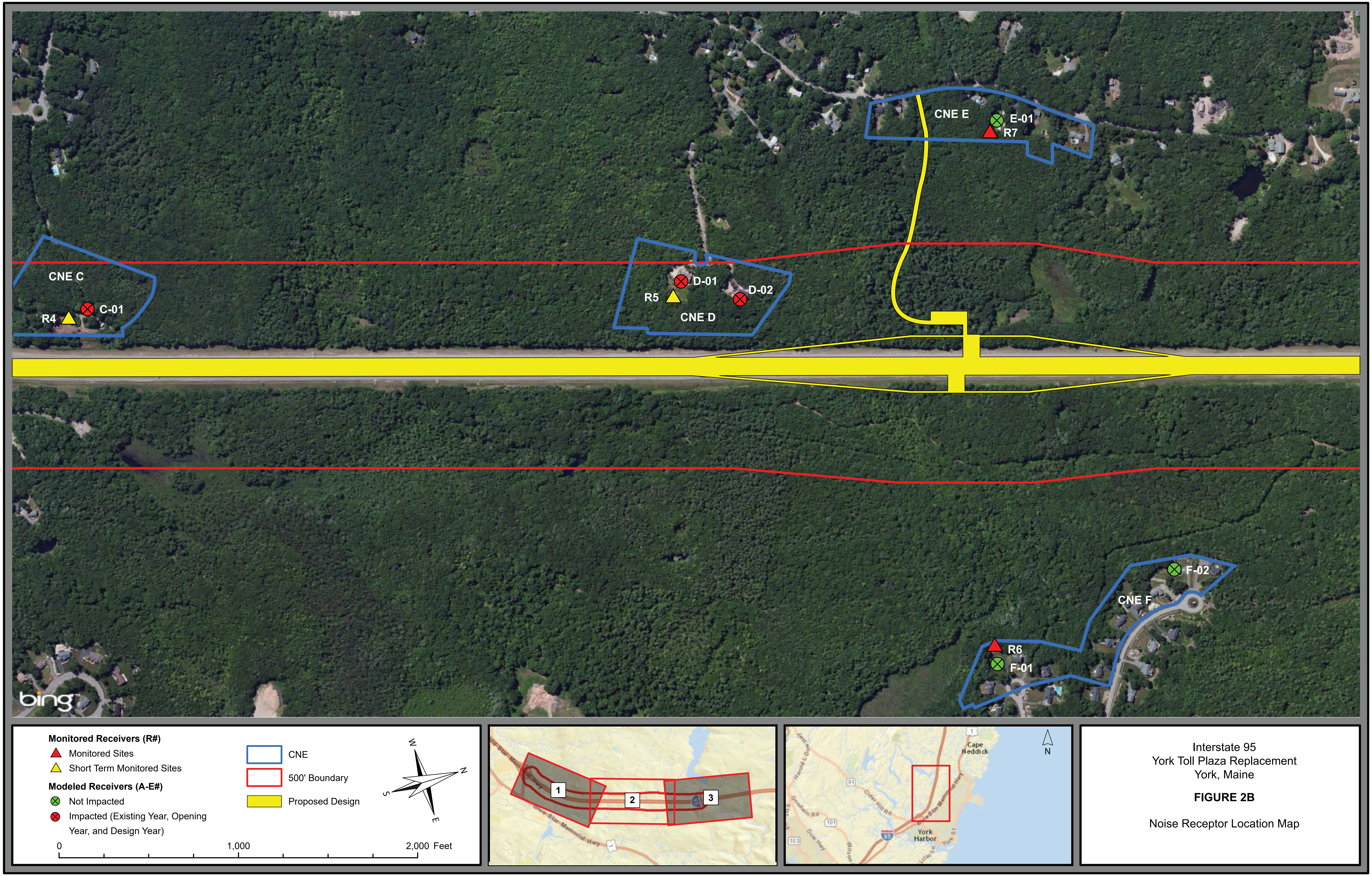
0 0.25 0.5
Miles



Interstate 95
York Toll Plaza Replacement
York, Maine

FIGURE 2A

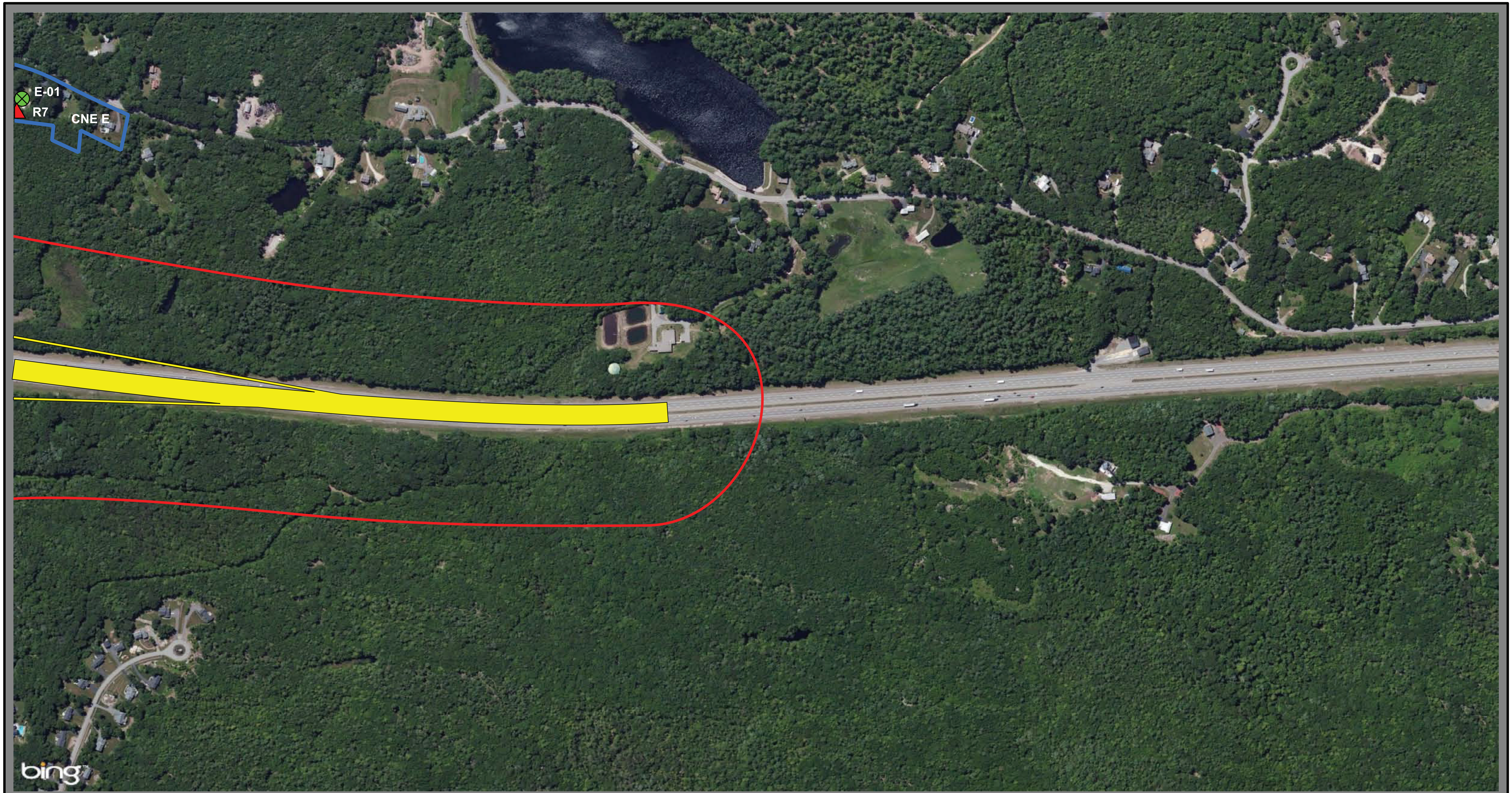
Noise Receptor Location Map



Interstate 95
York Toll Plaza Replacement
York, Maine

FIGURE 2B

Noise Receptor Location Map



Monitored Receivers (R#)

▲ Monitored Sites

△ Short Term Monitored Sites

Modeled Receivers (A-E#)

⊗ Not Impacted

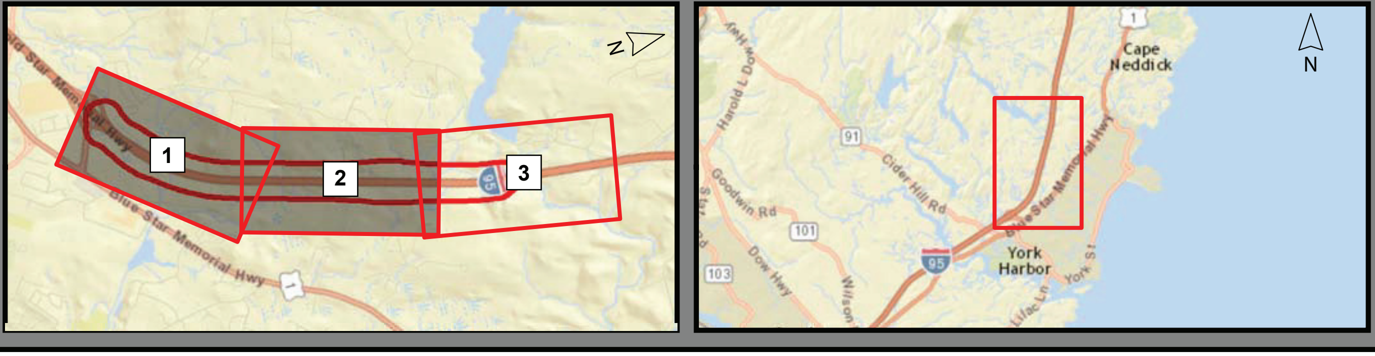
⊗ Impacted (Existing Year, Opening Year, and Design Year)

▭ CNE

▭ 500' Boundary

▬ Proposed Design

0 1,000 2,000 Feet



Interstate 95
York Toll Plaza Replacement
York, Maine

FIGURE 2C

Noise Receptor Location Map

2.0 INTRODUCTION

Although not required for environmental permitting, questions from local residents caused the Maine Turnpike Authority (MTA) to retain Jacobs Engineering Group (Jacobs) to conduct a noise analysis to assess and document potential noise impacts associated with the Interstate 95 (I-95) York Toll Plaza Replacement Project in York, Maine. The proposed project would construct a new high speed ORT toll plaza at Mile 8.8 and demolish the existing barrier toll plaza at Mile 7.3. The study area contains a mix of residential and institutional land uses. A Type I noise analysis has been performed as outlined within the MTA Highway Traffic Noise Policy. A project location map is shown in ***Figure 1***. A detailed display of the modeling sites and project area are shown in ***Figures 2A, 2B, and 2C***.

The purpose of this report is to document the methods for analysis, traffic noise impacts associated with the proposed toll plaza, and provide detailed analysis on future noise levels in the study area. This includes aerial photograph analysis, noise modeling methodologies and results. All additional relevant information incorporated into this noise analysis is included within Appendices A to E.

3.0 METHODOLOGY

3.1 REGULATORY REQUIREMENTS

The MTA is an independent quasi-state agency receiving no state or federal funds for its construction and maintenance, and as such, the MTA is not subject to regulation by the Maine Department of Transportation (MEDOT) or the Federal Highway Administration (FHWA). However, the MTA and MEDOT work closely with each other to provide consistent regulation of roadways. As a result, the MTA and MEDOT have developed a uniform noise policy that benefits users and abutters along their principle roadways and provides consistent and well defined action as it relates to highway traffic noise. This policy mirrors federal and state noise policies, which are advisory for the MTA.

Title 23, Part 772 of the U.S. Code of Federal Regulations (23 CFR 772), the FHWA Highway Traffic Noise Analysis and Abatement Guidance, June 2010 (Revised January 2011), or the most recent version, and the noise related requirements of NEPA were used as guidelines to implement the MTA Noise Policy. The current MTA Noise Policy became effective on January 22, 2015. This policy is applicable to Type I highway projects and was used to guide this analysis. The only portion of the project that fits the definition of a Type I highway project is the construction of the proposed ORT toll plaza at Mile 8.8 and thus noise measurements and analyses were conducted in the vicinity of Mile 8.8. Additional measurements and analyses were conducted in the vicinity of the existing barrier toll plaza at Mile 7.3 to document the resulting changes in the noise environment at that location as well.

3.2 SOUND LEVEL METRICS

Noise is generally defined as unwanted or annoying sound. Airborne sound occurs by a rapid fluctuation of air pressure above and below atmospheric pressure. Sound pressure levels are usually measured and expressed in decibels (dB). The decibel scale is logarithmic and expresses the ratio of the sound pressure unit being measured to a standard reference level.

Most sounds occurring in the environment do not consist of a single frequency, but rather a broad band of differing frequencies. The intensities of each frequency add to generate sound. Because the human ear does not respond to all frequencies equally, the method commonly used to quantify environmental noise consists of evaluating all of the frequencies of a sound according to a weighting system. It has been found that the A-weighted filter on a sound level meter, which includes circuits to differentially measure selected audible frequencies, best approximates the frequency response of the human ear.

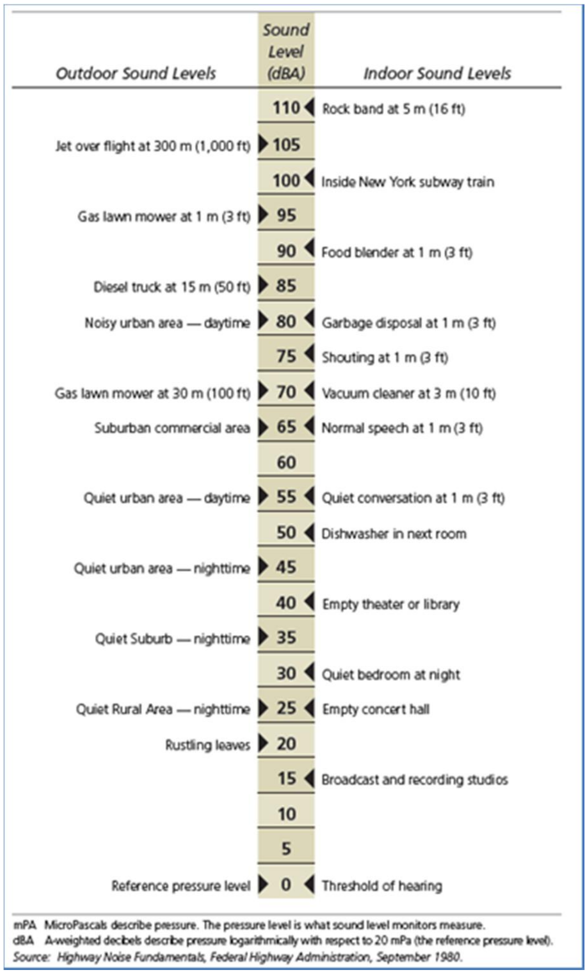
Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources, creating a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of traffic noise, a statistical noise descriptor called the equivalent hourly sound level, or Leq (h), is commonly used. Leq (h) describes a noise sensitive receptor’s cumulative exposure from all noise-producing events over a one-hour period.

Because decibels are logarithmic units, sound levels cannot be added by ordinary arithmetic means. The following general relationships provide a basic understanding of sound generation and propagation:

- An increase, or decrease, of 10 dB(A) will be perceived by a receptor to be a doubling, or halving, of the sound level.
- Doubling the distance between a highway and receptor will produce a 3 dB(A) sound level decrease.
- A 3 dB(A) change in sound levels is considered by FHWA and NEPA to be the threshold of audible change perceivable by the typical human ear.

Contained in ***Figure 3*** below are examples of common noise sources and their associated noise levels.

FIGURE 3: SOUND LEVEL EXAMPLES



Outdoor Sound Levels	*Sound Level (dBA)*	*Indoor Sound Levels*
	110	Rock band at 5 m (16 ft)
Jet over flight at 300 m (1,000 ft)	105	
	100	Inside New York subway train
Gas lawn mower at 1 m (3 ft)	95	
	90	Food blender at 1 m (3 ft)
Diesel truck at 15 m (50 ft)	85	
Noisy urban area — daytime	80	Garbage disposal at 1 m (3 ft)
	75	Shouting at 1 m (3 ft)
Gas lawn mower at 30 m (100 ft)	70	Vacuum cleaner at 3 m (10 ft)
Suburban commercial area	65	Normal speech at 1 m (3 ft)
	60	
Quiet urban area — daytime	55	Quiet conversation at 1 m (3 ft)
	50	Dishwasher in next room
Quiet urban area — nighttime	45	
	40	Empty theater or library
Quiet Suburb — nighttime	35	
	30	Quiet bedroom at night
Quiet Rural Area — nighttime	25	Empty concert hall
Rustling leaves	20	
	15	Broadcast and recording studios
	10	
	5	
Reference pressure level	0	Threshold of hearing

mPA MicroPascals describe pressure. The pressure level is what sound level monitors measure.
dBA A-weighted decibels describe pressure logarithmically with respect to 20 mPa (the reference pressure level).
Source: Highway Noise Fundamentals, Federal Highway Administration, September 1980.

3.3 NOISE ABATEMENT CRITERIA

The MTA Noise Policy has adopted the Noise Abatement Criteria (NAC) that have been established by FHWA (23 CFR 772) for determining traffic noise impacts for a variety of land uses. The NAC, listed in ***Table 1*** for various activities, represent the upper limit of acceptable traffic noise conditions and also a balancing of that which may be desirable with that which may be achievable. The NAC apply to areas having regular human use and where lowered noise levels are desired. They do not apply to the entire tract of land on which the activity is based, but only to that portion where the activity takes place. The NAC is given in terms of the hourly, A-weighted, equivalent sound level in decibels (dB(A)). The noise impact assessment is made using the guidelines listed in ***Table 1***. Noise-sensitive sites potentially affected by this project are classified as Category B and Category D.

TABLE 1: FHWA NOISE ABATEMENT CRITERIA

Hourly A-Weighted Sound Level Decibels (dB(A))			
Activity Category	**Activity Leq(h)**	**Evaluation Location**	**Description Of Activity Category**
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B*	67	Exterior	Residential
C*	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E*	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	Exterior	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing.
G	---	---	Undeveloped lands that are not permitted.
*: Includes undeveloped lands permitted for this activity category			

Source: 23 CFR Part 772

3.4 DEFINITION OF NOISE IMPACT

Traffic noise impacts occur if either of the following two conditions is met:

- The predicted traffic noise levels approach or exceed the NAC, shown in ***Table 1***. The MTA Noise Policy defines an approach level to be used when determining a traffic noise impact. The "approach" level has been defined by MTA as 1 dB(A) less than the NAC for Activity Categories A to E. For example, for a category B receptor, 66 dB(A) would be approaching 67 dB(A) and would be considered an impact. If design year noise levels "approach or exceed" the NAC, then the activity is impacted and a series of abatement measures would be considered.
- The predicted traffic noise levels are substantially higher than the existing noise levels. (Please note that this condition does not apply to the currently proposed York Toll Plaza Replacement Project.) The MTA Noise Policy defines a substantial noise increase as when predicted highway traffic noise levels exceed existing noise levels by 15 dB(A) or more. For example, if a receptor's existing noise level is 50 dB(A), and if the future noise level is 65 dB(A), then it would be considered an impact. The noise levels of the substantial increase impact do not have to exceed the appropriate NAC. Receptors that satisfy this condition warrant consideration of highway traffic noise abatement.

If traffic noise impacts are identified within the project corridor, then the MTA Noise Policy requires consideration of noise abatement measures. Noise abatement depends upon the feasibility of the design and overall cost weighted against the environmental benefit. Abatement analyses have not been performed as part of this analysis.

3.5 HIGHWAY NOISE COMPUTATION MODEL

Existing Year, Opening Year Build, Design Year No Build, and Design Year Build traffic noise calculations have been performed using the Federal Highway Administration’s Traffic Noise Model (FHWA TNM®) Version 2.5, which is the latest approved version. The FHWA TNM® was developed and sponsored by the U. S. Department of Transportation and John A. Volpe National Transportation Systems Center, Acoustics facility. The TNM estimates vehicle noise emissions and resulting noise levels based on reference energy mean emission levels. The existing and proposed alignments (horizontal and vertical) are input into the model, along with the receptor locations, traffic volumes of cars, medium trucks (vehicles with 2 axles and 6 tires,) heavy trucks, average vehicle speeds, pavement type, and any traffic control devices. The TNM uses its acoustic algorithms to predict noise levels at the selected receptor locations by taking into account sound propagation variables such as, atmospheric absorption, divergence, intervening ground, barriers, building rows, and heavy vegetation. Due to the intermittent and irregular nature of noise generated by compression release engine brakes, or “Jake” brakes which are often installed on diesel engines and used at the operator’s discretion, FHWA has no provision for its inclusion in the TNM computations. However, the facts that 85 percent of trucks now use E-Z Pass, and that the new ORT plaza is located on the crest of the hill which will to aid in the slowing down of the 15 percent of trucks that pay cash, allow for the general observation that use of Jake brakes should be virtually eliminated.

3.6 NOISE MONITORING AND MODEL VALIDATION

Data gathered from short-term noise monitoring was used to validate sound levels calculated from the TNM. These data, as well as roadway and terrain geometries were used to develop a model of the area in TNM. The resulting modeled traffic noise levels were compared with the monitored traffic noise levels. This was done to ensure that changes between future and existing noise levels were due solely to changes in project conditions and do not erroneously reflect discrepancies due to modeling and monitoring techniques. Per FHWA guidance, the difference between the monitored and modeled traffic noise levels should be within 3 dB(A).

Short term noise monitoring is performed for 20 minutes at each location. Data collected by the noise meter included time, average noise level (Leq), maximum noise level (Lmax), and instantaneous peak noise level (Lpk) for each interval. Hourly average noise levels were derived at each location from the 20-minute Leq values. During short term monitoring, traffic data was collected for roadways which contributed to the overall noise level, documenting the vehicle volume, composition, and speed. Traffic was grouped into one of three categories: cars, medium trucks, and heavy trucks. The traffic data applied to each monitoring event was obtained from MTA toll plaza traffic counts. This data was converted to one hour traffic data for validation of the noise model.

Long-term, 24-hour noise monitoring was performed at the Whippoorwill Subdivision and along Chases Pond Road near the intersection with Arnold Lane to quantify background, non-highway noise levels that cannot be accounted for by the TNM due to their distance away from I-95. To account for all potential noise sources in those communities, all future sound levels predicted in this study for residences in the Whippoorwill

Subdivision and along Chases Pond Road also include background noise contribution from the loudest ambient noise hour identified during 24-hour noise monitoring.

3.7 ANALYSIS PROCEDURE

To characterize the Existing Year, Opening Year Build, Design Year No Build, and Design Year Build noise levels at all noise-sensitive land uses in the study area, 11 noise prediction receivers (also called “receptors” and “sites”) were added to the validated noise model.

Noise modeling was then performed for Existing conditions using 2015 traffic data supplied by the project traffic engineers. This modeling step is performed to evaluate existing “worst-case” conditions associated with Existing Year worst-case free flow traffic volumes and composition. Next, No Build modeling was performed to evaluate “worst-case” conditions associated with Design Year traffic volumes without the proposed project in place. The model was then revised to reflect the addition of the York Toll Plaza Replacement Project as well as any associated changes to adjacent terrain or with existing roadways. This model was used to predict the Opening Year (2020) Build, and Design Year (2043) Build noise levels.

Additional analysis assumptions include the following:

- Noise levels were assessed for noise receptor locations up to approximately 500 feet from the proposed limits of construction.
    - Noise levels were also assessed within the Whippoorwill Subdivision specifically along Meadowlark Drive (located approximately 1000 feet east of the proposed toll plaza).
    - Noise levels were also assessed along Chases Pond Road near the intersection with Arnold Lane (located approximately 1000 feet west of the proposed toll plaza).
- Existing Year, Opening Year Build, Design Year No Build, and Design Year Build worst-case free flow traffic volumes and composition were provided by project traffic engineers. These data are used in traffic noise modeling to generate the loudest potential project-related traffic noise that noise-sensitive receptors may be expected to experience in all analysis years. For additional information, please refer to Appendix C – Traffic Data Summary.
- Medium and heavy truck volumes for each noise model were also provided by project traffic engineers. For additional information, please refer to Appendix C – Traffic Data Summary.

3.8 DATA SOURCES

Traffic count data was provided by MTA. Aerial photography was obtained from ESRI, Google Maps, and Bing Maps.

4.0 EXISTING NOISE ENVIRONMENT

4.1 COMMON NOISE ENVIRONMENTS

For reporting purposes, the project area was divided into areas of Common Noise Environments (CNEs). CNEs are defined as a group of receptors that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. In accordance with MTA guidance, noise-sensitive land uses within 500 feet of edge of design and project termini were identified. Existing Year (2015), Opening Year

(2020) Build, Design Year (2043) No Build, and Design Year (2043) Build noise levels were evaluated at these locations. Additionally, sound levels at noise sensitive sites within the Whippoorwill Subdivision were evaluated, specifically along Meadowlark Drive and Sparrow Lane (located approximately 1000 feet east of the proposed toll plaza) and noise sensitive sites along Chases Pond Road near the intersection with Arnold Lane (located approximately 1000 feet west of the proposed toll plaza). Base mapping, aerial photography, and site visits were used to identify noise-sensitive land uses within the study corridor. Six CNEs cover these identified land uses. The CNEs are shown in ***Figures 2A, 2B, and 2C***. The following is a brief description of each CNE.

- CNE A is located west of the existing barrier toll plaza and east of Chases Pond Road near Mile 7.3. The receptor within CNE A represents the York District Court. The York District Court does not have any outdoor uses, and is therefore classified as NAC D which utilizes interior noise levels. In order to predict interior noise levels, the exterior noise levels monitored were first calibrated against predicted noise levels from the noise model for exterior conditions and existing traffic volume levels (See Table 3). After calibration of the existing exterior values and the noise model was run again for no build, opening year and build traffic volume levels for exterior values and then assigned the appropriate noise reduction factor of 25 dB(A) as based on FHWA's Highway Traffic Noise Analysis and Abatement Policy and Guidance (FHWA-HEP-10-025). The values in Tables 4-8 represent noise levels for interior conditions based on modelling the actual exterior location and then applying the appropriate adjustment factor to represent interior conditions.

- CNE B is located east of the existing barrier toll plaza and west of New Town Road near Mile 7.3. Receptors within CNE B represent four residences and are classified as NAC B.

- CNE C is located west of the existing barrier toll plaza and north and south of Old East Scituate Road near Mile 7.3. The receptor within CNE C represents one residence and is classified as NAC B.

- CNE D is located west of the proposed ORT plaza and east of Woods Run near Mile 8.8. Receptors within CNE D represent two residences and are classified as NAC B.

- CNE E is located west of the proposed ORT plaza along Chases Pond Road located approximately 1000 feet from I-95 near Mile 8.8. The receptor within CNE E represents one residence and is classified as NAC B.

- CNE F is located east of the proposed ORT plaza along Meadowlark Drive and Sparrow Lane within the Whippoorwill Subdivision located approximately 1000 feet from I-95 near Mile 8.8. The receptors within CNE F represent two residences and are classified as NAC B.

4.2 NOISE MONITORING

Prior to noise monitoring, aerial mapping was reviewed to identify noise sensitive land uses and any significant sources of acoustical shielding. Five representative locations for short term and two representative locations for long term, 24- hour noise monitoring were identified; their locations are shown on ***Figures 2A, 2B, and 2C.*** Noise monitoring was performed at 20-minute intervals at each of the short term monitoring locations. Noise measurements were collected under meteorologically acceptable conditions when the pavement was dry and winds were calm or light. Measurements were conducted using Bruel & Kjaer SLM Type 2236 and 2237 ANSI Type 1 noise meters based on best practice procedures on the collection of existing noise level readings (Federal Highway Administration, Volpe National Transportation Systems Center, 1996). The sound level meters were calibrated before and after each measurement with a Bruel & Kjaer Type 4231 calibrator. The calibration records are included in ***Appendix A***.

Noise monitoring was conducted by Jacobs' noise staff on April 19th and 20th, 2016 during leafless season in a heavily vegetated area, although pockets of non-deciduous trees which retain leaves year-round were present throughout the project area. Per FHWA guidance, a traffic noise model may only account for noise attenuation from large, contiguous, and non-deciduous tree zones in order for the noise model to predict the loudest traffic noise that receptors would experience year-round. The presence of non-deciduous pockets throughout the project area was accounted for and credited in both the validation and prediction noise models through the use of leafless aerial imagery during model development, as well as field inspection during noise monitoring. The model does not account for any noise attenuation from deciduous trees.

The monitored Leq ranged from 51.2 dB(A) to 67.4 dB(A). At each short term monitoring location, the noise environment was dominated by nearby I-95, while at long term monitoring sites located farther away from I-95 (greater than 1000 feet), a traffic "drone" was perceptible. A summary of the monitoring results is presented in ***Table 2*** and the field data sheets and results are presented in ***Appendix B***.

TABLE 2: SUMMARY OF NOISE MONITORING DATA

Site	CNE	Location	Land Use Description	Land Use / Activity Category	Leq (dB(A))
R1	A	Near Miles 7.3	York District Court	Institutional / D	63.3
R2	B	Near Mile 7.3	Houses along Newtown Road	Residential / B	58.2
R3	B	Near Mile 7.3	Houses along Newtown Road	Residential / B	63.3
R4	C	Near Mile 7.3	Houses along Brown Lane	Residential / B	67.4
R5	D	Near Mile 8.8	Houses east of Woods Run	Residential / B	60.8
R6	F	Near Mile 8.8	Houses within Whippoorwill Subdivision	Residential / B	51.2
R7	E	Near Mile 8.8	House along Chases Pond Road	Residential / B	54.0

Source: Jacobs, 2016

4.3 NOISE MODEL VALIDATION

The validation of the traffic model was accomplished by comparing the monitored noise levels with the noise levels generated by the computer model using traffic volumes and speeds that were encountered during the monitoring process. Validation ensures that reported changes between Existing and Build conditions are due to changes in traffic, and not discrepancies between monitoring and modeling techniques. A difference of ±3 dB(A) or less between the monitored and modeled levels is considered acceptable, since this is the threshold of audible change perceivable by the typical human ear. A summary of the model validation is provided in ***Table 3***.

TABLE 3: NOISE MODEL VALIDATION

Site	Location	Monitored Noise Level (dB(A))	Predicted Noise Level (dB(A))	Difference (Predicted - Monitored dB(A))
R1	Near Miles 7.3	63.3	63.9	0.6
R2	Near Mile 7.3	58.2	58.8	0.6
R3	Near Mile 7.3	63.3	63.6	0.3
R4	Near Mile 7.3	67.4	67.5	0.1
R5	Near Mile 8.8	60.8	61.2	0.4

Source: Jacobs, 2016

As the validation sites have less than a 1 dB(A) difference between the monitored and modeled noise levels, the model is validated as an accurate representation of the project noise environment. Model validation was not performed at R6 and R7 as TNM does not account for non-highway noise sources, such as traffic traveling on Chases Pond Road.

4.4 UNDEVELOPED LANDS AND PERMITTED DEVELOPMENTS

In accordance with the MTA Noise Policy, highway traffic noise analyses will be performed for developed lands. MTA noise policy does not provide for noise mitigation for any undeveloped land that is permitted or constructed subsequent to this date.

Coordination with MTA and Jacobs' staff resulted in the determination that there were no permitted undeveloped properties within the project area.

4.5 MODELED EXISTING ENVIRONMENT

To characterize existing and future noise levels at all noise-sensitive land uses in the study area, 11 noise prediction receptors (also called "receivers" and "sites") were added in the TNM. These receptors represent 10 exterior land uses and one interior use area. The receptors are shown on ***Figures 2A, 2B, and 2C***. Existing traffic data was then entered into the TNM to predict existing sound levels at each receptor. The traffic data used for the analysis is included in ***Appendix C***. (Please note that the predicted noise levels shown in Table 4 for existing 2015 conditions represent modeled values and should not be compared to monitored values, shown in Table 3, that were recorded under different volume conditions and locations.)

With the toll plaza at Mile 7.3 under Existing (2015) conditions, the modeling results showed that seven receptors are currently classified as "impacted" by traffic noise, as five residences in CNE B and C near Mile 7.3 and two residences in CNE D near Mile 8.8 would approach or exceed the NAC defined limit of 67 dB(A) for residential land uses. ***Table 4*** summarizes the Existing results by CNE.

TABLE 4: RANGE OF PREDICTED EXISTING NOISE LEVELS BY CNE

CNE	Location	Existing Year (2015) dB(A)	Receptors approaching or exceeding 67 db(A)
A	Near Miles 7.3	45	None
B	Near Mile 7.3	68 to 70	Four receptors representing four residences.
C	Near Mile 7.3	73	One receptor representing one residence
D	Near Mile 8.8	66 to 72	Two receptors representing two residences
E	Near Mile 8.8	59	None
F	Near Mile 8.8	58 to 63	None

Source: Jacobs, 2016

5.0 FUTURE NOISE ENVIRONMENT

5.1 MODELED FUTURE ENVIRONMENT

To characterize the No Build condition, the TNM was revised to reflect the Design Year (2043) No Build traffic volumes. The traffic data used for this analysis is included in ***Appendix C.***

With the toll plaza at Mile 7.3 under Design Year (2043) No Build conditions, the modeling results showed that seven receptors would experience noise increases of 1 dB(A), as five residences in CNE B and C near Mile 7.3 and two residences in CNE D near Mile 8.8 would approach or exceed the noise levels adopted by MTA in their Traffic Noise Policy. ***Table 5*** summarizes the Design Year No Build results by CNE.

Analysis of the results in ***Tables 4 and 5*** shows that there are no additional receptors experiencing noise level increases in the Design Year No Build when compared to the Existing Year.

TABLE 5: RANGE OF PREDICTED DESIGN YEAR NO BUILD NOISE LEVELS BY CNE

CNE	Location	Design Year (2043) No Build dB(A)	Receptors approaching or exceeding 67 db(A)
A	Near Miles 7.3	46	None
B	Near Mile 7.3	69 to 71	Four receptors representing four residences
C	Near Mile 7.3	74	One receptor representing one residence
D	Near Mile 8.8	67 to 73	Two receptors representing two residences
E	Near Mile 8.8	60	None
F	Near Mile 8.8	59 to 64	None

Source: Jacobs, 2016

To characterize the Opening Year (2020) Build and Design Year (2043) Build conditions, the TNM was revised to reflect the Build Design as well as Opening Year and Design Year traffic volumes. The traffic data used for this analysis is included in ***Appendix C.***

With the toll plaza at Mile 8.8 under Opening Year (2020) Build and Design Year (2043) Build conditions, the modeling results showed that seven receptors would experience small noise increases, as five residences in CNE B and C near Mile 7.3 and two residences in CNE D near Mile 8.8 would approach or exceed the NAC. ***Tables 6 and 7*** summarize the Opening Year Build and Design Year Build results by CNE. None of the residences at the Whippoorwill subdivision would experience any perceptible noise impacts from the project.

Analysis of the results in ***Tables 4, 6 and 7*** shows that there are no additional receptors experiencing noise level increases in the Opening Year Build or the Design Year Build when compared to the Existing Year.

TABLE 6: RANGE OF PREDICTED OPENING YEAR BUILD NOISE LEVELS BY CNE

CNE	Location	Opening Year (2020) Build dB(A)	Impacted Receptors
A	Near Miles 7.3	45	None
B	Near Mile 7.3	69 to 70	Four receptors representing four residences
C	Near Mile 7.3	73	One receptor representing one residence
D	Near Mile 8.8	66 to 72	Two receptors representing two residences
E	Near Mile 8.8	59	None
F	Near Mile 8.8	59 to 64	None

Source: Jacobs, 2016

TABLE 7: RANGE OF PREDICTED DESIGN YEAR BUILD NOISE LEVELS BY CNE

CNE	Location	Design Year (2043) Build dB(A)	Impacted Receptors
A	Near Miles 7.3	46	None
B	Near Mile 7.3	70 to 71	Four receptors representing four residences
C	Near Mile 7.3	74	One receptor representing one residence
D	Near Mile 8.8	67 to 73	Two receptors representing two residences
E	Near Mile 8.8	61	None
F	Near Mile 8.8	59 to 65	None

Source: Jacobs, 2016

5.2 NOISE IMPACT SUMMARY

In order to make a determination that a noise impact exists, one of the following conditions must be met:

- Predicted noise levels either approach or exceed the NAC defined in ***Table 1***;
- A substantial noise increase, defined by MTA as a 15 dB(A) increase above existing noise levels for all noise-sensitive exterior activity categories. (Note: This project will note cause such noise increases)

Table 8 shows the Existing Year, Design Year No Build, and Design Year Build sound levels for each of the modeled receptors. The same seven sites in CNE B, CNE C and CNE D are currently classified under existing conditions as “impacted” by traffic noise because they approach or exceed the NAC defined limit of 67 dB(A) for residential land uses. All seven sites would experience an increase of 1dB(A) due to increases in no build traffic volumes and only four sites an additional 1 dB(A) increase due to construction of the project. This increase would not result in a perceptible difference in noise levels as it is below 3 dB(A) which is defined by FHWA and NEPA as the threshold of audible change perceivable by the typical human ear.

TABLE 8: MODELING RESULTS SUMMARY 1

Receptor	Location	NAC	Residences	Existing Year (2015)	Design Year No Build (2043)	Design Year Build (2043)	Noise Increase due to Traffic Growth (No Build - Existing (dB(A))	Noise Increase due to Plaza Relocation (Build - No Build (dB(A))
A-01	Near Miles 7.3	D*	1	45	46	46	1	0
B-01	Near Mile 7.3	B	1	68	69	70	1	1
B-02		B	1	69	70	70	1	0
B-03		B	1	68	69	70	1	1
B-04		B	1	70	71	71	1	0
C-01	Near Mile 7.3	B	1	73	74	74	1	0
D-01	Near Mile 8.8	B	1	66	67	67	1	0
D-02		B	1	72	73	73	1	0
E-01	Near Mile 8.8	B	1	59	60	61	1	1
F-01	Near Mile 8.8	B	1	58	59	59	1	0
F-02		B	1	63	64	65	1	1

**Represents interior noise levels (-25 dB(A) from exterior noise levels)*

Note: Noise levels calculated in CNE E and CNE F include non-highway background noise contributions of 51.2 dB(A) and 54 dB(A), respectively, as established by long-term twenty-four hour monitoring.

No perceptible noise impacts are anticipated from the proposed ORT toll plaza at Mile 8.8, as all impacts to receptors in either the Design Year No Build or Design Year Build were already present in the Existing Year. With the toll plaza remaining at Mile 7.3, an increase of 1 dB(A) is anticipated to occur at all receptors as a result of natural traffic growth between the Existing Year (2015) and the Design Year (2043) No Build.

Under the Design Year (2043) Build scenario, the toll plaza relocation to Mile 8.8 would not increase traffic noise at any location more than 1 dB(A). At receptors B-01 and B-03 near Mile 7.3, traffic noise would increase slightly by 1 dB(A) due to higher travel speed resulting from the removal of the existing toll plaza at Mile 7.3. In the vicinity of Mile 8.8, the roadway facility would be expanded to be slightly closer to receptors E-01 and F-02, as well as introduce new traffic that would be accelerating at full-throttle away from the relocated toll plaza. These actions would introduce a slight traffic noise increase of 1 dB(A) in CNE E and CNE F.

The overall effect of the toll plaza relocation on traffic noise in the project area would be minimal for the following reasons:

- The relocation would not affect travel demand for the Turnpike, therefore there is no increase between No Build and Build traffic volumes.

- The distance between the roadway noise and receptors is not significantly decreased.
- The new toll plaza would not introduce a significant amount of vehicles accelerating at full-throttle from Mile 8.8 as the majority of vehicles would remain at free-flow “cruise” speed through the ORT lanes.

While slight noise level increases would occur in CNE B, CNE E, and CNE F, the maximum increase in noise levels as a direct result of the toll plaza relocation is predicted to be 1 dB(A).

Table 9 shows the change in sound levels between Existing Year (2015) and Opening Year (2020) Build. With the toll plaza relocated from Mile 7.3 to Mile 8.8, no additional noise impacts would occur, nor would any existing noise impacts be perceptibly worsened by the project as the increase in traffic noise would be a maximum of 1 dB(A) occurring at four receptors in CNE B and CNE F.

TABLE 9: MODELING RESULTS SUMMARY 2

Receptor	Location	NAC	Count	Existing Year (2015)	Opening Year (2020) Build	Noise Increase from Existing to Opening Year
A-01	Near Mile 7.3	D*	1	45	45	0
B-01	Near Mile 7.3	B	1	68	69	1
B-02		B	1	69	69	0
B-03		B	1	68	69	1
B-04		B	1	70	70	0
C-01	Near Mile 7.3	B	1	73	73	0
D-01	Near Mile 8.8	B	1	66	66	0
D-02		B	1	72	72	0
E-01	Near Mile 8.8	B	1	59	59	0
F-01	Near Mile 8.8	B	1	58	59	1
F-02		B	1	63	64	1

**Represents interior noise levels (-25 dB(A) from exterior noise levels)*

Note: Noise levels calculated in CNE E and CNE F include non-highway background noise contributions of 51.2 dB(A) and 54 dB(A), respectively, as established by long-term twenty-four hour monitoring.

6.0 CONSTRUCTION NOISE CONSIDERATIONS

MTA is also concerned with noise generated during the construction phase of the proposed project. While the degree of construction noise impact will vary, as it is directly related to the types and number of equipment used and the proximity to the noise-sensitive land uses within the project area. Land uses that are sensitive to traffic noise, are also potentially considered to be sensitive to construction noise. Any construction noise impacts that do occur as a result of roadway construction measures are anticipated to be temporary in nature and will cease upon completion of the project construction phase.

However, during the design phase of the proposed project, MTA will work with local public officials and community members to limit, minimize, or eliminate adverse construction noise related impacts to the community, as practicable. Construction noise control measures will be incorporated in the plans and specifications in accordance with MTA policy.

Appendix A
Noise Meter and Acoustical Calibrator Calibration Certificates

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.31855

Instrument: **Sound Level Meter**
Model: **2236**
Manufacturer: **Brüel and Kjær**
Serial number: **2100601**
Tested with: **Microphone 4188 s/n 2057666**
Preamplifier ZC0027
Type (class): **1**
Customer: **Jacobs Engineering**
Tel/Fax: **973-568-6796, -267-0555 / -267-3555**

Date Calibrated: **7/29/2014** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes **X** No
Calibration service: __ Basic **X** Standard
Address: **299 Madison Ave.,**
Morristown NJ 07962-1936

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 21, 2014	Scantek, Inc./ NVLAP	Jul 21, 2015
DS-360-SRS	Function Generator	88077	Aug 30, 2012	ACR Env./ A2LA	Aug 30, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Sep 3, 2013	ACR Env./ A2LA	Sep 3, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0 °C	99.85 kPa	50.7 %RH

Calibrated by:	Mariana Buzduga	**Authorized signatory:**	Valentin Buzduga
Signature		Signature	
Date	7/29/2014	Date	7/29/2014

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - ANSI S1.4 CLAUSE 3.2	Passed	0.2
INPUT AMPLIFIER TEST: GAIN TEST / ATTENUATOR SETTING - ANSI S1.4-1983 CLAUSE 5.3	Passed	0.25
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.25
FILTER TEST: OCTAVE FILTER - IEC60225 CLAUSE 6.2 AND 6.3	Passed	0.25
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone:	Brüel & Kjær 4188 s/n 2057666 for acoustical test
Preamplifier:	Brüel & Kjær ZC0027 s/n n/a for all tests
Other: line adaptor ADP005 (18pF) for electrical tests	
Accompanying acoustical calibrator:	Brüel and Kjær 4231 s/n 2085219
Windscreen:	none

Measured Data: in Test Report # 31855 of 12+1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.31856

Instrument: **Microphone**
Model: **4188**
Manufacturer: **Brüel & Kjær**
Serial number: **2057666**
Composed of:

Date Calibrated: **7/29/2014** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Jacobs Engineering**
Tel/Fax: **973-568-6796, -267-0555/-267-3555**

Address: **299 Madison Ave.,**
Morristown NJ 07962-1936

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 21, 2014	Scantek, Inc./ NVLAP	Jul 21, 2015
DS-360-SRS	Function Generator	88077	Aug 30, 2012	ACR Env./ A2LA	Aug 30, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Sep 3, 2013	ACR Env./ A2LA	Sep 3, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	22909	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014
1203-Norsonic	Preamplifier	92271	Oct 24, 2013	Scantek, Inc./ NVLAP	Oct 24, 2014
4180-Brüel&Kjær	Microphone	2246115	Oct 15, 2013	NPL-UK / UKAS	Oct 15, 2015

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Mariana Buzduga	**Authorized signatory:**	Valentin Buzduga
Signature		Signature	
Date	7/29/2014	Date	7/29/2014

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments:	The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0 ± 1.0	99.85 ± 0.001	50.7 ± 2.0

Main measured parameters:

Tone frequency (Hz)	Measured[4] /Acceptable Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-30.07 ± 0.12/ -30.0 ±2	31.37

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 31856 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.31857

Instrument: **Acoustical Calibrator**
Model: **4231**
Manufacturer: **Brüel and Kjær**
Serial number: **2085219**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:

Date Calibrated: **7/29/2014** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Jacobs Engineering**
Tel/Fax: **973-568-6796, -267-0555 /-267-3555**

Address: **299 Madison Ave.,**
Morristown NJ 07962-1936

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	**Description**	**S/N**	**Cal. Date**	**Traceability evidence**	**Cal. Due**
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 21, 2014	Scantek, Inc./ NVLAP	Jul 21, 2015
DS-360-SRS	Function Generator	88077	Aug 30, 2012	ACR Env./ A2LA	Aug 30, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Sep 3, 2013	ACR Env./ A2LA	Sep 3, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2014
140-Norsonic	Real Time Analyzer	1403978	Mar 21, 2014	Scantek, Inc. / NVLAP	Mar21, 2015
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	950698	Nov 8, 2013	Scantek, Inc. / NVLAP	Nov 8, 2014
1203-Norsonic	Preamplifier	92271	Oct 24, 2013	Scantek, Inc./ NVLAP	Oct 24, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Mariana Buzduga	**Authorized signatory:**	Valentin Buzduga
Signature		Signature	
Date	7/29/2014	Date	7/29/2014

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES[1] FROM STANDARDS REFERENCED IN PROCEDURES:	MET[2]	NOT MET	COMMENTS
Manufacturer specifications			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
Current standards			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	X		
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] The tests marked with (*) are not covered by the current NVLAP accreditation.

Main measured parameters [3]:

Measured[4]/Acceptable[5] Tone frequency (Hz):	Measured[4]/Acceptable[5] Total Harmonic Distortion (%):	Measured [4]/Acceptable Level[5] (dB):
999.81 ± 1.0/1000.0 ± 10.0	0.2 ± 0.1/ < 3	94.02 ± 0.12/94.0 ± 0.4
999.81 ± 1.0/1000.0 ± 10.0	0.3 ± 0.1/ < 3	114.04 ± 0.12/114.0 ± 0.4

[3] The stated level is valid at reference conditions.

[4] The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

[5] Acceptable parameters values are from the current standards

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.7 ± 1.2	99.86 ± 0.001	49.6 ± 2.7

Tests made with following attachments to instrument:

Calibrator ½" Adaptor Type: UC0210
Other:

Adjustments: Unit was not adjusted.
Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Measured Data: in Acoustical Calibrator Test Report # 31857 of two pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Appendix B
Noise Monitoring Data Forms

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Short-Term Monitoring

Interstate 95 York Toll Plaza Replacement

Site # R1

Done By: MC

Meter: B&K 2237

Description : Courthouse

	Start	End
Date	4/19/2016	4/19/2016
Time	10:44 AM	11:04 AM

Traffic	**NB/EB**	**SB/WB**
Cars	428	337
MT	15	10
HT	72	72
Buses	1	2
Motorcycles	0	0
Total	**516**	**421**

Notes:

NB faster, accel away from booth (car 40+, truck 30+)

SB slower, decel into booth, airbrake all 30

Site at grade, direct LOS, ramp lightly used

20:12 / LEQ 63.3, 97.3, 53.9, 77.2

Wind Speed (mph) 0-5 **Temp. (°F)** 44 **Humidity (%)** 75

North

Jacobs Engineering Group, Inc.

Interstate 95 York Toll Plaza Replacement

Site # R2
Done By: MC
Meter: B&K 2237

Description : 14 Newtown Road

	Start	End
Date	4/19/2016	4/19/2016
Time	8:51 AM	9:13 AM

Traffic	**NB/EB**	**SB/WB**
Cars	338	541
MT	22	18
HT	83	58
Buses	0	0
Motorcycles	0	0
Total	**443**	**617**

Count data from Toll Plaza

Notes:

Loud "drone" can be heard, environment unremarkable.
Tree buffer does not appear to block much noise. Ground
wet from morning light rain. Soil may be harder
21:00 LEQ 58.2, MaxP 91, MinL 53

Wind Speed (mph) 0-5 **Temp. (°F)** 44 **Humidity (%)** 76

North ↑

Jacobs Engineering Group, Inc.

Interstate 95 York Toll Plaza Replacement

Site # R3

Done By: MC

Meter: B&K 2237

Description : 39 Newtown Road

	Start	**End**
Date	4/19/2016	4/19/2016
Time	8:51 AM	9:13 AM

Traffic	**NB/EB**	**SB/WB**
Cars	290	487
MT	5	10
HT	67	48
Buses	2	0
Motorcycles	0	0
Total	**364**	**545**

Notes:

NB trucks accel. Loud from nearby booths. SB trucks decel, sometimes air braking, only 1 during run. Cars at leas 60 mph. NB trucks accel 50+, SB trucks fast.

Clear LOS, ground slightly wet; quieter than expected. Ground slightly elevated, some Z fluctuations.

leq: 63.3

Wind Speed (mph) 0-5

Temp. (°F) 44

Humidity (%) 72

North ↑

Jacobs Engineering Group, Inc.

Interstate 95 York Toll Plaza Replacement

Site # R4

Done By: MC

Meter: B&K 2237

Description : Brown's Freehold

	Start	End
Date	4/19/2016	4/19/2016
Time	11:35 AM	11:56 AM

Traffic	**NB/EB**	**SB/WB**
Cars	413	385
MT	11	13
HT	84	73
Buses	0	0
Motorcycles	0	0
Total	**508**	**471**

Notes:

SB much slower ~45mph cars, trucks 30-45mph.

NB all 60 mph, trucks similar. Site is abandoned, demolished

home. Future home to be in vicinity possibly.

20:05 LEQ 67.4, 99.7, 54.4, 83. 4

Wind Speed (mph) 0 **Temp. (°F)** 45

Humidity (%) 70

North ↑

Jacobs Engineering Group, Inc.

Interstate 95 York Toll Plaza Replacement

Site # R5

Done By: MC

Meter: B&K 2237

Description : 3 Elizabeth Lane

	Start	End
Date	4/19/2016	4/19/2016
Time	12:23 PM	12:43 PM

Traffic	**NB/EB**	**SB/WB**
Cars	451	441
MT	19	8
HT	75	81
Buses	0	0
Motorcycles	0	0
Total	**545**	**530**

Count data from Toll Plaza

Notes:

Loud, but barely visible due to leafless trees, elevation,

cliffs prominent, site at least +10.

20:20 Leq 60.8, 92.9, 53.3, 72.4

Wind Speed (mph) 0

Temp. (°F) 45

Humidity (%) 70

Jacobs Engineering Group, Inc.

Long-Term, Twenty-Four Hour Monitoring

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Long-Term, Twenty-Four Hour Monitoring Location Results				
Site	**Hour**	**Average of Leq**	**Average of L10**	**Average of L90**
R6	0	48.4	50.3	45
	1	46.2	47.8	43.3
	2	46.6	48.5	43.2
	3	48	49.7	44.4
	4	47.6	49.1	44.9
	5	50.5	51.9	48
	6	51	52.4	48.6
	7	50.6	52.1	48
	8	45.8	47	43.8
	9	42.2	42.9	41.1
	10	41	41.9	40.4
	11	41.6	44.7	40.5
	12	43.1	43.2	
	13	43.6	45.3	40.8
	14	42.7	44.6	40.7
	15	48.5	47.3	47.8
	16	44.1	45.3	40.7
	17	45.3	46.1	43.5
	18	43.1	43.9	41.3
	19	49.5	50.8	47.4
	20	54	54.6	52.8
	21	52.2	53.2	50.5
	22	52	53.8	48.7
	23	50.3	52.1	47.3
R7	0	42.9	43.6	41.8
	1	42.8	43.7	41.8
	2	44.2	46.2	42
	3	46	48.2	43.2
	4	45.3	48.1	41.5
	5	49	51.6	44.5
	6	49.7	52.4	44.3
	7	48.9	52.6	41.8
	8	48.1	51.7	41.2
	9	45.8	49.2	41
	10	46.8	50.1	42.1
	11	48	50.5	44
	12	47.6	50.5	41.9
	13	46.8	50	41.9
	14	49.9	52.4	45.8
	15	51.2	53.6	47.5
	16	50.4	52.9	46.1
	17	50	52.5	45.9
	18	48.9	51.3	44.8
	19	48.3	50.4	44.9

Long-Term, Twenty-Four Hour Monitoring Location Results				
Site	**Hour**	**Average of Leq**	**Average of L10**	**Average of L90**
	20	48.1	50.1	45
	21	46.9	49.1	43.6
	22	44.7	46.1	42.2
	23	44.1	45.8	41.8

Appendix C
Traffic Data Summary

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Traffic Data for Noise Study		Northbound									
		Light Vehicles			Medium Trucks			Heavy Trucks			MP 7.3
		Total	Cash	EZ-Pass	Total	Cash	EZ-Pass	Total	Cash	EZ-Pass	On-Ramp
Existing Year	2015	3,436	911	2,525	42	11	31	152	41	111	320
Opening Year	2021	3,583	950	2,633	44	12	32	158	42	116	334
No Build	2,043	4,140	989	3,151	62	10	52	223	37	186	473
Design Year	2043	4,140	989	3,151	62	10	52	223	37	186	473

Traffic Data for Noise Study		Southbound									
		Light Vehicles			Medium Trucks			Heavy Trucks			MP 7.3
		Total	Cash	EZ-Pass	Total	Cash	EZ-Pass	Total	Cash	EZ-Pass	Off-Ramp
Existing Year	2015	3,710	1,449	2,260	57	21	36	207	77	130	440
Opening Year	2021	3,868	1,511	2,357	60	22	38	216	80	136	459
No Build	2043	4053	1393	2660	100	26	74	356	92	264	649
Design Year	2043	4,053	1,393	2,660	100	26	74	356	92	264	649

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Appendix D
References

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APPENDIX 7

YORK MEETING LIST 2006-2016

York Meetings 2006 - 2016

Date	Reason for meeting	Where	Attendees
2006-09-26	Town Mangers meeting	York Maintenance	Towns of York, Ogunquit, Wells, MTA Staff
2006-10-25	Joint Select Board Meeting	Ogunquit Town Hall	Towns of York, Ogunquit, Wells, MTA Staff
2007-03-21	Presentation to York County Delegation		York County Legislators, MTA Staff
2007-08-09	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-08-10	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-09-21	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-11-29	Town Mangers meeting	Tour of York Toll	Towns of York, Ogunquit, Wells, MTA Staff
2007-12-10	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2008-01-22	Town Mangers meeting		Towns of York, Ogunquit, Wells, MTA Staff
2008-01-23	Joint Select Board Presenation	Ogunquit Town Hall	Towns of York, Ogunquit, Wells, MTA Staff
2008-02-15	Town Mangers meeting		Towns of York, Ogunquit, Wells, MTA Staff
2008-02-27	Public Meeting	York Middle School	Members of the public (about 40 signed in) MTA and HNTB Staff
2008-04-03	Public Meeting	York Middle School	Members of the public (over 350 signed in), Think Again, Town of York, MTA and HNTB Staff

2008-04-29	MTA/York Meeting	MTA	MTA Staff, MTA Board, York Selectmen
2008-05-15	Authority and York Selectmen meeting	York Beach Fire Station	MTA Staff, Think Again, HNTB, York Selectmen, Town of York
2009-06-19	Presentation of the York Toll Existing Site Feasibility Study	MTA	MTA Board members and Staff, York selectmen
2009-09-03	Letter to Joan Jarvis from Conrad Welzel with answers to questions they submittted on the Existing Site Evaluation		
2009-09-09	Letter from Chairman Conley to York regarding the Resolution to accept the Recommendations from HNTB		
2009-10-26	Second set of answers sent to Think Again		
2009-11-05	Authority and York Selectmen meeting	MTA	Members of the public (about 50 signed in) Think Again, MTA Board and Staff
2009-12-16	Abutters meeting	York Middle School	Abutters, MTA and HNTB Staff
2010-01-21	Public Meeting	York Middle School	Members of the public, Think Again, Dawn Hill, Town of York, MTA and HNTB Staff
2010-02-10	York Water District meeting		YWD, HNTB, MTA Staff
2012-03-08	York Water District meeting	YWD	YWD, HNTB, MTA Staff
2014-05-14	Think Again Meeting	Norma's	Sara Zografos, Peter Mills, Think Again
2014-09-15	Think Again Meeting	Norma's	Erin Courtney, Sara Zografos, Think Again

2014-10-14	Workshop on wetland mapping	MTA	Dean Lessard, Dick Bilden, MTA Staff
2014-10-16	MTA Board Meeting-wetland mapping presentation	MTA	MTA Board and Staff, Think Again
2014-10-20	Think Again Meeting	Norma's	Erin Courtney, Sara Zografos, Think Again
2014-12-18	MTA Board Meeting- plaza sizing presentation	MTA	MTA Board and Staff, Think Again
2014-12-18	Workshop on plaza sizing	MTA	Dean Lessard, Dick Bilden, David Linney, MTA Staff & Jacobs
2015-03-23	Pre Board Meeting Workshop on exisitng plaza location	MTA	Dean Lessard, Dick Bilden, MTA Staff
2015-03-26	MTA Board Meeting-existing site presentation	MTA	MTA Board and Staff, Think Again
2015-05-28	MTA Board Meeeting	MTA	MTA Board and Staff
2015-06-25	MTA Board Meeting- alternative site matrix	MTA	MTA Staff, Think Again
2015-06-25	Workshop on alternative site matrix	MTA	Dean Lessard, Dick Bilden, David Loane, MTA Staff
2015-07-23	MTA Board Meeting	MTA	MTA Board and Staff
2015-07-27	York Selectmen's Meeting	York	Peter Mills, Bruce Van Note, York
2015-08-03	Workshop-answer questions on the evaluation matrix	MTA	MTA Staff, Think Again, York
2015-09-03	MTA Board Meeting-public comment on the alternative sites matrix	MTA	MTA Staff and Board, Think Again, York

2015-11-19	MTA Board Meeting	MTA	MTA Staff and Board
2016-05-26	MTA Board Meeting Executive Session	MTA	MTA Staff and Board
2016-06-23	MTA Board Meeting Executive Session	MTA	MTA Staff and Board
2016-10-05	Public Meeting	York Maintenance	MTA Staff and Board, Think Again, York

APPENDIX 8

MTA RESPONSES TO YORK QUESTIONS 6/9/08

Maine Turnpike Authority

430 RIVERSIDE STREET
PORTLAND, MAINE 04103

June 9, 2008

Dear Interested Citizen:

On April 3, 2008, the Maine Turnpike Authority held a public meeting at the York Middle School to update residents and receive comments and questions on the ongoing study regarding the replacement of the York Toll Plaza. At that meeting, we made a commitment to record the relevant questions posed and provide written responses to everyone who signed the meeting attendance sheets. Those responses are enclosed.

We had hoped to send these responses to you much earlier, but as you may know, the process and schedule of the study has been adjusted significantly since April 3. We felt it was important to re-examine all of the questions in the context of these changes and update our responses accordingly, which required additional time.

The most notable change in the study process and schedule was the decision of the Turnpike Authority -- at the request of the York Board of Selectman and in response to concerns expressed by local citizens -- to direct its chief consulting engineer to conduct a more in-depth study of the feasibility of rebuilding the toll plaza at the existing location. We expect that this additional component of the study will be presented to our Board later this summer and we look forward to sharing this information with local officials and interested citizens.

I hope that you find the enclosed information to be useful. Please understand that it is not intended to serve as the conclusive response to the many local concerns expressed about this project, but rather another step in the process to enhance the dialogue on this important issue.

Sincerely,

DJ Paradee

Daniel J. Paradee
Public Affairs Manager

Responses to Questions
MTA public meeting on the replacement of the York Toll Plaza
York Middle School
April 3, 2008

Table of Contents:

1) Introduction

On April 3, 2008, the Maine Turnpike Authority staff held a well attended public meeting at the York Middle School in York Maine to update residents and receive comments and questions regarding an ongoing study about the replacement of the York Toll Plaza. Recognizing that such a large forum does not always provide an opportunity to answer all questions adequately, MTA staff recorded questions with the intent of providing written answers. This document contains those answers.

It is important to note that the Turnpike Authority, at the urging of the York Board of Selectman and in response to concerns raised by local citizens, has significantly adjusted the process and schedule of this study since the April 3, meeting. Most notably, the Turnpike Authority has agreed to commission a more in-depth study of the feasibility of reconstructing the toll plaza at the existing location. These adjustments in process and schedule had to be accurately reflected in the answers contained in this document and thus prolonged its completion.

This is not intended to be the conclusive response to all local questions and concerns, but is rather just another step in the process to enhance the dialogue on this important and challenging issue.

2) Purpose of MTA & Accountability

1. Why does the Turnpike Authority still exist and collect tolls?
   Response: The Maine Turnpike Authority was established by the Maine Legislature in 1941 to function as an independent agency of government with the power to issue revenue bonds and collect tolls for the purpose of building, maintaining and operating an express highway. As an independent agency, the Turnpike was created to carry its own debt and credit rating, completely separate from the state's debt and credit rating.
   At the time, it was generally understood that once the debt for the construction of the Turnpike was paid off, the tolls would be removed and the cost of maintaining the Turnpike would be paid for, like other state highways, through the gas tax and various other taxes. However, when the issue came before the Legislature in the early 1980's, legislators were confronted with several financial realities.

   - *In order to maintain and operate the Turnpike, the Legislature would have had to significantly raise the gas tax or redirect funding from other transportation projects around the state.*
   - *In 1982, The Turnpike was nearly 35 years old and experiencing significant traffic growth. The Legislature recognized that substantial investments to rehabilitate the original infrastructure would be required in the foreseeable future.*
   - *The Legislature foresaw the need for major capital improvements on the Turnpike including the construction of new interchanges and the eventual widening of the southern section of the Turnpike. They understood that these projects would require substantial investments that might not be possible without continued toll revenue.*
   - *The Legislature understood that eliminating tolls and relying instead on the gas tax to maintain the Turnpike, would significantly increase the cost burden on Maine residents, while decreasing the burden on out-of-state users. Out of state drivers contributed only 20% of the gas revenues collected in the state, but they contributed up to 50% of the tolls collected.*

   For these and various other reasons the Maine Legislature voted in 1982 to continue the Maine Turnpike Authority and the collection of tolls. The tolls are used to fund operations and maintenance as well as to pay debt service on the existing bonds.

2. To whom is the Maine Turnpike accountable?
   Response: The Turnpike Authority was created by an act of the Maine Legislature. Its annual operating budget and any adjustments to the borrowing cap must be approved by the Maine Legislature.
   Six members of the Maine Turnpike Authority Board of Directors are appointed by the Governor and confirmed by the Maine Senate. The seventh member is ex-

officio and is the Commissioner of Transportation or his/her designee. The Governor's appointees must be selected to provide representation from the counties along the Turnpike corridor, including York, Cumberland, Androscoggin and Kennebec.

The Turnpike Authority is also accountable to its bondholders. Bondholders are represented by bond counsel to assure that the Maine Turnpike is properly maintained and managed. The Maine Turnpike is one of only six toll agencies in the country that has earned AA credit ratings from all three of rating agencies: Standard & Poors, Fitch and Moody's. The Maine Turnpike is also required to comply with applicable Maine Department of Environmental Protection and United States Army Corps of Engineers environmental permits.

3) Purpose of Toll Collection and York Plaza

1. Why doesn't the MTA spend more money on encouraging E-ZPass vs. cash?
   Response: The Maine Turnpike Authority conducts E-ZPass promotional campaigns, employing television advertising, newspaper advertising and direct mail. The most recent effort, which took place in November of 2007 consisted of an extensive 42,000 piece mailing to all residents of 13 towns in southern York County that were not identified as E-ZPass customers. The direct mail effort was supported by a three week large space display advertising campaign in newspapers serving the southern York County area. The total cost of the promotional program was $41,534.00. The MTA will continue to pursue creative, targeted and cost-effective marketing strategies

2. Why are tolls collected from school buses?
   Response – The MTA is required by its bond resolution to collect tolls from all vehicles in an equitable manner to pay for the maintenance and operation of the roadway.

3. Why does the MTA want to build a new toll plaza?
   Response – The new toll plaza project is being contemplated because of the identification of deficiencies and safety concerns with the existing plaza as documented in the LD534 Response Report. The current plaza has outlived its life expectancy through a series of retrofits, not the least of which was expanding the plaza from 11 lanes to 17 lanes. Current data supports the construction of a new facility as the most prudent expenditure of funds.

4. Why doesn't the MTA remove the York Toll?
   Response: The ideal way to distribute tolls fairly and equitably to the patrons traveling on toll highways, such as the Maine Turnpike, is with strategically placed toll plazas. Well placed toll plazas work to maximize equity and balance toll rates in all types of toll systems. The critical element is that the toll plazas bookend the toll road itself. All major toll roads of significant distance in this region of the United States have a mainline toll plaza located at both ends. This includes the Maine Turnpike, Massachusetts Turnpike, New Jersey Turnpike, Garden State Parkway, and Pennsylvania Turnpike.

Removal of the York Toll plaza without other significant toll system changes will exacerbate toll rates and toll equity. For example, out-of- state patrons entering from the south will be able to travel to Gray without paying a toll. In order to make up this lost revenue, toll rates at the remaining mainline and interchange toll plazas will have to go up significantly, or other toll system infrastructure will need to be added (see response below). Significant toll rate increases at interchange and northern mainline toll plazas will primarily affect Maine residents and will likely result in diversion to local roads as patrons choose not to utilize the Maine Turnpike for short to moderate distance trips.

In conclusion, the York Toll Plaza plays a big part in allowing the Maine Turnpike Authority to effectively and equitably distribute tolls to all patrons, including the large amount of patrons that come from out-of-state.

5. Why doesn't the MTA remove York Toll and collect the toll revenue at all other toll locations?

   Response: Without a southern mainline plaza, the only way to collect cash tolls from vehicles entering the Turnpike from the south would be to reconstruct exiting toll booths at every plaza from Wells to Gray. This would roll back the significant operational gains made ten years ago when the Turnpike Authority converted to a faster, more efficient and cost-effective system of toll collection.

   In 1997, the Maine Turnpike converted from a toll ticket system to a new system of fixed fares and electronic toll collection. The changes were driven by a pressing need to handle ever-increasing traffic volumes more efficiently and to reduce the rising operational cost of collecting tolls.

   Under the fixed fare system, all cash paying customers of the same vehicle class pay the same amount when entering the Turnpike and exit the Turnpike at most interchanges without stopping to pay a toll. By collecting the same fixed fare cash amount from every customer upon entry, the system eliminated time consuming fare calculations and dramatically sped up toll collection. More importantly, the system eliminated the need for customers to stop and pay a toll when exiting at Turnpike interchanges. Because exiting toll booths were no longer necessary, many were converted to additional entering lanes, increasing the thru-put capacity at each plaza and preventing the need for costly and environmentally impactful toll plaza expansions. In its first year of operation, the new system eliminated more than 25 million vehicle stops, which in turn reduced congestion, gas consumption, air pollution and turnpike operating costs. The reintroduction of exiting tolls to collect revenue lost by the elimination of the York toll plaza would result in millions of unnecessary vehicle stops and would increase congestion, air pollution and gas consumption.

6. Why doesn't the MTA remove the York Toll, keep the toll free exits, and simply replace the lost revenue by increasing entry tolls at every other location?

   Response: If the southern toll plaza is eliminated and exit tolls are not reintroduced, we estimate that entry tolls at all locations would have to be increased by $0.90 to make up for the lost revenue. This would result in extreme *toll inequity for Turnpike users. For example, under such a system motorist entering the Turnpike in York could travel more than 50 miles to Gray without paying a toll. A motorist traveling 31miles from Wells to Gray would pay $1.50 ($0.90 + 0.60). A motorists traveling just 1 mile from Exit 47 to Exit 48 in Portland would also pay a toll of $1.50. The toll rates for the New Gloucester and West Gardiner mainline toll plazas would also need to increase to $1.75. This proposal would create extreme toll rate inequities and would significantly shift toll burden currently paid by out-of-state users onto Maine resident users.*

7. Why can't we remove the York Toll and make up the lost revenues by increasing tolls incrementally from south to north? For example, charge 60 cents at Wells, 75 cents at Kennebunk, $1.00 at Biddeford and so on.
   Response: This proposal would create even greater toll rate inequities by allowing motorists who enter from Exit 7 or further south to travel for free up to Exit 63, while charging excessively high tolls for motorists making short trips between exits in the Biddeford - Saco area and the greater Portland area. This would also shift more of the toll burden from out-of-state users to Maine resident users.

8. Can One-Way Tolling be applied at the York Toll Plaza?
   Response – One-way tolling is a method of toll collection that involves charging twice the fare in one direction, while allowing toll free travel in the other direction. The Maine Turnpike Authority conducted a feasibility study of one-way tolling in 2005. The feasibility study took place at the same time and benefited from the experience of a two-year, one-way tolling demonstration project at the Hampton Toll Plaza on the New Hampshire Turnpike.
   Based on the findings of the feasibility study and the experience of Hampton Toll Plaza demonstration project, the Maine Turnpike Authority determined that one-way-tolling was not a viable tolling strategy for Maine. The Authority's decision was largely due to concerns about the number of vehicles that would divert onto local roadways to avoid the double-tolled direction. The study estimated that an average of 11.7% of the vehicles would divert around the toll plaza to avoid the doubled toll. Note that one-way tolling was not resumed at the Hampton Toll Plaza following the demonstration project for the same reason.
   A closer look at one-way tolling suggests that it is only successful on bridges, tunnels and in rare instances on highways, where there is little opportunity to divert around the facility to avoid the toll. The only successful examples of one-way tolling in our region of the country are on bridges and tunnels in urban areas, such as the Tobin Bridge in Boston, Tapanzee Bridge in New York and the Benjamin Franklin Bridge in Philadelphia. It is successful on these facilities because it is virtually impossible to divert around them and reach your destination in a reasonable amount of time. This is not the case on the Maine Turnpike and other more rural toll highways, where the opportunity for diversion exists. A doubled toll in one direction at the York Toll Plaza would likely result in an unacceptable level of diversion onto Rt. 1 and other alternative routes.

9. Why doesn't the Maine Turnpike adopt cashless tolling?
Response: Cashless tolling may become a universally viable technology someday in the future, but not the identifiable future, particularly on a highway like the Maine Turnpike, which serves such a diverse mix of users.
The most common application of cashless tolling is a system in which a very high percentage of a highway's users have an electronic toll collection device (E-ZPass) in their vehicle and pay their tolls accordingly. Tolls are collected from the small percentage of motorists who do not have electronic toll collection by capturing a video image of their vehicle's license plate and sending the registered owner a bill.

Successful examples of cashless tolling involve highways in urban areas that serve primarily as commuter routes and have a very high rate of electronic toll collection usage, generally exceeding 80%. In addition, the vast majority of their users typically reside within the same jurisdiction or use the same electronic toll system operator, making it possible to conduct a billing and enforcement program for motorists without electronic toll collection.

The Maine Turnpike shares none of the characteristics that are essential for a successful cashless tolling program. The Maine Turnpike is primarily a rural highway. It is not a commuter-oriented highway. Most Maine Turnpike drivers are occasional users and a high percentage of them are from out-of-state. Nearly 50% of the users of the York Toll Plaza are from out-of-state.

While E-ZPass usage on the Maine Turnpike is nearing 50% and continues to grow, there is no expectation, given the highway's diverse user base, that the rate will reach the 80% -90% range in the near future. That means that the Authority would be required to collect a significant portion of its revenue by capturing video images of license plates and sending a bill to the vehicle's owner. Because the Maine Turnpike serves so many occasional users, the cost of processing and sending a bill could exceed the toll amount to be collected. There is no universal, reliable system in place that would allow the Authority to access the names and addresses of out-of-state drivers for billing purposes, and certainly no system to enforce penalties for unpaid video tolls.

10 Will the Turnpike's E-ZPass technology soon become obsolete?
Response: Like any technology, electronic toll collection is always evolving, but there is no indication that the current system will become obsolete in the foreseeable future. The Maine Turnpike Authority is an active, voting member of the E-ZPass Interagency Group (IAG), which is comprised of 24 agencies, operating in 13 states that provide compatible E-ZPass technology to their customers. Together, the IAG agencies have issued more than 17 million active E-ZPass tags. Given the significant commitment by the Maine Turnpike and all other IAG member agencies to create and maintain a system that is compatible

from state to state, it is highly unlikely that any sudden technology changes would be adopted by the IAG that would render the systems of member agencies obsolete.

4) York Plaza Conditions and Concerns (Deficiencies)

1. What are the traffic delays at York Toll Plaza? What impact has E-ZPass had on the delays?

   Response: E-ZPass has had a positive influence on delays and backups at the York Toll Plaza. One of the more notable factors in this has been the shift in cash paying customers to the E-ZPass system. For the existing arrangement and number of lanes, on average, dedicated E-ZPass lanes can process approximately three times as many vehicles as a cash lane. Following is some of the more recent delay and backup data.

- In 2005 northbound backups averaged 1157' with 173 seconds of delay for cash customers. By comparison E-ZPass customers averaged 120 seconds of delay.

- In 2005 southbound backups averaged 4335' with 442 seconds of delay for cash customers. By comparison E-ZPass customers averaged 375 seconds of delay.

Experience indicates that, as cash-payers shift into the E-ZPass program, toll plaza backups and delays diminish. However, given the mix of users that include cash-paying patrons and E-ZPass patrons, we will continue to encounter situations in which cash backups block access to the dedicated E-ZPass lanes exacerbating backups and delays significantly. This diminishes the potential benefit of the growth in E-ZPass usage. The solution to this circumstance is the safe separation of the cash paying patrons from the E-Z Pass patrons.

2. If the York Toll Plaza has safety problems, how can the MTA still operate it?

   Response: All highways and toll plazas have safety challenges. It is the responsibility of the operator to minimize those safety challenges. Over the years the MTA has invested a significant amount of money to upgrade and repair the existing plaza to minimize crashes and traffic flow problems that often result in crashes. But these upgrades and repairs are not able to address the plaza's more fundamental safety problems of being located near an interchange, on a curve and at the bottom of a hill. These fundamental problems will only cause the plaza to become more unsafe as traffic volumes increase. The toll plaza study is being conducted to ensure the future, long-term safe operation of the plaza.

3. Why is the speed limit for the E-ZPass lane 35 mph at the Hampton Toll Plaza in New Hampshire, and 10mph at York?

   Response: The approach to both York and the Hampton Plazas is signed at 35mph. The speed limit immediately before and after both plazas is 10mph for E-ZPass customers.

4. Why are the E-ZPass lanes on the right side?

   Response: When the MTA introduced electronic toll collection (ETC) in 1997, the dedicated ETC lanes were located on the left of the plaza for approaching traffic. This configuration seemed to make sense because it allowed ETC users to travel straight through the plaza. The MTA, however, received complaints from residents of nearby communities saying that the ETC lanes were often blocked by tourists who seem to congregate near the middle of the plaza. The middle lane also made it difficult to access the interchange. The MTA held focus groups with local residents, which concluded that the ETC lanes should be placed on the far right side, allowing users to go around the backups in the middle of the plaza and access the York interchange easier. The MTA responded by moving ETC lanes to the far right. In 2005, the MTA added back ETC lanes on the left side of the plaza, so now there are dedicated ETC lanes on both the left and right side of the plaza. It should also be noted that all toll lanes will accept E-ZPass.

5) <u>Feasibility Study & Proposed Facility</u>

1. How will the plaza be plowed and kept safe during a snowstorm?

   Response: The MTA maintenance crews will plow this plaza much the same way the mainline is plowed and maintained. With the presence of median barriers and barriers separating cash from E-ZPass patrons, the plowing will consist of a number of one-way loops with typical snow removal procedures in certain areas.

2. How will the toll plaza be designed so that it will be visually pleasing?

   Response: The conceptual design for a new plaza is in the very preliminary stages with only a few initial thoughts; the toll plaza should be in keeping with southern Maine and be a subtle but welcoming 'gateway' to Maine. The new plaza will replace the existing substandard, rusted, antiquated, and bumpy plaza that more than 17 million people experience each year as they enter and depart Maine.

3. Why is the proposed toll plaza being designed to accommodate large volumes of traffic when bottlenecks occur downstream at the Hampton Toll Plaza in NH?

   Response: The MTA has a responsibility to its customers and to the State of Maine to operate as safely and efficiently as possible. While it is important for agencies in neighboring states to communicate and cooperate, MTA standards of safety and operation should not be determined by the standards of other highways or facilities.

4. Why is the plaza currently designed with a total of 21 lanes? If Highway Speed Tolling efficiently and quickly processes vehicles, why are there more lanes than the existing 17 lane plaza?

   Response: The MTA is still in the early stage of design development. Initial designs called for 21 lanes consisting of seven northbound and eight southbound cash lanes with three highway speed tolling lanes in each direction. This is a reasonable preliminary estimate of the number of lanes required based on current *traffic projections, E-ZPass usage, toll collection processing rates and acceptable vehicle backups. As part of the MTA's ongoing avoidance and minimization (of impacts) process, traffic modeling parameters are being refined and updated to reduce the number of lanes while providing a safe plaza and reasonable level of service.*

5. What factors into the width and length of the proposed toll plaza?
   Response: The width of the plaza footprint is a function of the number of lanes and necessary support buildings. See the question above for discussion on the number of lanes. The length of plaza footprint is based on a design that allows for: 1.) E-ZPass and cash paying vehicles to safely diverge and merge, 2.) cash paying vehicles to slow down and choose a cash lane, 3.) an appropriate distance for vehicles to queue, and 4.) for the cash paying vehicles to accelerate and merge into one lane before merging with the E-ZPass vehicles.

6. How can traffic safely merge at 65 mph after paying tolls?
   Response: Cash customers will exit and enter the mainline using an off-ramp and on-ramp that meet all of the standard guidelines of a typical interstate interchange at 65 mph posted speed.

7. How does the crash rate on the Maine Turnpike compare to National rate? If the Turnpike is much lower, why is there a need to lower the crash rate?
   Response: The standard of comparing crash rate statistics in Maine is not against National values but instead against statewide values. Crash rate data was requested of the MaineDOT for the three year periods of 2003-2005 and 2004-2006. This data shows that the roadway immediately south of the York Toll plaza for both the Northbound approach and the Southbound departure are high crash locations; in fact the Northbound approach has the #11th highest crash rate out of 1,054 high crash locations within the State of Maine.

8. Can the accident data for the High Crash Locations be provided?
   Response: Yes. Data for High Crash Locations as well as all crash data for the Turnpike is available from the MaineDOT for any interested party. The MTA has also provided this information to the Town of York. In summary, both the northbound and southbound lanes on the south side of the York Toll Plaza are rated to be High Crash Locations by the MaineDOT. The northbound lanes on the southside of the plaza are ranked as the 11th highest crash location of 1,054 high crash locations in the state.

9. What consideration has there been for access to the plaza for fire and police?
   Response: Access for emergency vehicles has been discussed in general terms with town officials. This type of access is always a part of the design process for all plazas and service buildings. From these early discussions, we have the required level of information necessary for conceptual planning and will work with local fire, police and emergency management to acquire more detailed information as the project moves into preliminary and final design

10. If funding is so critical for the Turnpike, is constructing a new toll plaza more imperative than repairing bridges and other infrastructure?

    Response: The roadways, bridges, interchanges, toll plazas, service areas and maintenance areas are subjected to increasing stress due to age, growing levels of traffic and the demands of the harsh northern New England climate. To ensure the sound condition and effective operation of the Turnpike, the Authority's 20 year plan funds and implements proactive Operation and Maintenance, Reserve Maintenance and Capital Improvement programs. The vigilance of the Authority through these programs has resulted in a well-maintained and efficiently-operated Turnpike. As the Authority looks to future initiatives, such as the reconstruction of the mainline toll plaza in York, it will continue to assure that turnpike facilities meet current safety standards as well as projected demands. Given that the York Toll Plaza handles more than 16 million vehicles per year and generates 40% of the revenue necessary to maintain the MTA's overall infrastructure, its safe and efficient operation is no less important than any bridge or section of roadway.

6) <u>What Would it Take to Build at the Existing Location?</u>

1. Can the York plaza be reconstructed at the existing site?

    Response: At the urging of the York Selectman, the Turnpike Authority has directed its consulting engineer to conduct a more in-depth study about the possibility of constructing a new plaza at the existing location. Prior to this the MTA commissioned feasibility study that considered three different alternatives at the existing site in addition to the no-build alternative. The study concluded that each of the alternatives failed to achieve the basic safety and efficiency objectives originally intended by the toll plaza improvement project, and failed to meet the basic design guidelines established by the Federal Highway Administration for safe toll plaza design and operation. The study also indicated that the cost of building at the existing site would be similar to the cost of building at a new site that would achieve the project objectives and meet federal guidelines for toll plaza safety.

    The following are operational issues identified as unresolved at the existing location alternative that affect both capacity and the safety of patrons and staff:

    A. *Safety concerns remain due to proximity of Chases Pond Road interchange. Confusing traffic patterns will result with access to the on and off ramps occurring within the cash lanes of toll plaza area.*
    B. *The plaza will remain at the low point of a hill which is not recommended. This creates a safety concern due to the potential of heavy vehicles losing their brakes and striking the plaza or stopped traffic. In addition the hill leads to heavy engine braking noise southbound and heavy acceleration noise northbound as commercial vehicles approach and depart the plaza.*

C. *Sight distance will not improve, in fact from both north and south approaches it will get worse due to cash lanes being moved further from the center of the mainline. Sight distance is compromised by the close location of Chases Pond Road Bridge and horizontal curve of the mainline approach. Improper sight distance, leads to inefficient decisions and unsafe last second lane changes.*

D. Wetland and other environmental impacts will be significant and obtaining permits will be more difficult. The mitigation of these impacts, even if allowed, would add $3-10 million to the 'similar' project costs resulting in a project cost exceeding a new location.

2. What is the value of the wetlands around the existing plaza? When comparing sites, is the quality of the wetland considered?

   Response: Wetland type, area, quality and function are considered when screening sites. Wetlands adjacent to the existing toll plaza are substantive and associated with the Little River. While some of those nearby wetlands have experienced impacts attributable to nearby facilities (such as the toll plaza), the effects are limited to the immediate proximity. The wetland is extensive, diverse, and one of the larger contiguous wetlands in the study area. Similarly, wetlands adjacent to other development or roadways may also have experienced degradation or changes to the functions, which is also considered.

3. How much has the ground at the toll plaza settled?

   Response: From available information, pavement in the immediate plaza area has settled as much as 4.5 feet.

4. With proper engineering, can the settlement of the existing site be remedied?

   Response: Yes, the existing site could be engineered to minimize the effects of differential settlement, though at a substantial cost. Soil settlement is only one of the operational and safety concerns at the plaza.

7) Site Identification and Screening Process

1. Why does the MTA consider the York Plaza project in the early stages of the project development process when the LD534 Report was delivered as Final to the legislature's Transportation Committee?

   Response: There has been much confusion about the relationship between a study report which was completed to meet the specific requirements of a law passed by the Maine Legislature (LD 534) and the Turnpike Authority's broader study regarding the reconstruction and possible relocation of the southern toll plaza, which is still ongoing.

   In LD 534, the Legislature required the Turnpike Authority to document the need for the replacement of the southern toll plaza as well as the reasons why the existing location may not be suitable for this replacement project. The parameters of this study and report were clearly defined by the Legislature and did not *include any discussion of alternative sites. The MTA completed the report and presented it to the Legislature's Joint Standing Committee on Transportation, as required by the law. The MTA has since received correspondence from the House and Senate Chairmen of the Transportation Committee confirming that the MTA has completed and complied with the requirements of LD 534.*

The MTA's study regarding the replacement and possible relocation of the southern toll plaza is a separate and much more extensive undertaking including items reported in the LD 534 Response Report. The purpose of the study is to inform the Turnpike Authority Board of the deficiencies of the existing plaza and to recommend strategies to address those deficiencies and to make operational improvements that will allow the facility to function safely and efficiently in the future. It will present the Board with a range of options from rehabilitating the plaza, to modifying the plaza in conjunction with adjacent mainline reconstruction (to meet current design criteria), to building a new plaza at an alternate site. Benefits, impacts and costs will be included in the report for comparison purposes. This study was and is still in the early stages. The MTA Board: 1) has not received the study report, 2) has not made any decisions about the feasibility of replacing the plaza in the current location, 3) has not yet considered any alternative locations, and 4) has not filed for any environmental permits.

- *Once the Turnpike Board makes a decision, the regulatory agencies such as the Maine Department of Environmental Protection and the U.S. Army Corps of Engineers will review all the data and will make their own determination if permits for a project are feasible.*

2. Was the public involved in LD534?

   Response: LD534 required that the MTA should "hold informational sessions with interested parties." The MTA staff sought guidance on this requirement from the Chairs of the Legislature's Transportation Committee. They confirmed that a public meeting with selectmen from York, Ogunquit and Wells televised on local access cable would satisfy the intent of the law. (The MTA also held a number of other meetings as contained in the following response) The MTA arranged and participated in that meeting on January 23, 2008. The MTA reported back to the Legislature's Transportation Committee at a public meeting on April 3, 2008. Again, it is important to note that LD534 was specifically focused on the technical information regarding the deficiencies of the York Toll Plaza. It did not include any discussion of alternate sites, environmental impacts, community impacts or other issues that have since generated public interest.

3. What public meetings have been held to date?

   Response: It is important to understand that while the subject of replacing the York toll plaza has been discussed with local officials and at public meetings for several years, specific information about potential alternate sites and their potential community and environmental impacts was not available until recently. The MTA has provided information as it has become available during the course *of the study. The following meetings have occurred to present information and gather input:*

- ***A. Municipal Meetings***
  1. *Town staff input and information sharing – throughout*
     - *a) Annual Town Visit meetings December 16, 2004*
     - *b) Annual Town Visit meetings November 28, 2005*
  2. *Town Managers' meetings*
     - *a) 1st meeting Sept. 26, 2006*
     - *b) 2nd meeting including Plaza site tour November 29, 2007*
     - *c) 3rd meeting January 22, 2008*
     - *d) 4th meeting February 15, 2008*
  3. *Joint Select Board meeting – October 25, 2006*
  4. *Joint Select Board presentation – January 23,2008*
- ***B. Permitting Agency Meetings***
  1. *State/Federal Interagency meeting – October 10, 2006*
- ***C. Legislative Meetings***
  1. *Legislative hearing on LD 534 – April 13, 2007*
  2. *Legislative Tour & Briefing – August 9, 2007*
  3. *Legislative Tour & Briefing – August 10, 2007*
  4. *Legislative Tour & Briefing – September 21, 2007*
  5. *Legislative Tour & Briefing – December 10, 2007*
  6. *LD534 presented to Transportation Committee – April 3, 2008*
- ***D. Public Meetings***
  1. *Public Informational meeting – February 27, 2008*
  2. *Public Informational meeting – April 3, 2008*
  3. *Meeting of York Selectman and MTA Board – April 29 , 2008*
  4. *Meeting of York Citizens and MTA staff – May 15, 2008*

4. Why weren't the LD534 Options compared to the Site Identification and Screening Alternatives?

   Response: The LD534 Response Report details the investigation and findings related to possibilities of addressing specific deficiencies and safety issues at the existing plaza. A range of the upgrade and modification options were developed for the existing toll plaza that address some of these deficiencies. (It became apparent that looking at a generic relocation alternative may also be necessary.) The Site Identification and Screening Report details the investigation and location of possible sites along the Maine Turnpike corridor that hold potential for meeting basic design guidelines for the construction of a mainline toll plaza as well as addressing the identified deficiencies and safety issues. The options dealing with the existing site can not fairly be compared to the alternative locations for the simple fact that the existing site options do not meet the basic engineering design guidelines for mainline toll plazas currently in use today. Even though the existing site options are shown with associated costs, these numbers do not tell the whole story, e.g. simply replacing the toll booths, canopy and tunnel does not address traveler safety, congestion, or staff safety.

5. Why aren't the results of the LD534 and Site Identification and Screening Reports combined?

    Response: The LD report was prepared at the request of the Legislature to address specific questions of the Legislature. The Site Identification and Screening report is being prepared for submission to the Army Corps of Engineers for the purpose of obtaining a LEDPA (Least Environmentally Damaging Practicable Alternative). The report documents the entire site location process, which is consistent with good transportation planning practices as well as federal and state environmental laws. Elements of the LD report, such as documenting project purpose and need and evaluating the existing facility location, are also elements required by federal and state environmental laws. In summary, the Maine Department of Environmental Protection and the Army Corps of Engineers will review both the feasibility of the existing location as well as alternate locations.

6. The Site Identification and Screening Report began with 16 sites and narrowed the candidates to four. What criteria were considered to eliminate the 12 sites?

    Response: The 12 sites were not carried forward due to their high levels of impacts including one or more of the following reasons: residential impacts or proximity to higher density development, wetland or natural resource impacts, impacts to tidal wetlands, and/or refined engineering screening.

7. How can a design be shown if a site is not yet selected?

    Response: Conceptual site designs were developed to compare multiple locations and to assess relative impacts between alternatives. This is a standard planning/engineering method. Additional site refinement, design and consideration of public input will need to be applied to the four alternative sites to develop even more site-specific information for use when screening the sites.

8. When comparing the four alternative sites, how is the criteria weighted in the comparison matrix? What consideration is given to homes?

    Response: The environmental permitting agencies do not provide a specified weight or factor for comparing dissimilar resources (homes, wetlands, etc.). Resources and potential impacts are quantified and compared or ranked within each resource and compared on whole. Generally, residences and wetlands are the most prevalent consideration in screening sites.

9. How are people represented in the comparison matrix of the four alternative sites?

    Response: People are represented in the homes/residences categories including densities of homes, proximity of homes, land-use type and the inclusion of proposed developments.

10. What is the cost comparison of reconstructing the existing plaza vs. a new site?

    Response: It is important to note here that a comparison of cost alone does not tell a complete story. First and foremost is that an alternative that does not meet basic goals, purpose and/or design guidelines can not fairly be compared to an *alternative that does meet all of these criteria. As well, at the current stage of development there are a number of items that are not accounted for either completely or partially, e.g. wetland impacts and the mitigation ratio they must be replaced at, soil engineering and the extent to which advanced construction methods might need to be applied. With that said, reconstruction of the existing plaza, while not addressing all safety or operational issues, and not meeting the basic engineering design criteria could cost $37 million dollars plus an additional $10 million dollars worth of wetland mitigation costs (estimated 26 acres impacted) plus upwards to $15 million dollars for advance soil construction. Still, the estimate for the existing site alternatives does not include potential costs of reconfiguring the Chases Pond Road interchange or its complete relocation to meet some of the basic design guidelines; which could also add millions to the cost, pushing the total cost to over $70 million dollars. A new plaza alternative in a new location could cost $36-38 million with an additional $0.5 to $4 million in wetland mitigation costs (estimated 1-11 acres impacted). A new plaza would be located such that other unknown costs are minimized and/ or avoided, e.g. soils, interchanges, roadways, etc. Based on location selection criteria a new location would meet all the basic design criteria as well as address deficiencies and issues currently plaguing the existing plaza. Therefore a new plaza in a new location may cost up to $40 million dollars. To reiterate, costs of reconstructing at the existing site vs. building a new plaza at an alternative site are not the only factors for comparing options. Reconstructing the existing plaza leaves many deficiencies unresolved including safety concerns that are a leading factor in the Plaza being identified as a High Crash Location.*

11. When selecting a site, are cemeteries considered? There is at least one near MM11.3.
    Response: Yes, cemeteries are considered a significant constraint.

12. When selecting a site, are vernal pools considered? There are many surrounding all of the alternative sites.
    Response: Yes, vernal pools are considered in the evaluation. An initial site inspection was conducted to identify vernal pools and significant wildlife habitat within potential project footprints and within a 500 foot buffer area from the footprint.

13. How are wetland impacts estimated?
    Response: Wetland areas were identified for all candidate sites in the same manner using aerial photographs, Natural Resources Conservation Service Soil Survey mapping of hydric soils, National Wetland Inventory mapping of wetlands, and USGS topographic maps. The wetland information for alternative sites is equivalent and only used to make comparisons between initial alternatives (Phase 1) for screening. Subsequent information will be added to refine wetland boundaries to compare the Phase 2 alternatives. Once the preferred site is selected, formal wetland delineations will be conducted to determine exact wetland boundaries, locations surveyed, and permit applications will be prepared

using refined site design and field-delineated wetlands. Other information such as functional assessments and ecological resources will be included.

14. Are wildlife sanctuaries reviewed and considered?
    Response: Yes. If land in the Wildlife Sanctuary was identified as a special wildlife habitat or critical habitat area, then that area would be considered in the screening analyses. If the Wildlife Sanctuary is not designated as special or critical habitat, no special consideration is made

15. Will any roads be relocated? Who would pay for this?
    Response: At this stage of planning, the MTA does not anticipate the relocation of any local road. As the project enters into design, there may be a need to address some existing roadside ditches and grading. The MTA would incur the costs for such work to any public road if the work is necessitated by MTA construction.

16. Will security for the York Water District Treatment Plant be compromised if the selected site puts the plaza in close proximity?
    Response: The treatment plant and Chases Pond are not currently fenced from nearby properties, but the Turnpike right-of-way is fenced. A fence will be installed along the right-of-way between the toll plaza and all abutters. Sites at Mile Markers 8.7 and 9.9 are the closest to the treatment plant, and based upon the conceptual design, it is unlikely that any additional tree clearing between the Turnpike and the treatment plant will be needed.

17. If the water line is required to be relocated, who will pay for it?
    Response: This is a legal question that would depend in part on the nature of the York Water District's property rights in the property through which the line runs. The MTA would work with the York Water District to determine these rights and responsibilities accordingly.

18. How much on-site investigation has there been?
    Response: To date, staff, engineers, planners, surveyors and scientists have conducted various preliminary field investigations to collect and/or verify publicly available data to be able to develop the conceptual plans. As the project progresses there will be a need for more detailed information gathering in all of these areas. Most recently in April and May 2008, environmental scientists have been onsite to verify wetlands and locate vernal pools.

19. Is the MTA's mapping accurate?
    Response: Mapping resources used to date for site identification and screening is of the accepted scale, quality and resolution to meet expectations of all review and permitting agencies. As the project progresses, refined mapping and information will be gathered and used.

20. How will all of the public input be reviewed and used before selecting the preferred site to rebuild the York Toll Plaza?

Response: The Turnpike Authority is reviewing the information and confirming that all data is considered and there are no substantive data gaps for making a site selection. Any new information will be included in the site screening and permitting processes.

21. Has the public said anything that would affect the MTA's decision of rebuilding the York Toll Plaza at an alternative site?
    Response: The MTA received a lot of information from the April 3, 2008 meeting. Examples of information that the MTA will pursue further includes environmental impacts, land use, public infrastructure, possibility of a cemetery and the additional meetings with a smaller core group of York residents and officials to spend more time learning various items about the project and the area.

22. Is it possible that all four sites could be rejected?
    Response: Any and all of the sites are subject to elimination during the course of the study.

8) <u>Environmental Considerations</u>

1. How is air quality going to be addressed; for example ozone non-attainment area; exhaust blowing to the beaches?
   Response: The Federal and State Permit process will dictate the procedures for analyzing air quality. Since this area is a non-attainment area for ozone, Maine is required to prepare State Implementation Plans (SIP) that show how the state will improve the air quality to attain the National Ambient Air Quality Standards. Both new and improvement highway projects must be contained in the area's Transportation Improvement Program (TIP). The modeling procedures for ozone and NO2 require long term meteorological data and detailed area wide emission rates for all existing and potential sources. This modeling is performed by the Maine Department of Transportation (MaineDOT) in conjunction with Metropolitan Planning Organizations (MPOs) for the region to show that regional emissions plus projects in the TIP are in conformance with the SIP and the Clean Air Act (CAA) amendments. The Portland Area Comprehensive Transportation Committee (PACTS) and the Kittery Area Comprehensive Transportation Study (KACTS) are the two MPOs responsible for this analysis. Once the MaineDOT and MPOs have completed their analysis, it is forwarded to the FHWA for final ruling on the TIP's conformance with the SIP and the CAA and its amendments. Conformance with the SIP means that the area will be on schedule with complying with the CAA and its amendments throughout the state.

2. How is lighting going to be addressed?
   Response: Lighting will be developed for the selected site during the preliminary and final design stages. Lighting technology has improved over the years with the benefits being better ability to control the 'night sky' effect as well as better control of surface illumination and its reflectivity. The design will incorporate

fixtures that direct light downward and are consistent with safety practices for highway lighting.

3. How is noise going to be addressed?
   Response: The noise levels along the project will be addressed according to the Maine Turnpike Authority's Highway Traffic Noise Policy. This policy parallels the Maine Department of Transportation's Noise Policy, with both policies following the criteria set forth in 23 CFR 772 which is the FHWA's highway traffic noise policy. Future noise levels will be modeled according to FHWA procedures, impacts and potential mitigation measures will based on the Highway Traffic Noise Policy.
   The noise heard at a highway speed toll plaza is similar to what is heard along the mainline today and is less than what is heard at the existing plaza today. A good portion of this is attributed to the design guidelines for locating a toll plaza and the implementation of highway speed tolling. Noise will be addressed during the preliminary and final design stages.

4. How will the groundwater supply be protected?
   Response: The toll plaza facility will be designed and constructed to meet current building and safety codes. Storm water management systems will meet current Maine Department of Environmental Protection standards to protect groundwater and surface waters.

5. How will adjacent streams and other waterways (that eventually lead into the ocean) be protected from stormwater pollution?
   Response: For a project such as the proposed toll plaza, the Turnpike is required by law to construct stormwater management systems that meet the State of Maine requirements. Compared with older design and construction methods, new construction methods are vastly improved.

6. How are the Priority Coastal Rivers (Cape Neddick and Josias) being evaluated, treated, prevented, avoided etc?
   Response: These rivers are known resources and are identified in the site selection and screening process. See responses to storm water and groundwater above. The Cape Neddick and Josias Rivers are not listed as Non-point Source Priority Watersheds, Coastal Waters or Rivers and Streams by the Department of Environmental Protection.

7. How will pollution of water supply be prevented?
   Response: The York Public Water Supply is derived from surface water taken from Chases Pond. The Turnpike and toll plaza alternatives are not in the watershed of Chases Pond. The water inlet to the public system is uphill of the Turnpike and the distance from the nearest proposed work area for a toll plaza to the inlet is 1,050 feet for Site 8.7 and 900 feet for Site 9.9. Drainage from a toll plaza or the roadway cannot physically enter Chases Pond. The main water line crosses beneath the Turnpike similar to many other public utilities beneath roads

and highways. Measures will be taken to protect the pipe during construction. Crossing or relocating a water main is a routine utility protection/relocation occurrence and should not pose any pollution threat to the water supply.

9) <u>Right-of-Way Considerations</u>

1. How will access to the toll plaza be decided?

   Response: Site access from an identified local road for MTA employees and other associated parties is noted in the comparison matrix of the four alternate sites in the Site Identification and Screening Report and will be further analyzed for the preferred site.

2. What is the MTA doing to consider the "human factor" when proposing a project at the scale of a new mainline plaza?

   Response: The MTA is required by the regulatory permitting agencies to consider both human resource and natural resource impacts in the development of this project.

3. How are homes values in a poor housing market going to be fairly established?

   Response: It is one of the goals of the MTA not to displace anyone. However, in these situations, home values, are established using generally accepted appraisal practices such as the use of comparable sales in the same or similar markets. Because all the homes in a region are under the same market conditions, the "market value" is a relative value that rises and falls affecting all homes equally.

4. How much money has been set aside for purchase of land?

   Response: Money has not been specifically set aside for the purchase of land. However, the MTA is committed to setting aside the amount of money necessary to assure that landowners receive fair and appropriate compensation for any land acquired.

# # #

APPENDIX 9

MTA RESPONSES TO YORK QUESTIONS 11/16/15

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Memorandum

To: MTA Board Members

From: MTA Staff

Re: Responses to comments to the MTA Board on September 3, 2015

Date: November 16, 2015

MTA will work with the Town of York and nearby residents in a fair and respectful manner toward the goal of replacing the York barrier toll plaza with a modern Open Road Tolling (ORT) plaza. A properly placed new plaza will be safer and affordable for travelers while less disruptive to abutters, toll collectors, and the environment.

Summarized below (*in italics)* are comments made by those who spoke to the MTA Board at its September 3, 2015, meeting followed by MTA staff responses.

The question presently before the Board is: **For the purpose of further permitting and design analysis, <u>what is MTA's preferred site for a replacement ORT plaza in York?</u>**

<u>Background</u>

The MTA has been studying how best to deliver the York toll plaza project to its customers and the people of Maine for over 10 years. In the earlier years, analysis by HNTB supported a conclusion to replace the current deteriorating and substandard barrier plaza with a new Open Road Tolling plaza at any of several locations to the north of the current plaza, including Mile 8.7. (ORT allows for highway speed electronic toll collection and retains cash collection for those that want or need it.) At that time, many York residents opposed those conclusions, arguing that All Electronic Tolling (AET) was a better alternative. (AET eliminates point-of-service cash collection and replaces it with license plate photo enforcement, back office administration, and after-service collection activity.)

In 2011, MTA took a fresh look at critical project issues such as toll collection systems (ORT vs. AET), plaza sizing, and locations. Regarding the ORT vs. AET question, the MTA retained CDM Smith, another national toll consultant, to help MTA determine whether AET was feasible. A detailed survey of cash paying customers at York and other plazas was conducted to determine their home state or country and assess collection risk. MTA adopted several initiatives to boost E-ZPass use, which is a necessary predicate to any AET system. MTA also obtained statutory changes and negotiated with New Hampshire and Massachusetts to improve reciprocity for out-of-state collections.

On July 24, 2014, after nearly three years of additional study, the Board accepted the recommendation of staff and determined that AET is not feasible on the Maine Turnpike and would not be in the best interests of the MTA or Turnpike users for the foreseeable future. Among other reasons, it would require non E-ZPass toll rates at York to double from $3 to $6 to compensate for lost revenue and would cause traffic diversion estimated at an additional 3,400 to 5,500 vehicles per day onto adjoining roads like Route 1 which is already congested.

In August 2014, the MTA retained Jacobs, another experienced engineering consultant, to obtain more detailed environmental information, reexamine ORT plaza sizing, take a fresh look at options near the current plaza at Mile 7.3, and analyze other locations. In June 2015, after a detailed look at the current plaza site, Jacobs recommended further evaluation of the Mile 8.8 site because it would be safer, would cost about $20 million less, would have much less impact on wetland and streams, and would be less disruptive to travelers, toll collectors, and abutters.

Although work to date is extensive and reliable for the purpose of alternatives analysis, it is important to note that the replacement plaza has not yet been fully designed; nor is it customary to do so at this early stage. Work to date has been aimed at considering and narrowing a proper range of practicable alternatives in light of the project purpose. In an attempt to answer as many questions as possible, the MTA has performed more analysis than is common for the current pre-permitting stage. Field mapping of wetlands, initial design of the plaza, determination of wetland, stream and vernal pool impacts, creature habitat reviews, and cost estimates have all been done in order to help the Turnpike Board and the public to make a well informed decision. But for all projects like this, true final design comes later. Once a preferred site is selected, environmental permits have been obtained, mitigations have been negotiated, and MTA proceeds to final design, more refined answers will emerge.

As with all MTA projects, we will continue to follow the process, respectfully engage concerned citizens, and base our actions on the rules, the facts, and the best expert advice. Since the York plaza project was first proposed over 10 years ago, MTA staff has met with York officials and residents dozens of times, including about 14 times over the last year. Since Jacobs was retained, York Town officials and residents have been given unparalleled access to project information, sometimes receiving it at the same time as MTA Board members. Special workshops with MTA staff, Jacobs, and a designated team of 2 or 3 people from York were held to review environmental studies, plaza sizing, and engineering information. MTA has maintained a detailed project website with project reports, maps, and analyses. This has been an expensive and time consuming process, but one that the MTA willingly undertook to assure that sufficient information exists for the Board to make a sound decision, and to give concerned citizens ample opportunity to be heard and review the facts.

MTA has a legal and fiduciary obligation to all 1.3 million Mainers and to the 62 million travelers who use and pay for the Turnpike every year, to look for the best site – a site that is safer, affordable, and less disruptive to travelers, abutters, toll collectors, and the environment. We look forward to working with interested persons toward that goal.

Sept. 3rd Comments
and MTA Staff Responses

1. Randy Small, Chases Pond Road, York

Substance of Comment

Mr. Small urged the MTA to "simply be honest." He stated that engineers working on his property unannounced had frightened his daughter and said that he wanted to be informed before people came onto his property.

MTA Staff Response

We agree that simple honesty is the foundation for work on public projects.

Regarding notice, it is MTA protocol to notify abutters when we conduct non-emergency environmental or survey work on their property. We do this even though there is no legal requirement in Maine for public highway officials, or even for private individuals, to give notice to enter un-posted open lands.

Because Mr. Small's property is a mile north of the area recommended for a toll plaza, we did not anticipate that the consultants would enter the Small property on the day in question. We now understand that they did need to map vernal pools and a wetland area near the Turnpike in this vicinity. The people who did the survey work do not recall encountering any people or animals. If Mr. Small's daughter was alarmed, then we apologize for that discomfort.

2. Don Rose, Whippoorwill Homeowner's Association, York

Substance of Comment

Mr. Rose stated that there was $40 million of assessed value in the Whippoorwill subdivision, with a market value of $50 million. He said that according to a broker a toll booth built in the vicinity might decrease property values by as much as 10%, and he wondered how that would be considered.

MTA Staff Response

The two Whippoorwill homes closest to the Turnpike are over 900 feet from the road and a quarter mile from the recommended plaza site. Most of the other homes are between 1/3 and 2/3 of a mile. The subdivision as a whole is closer to Route 1 than to the Turnpike.

Between the Turnpike and the subdivision is rolling and densely wooded terrain. Sound pressure levels from an ORT plaza a quarter mile away is not perceptibly greater than any sound that is presently perceived from distant highway traffic.

The same is true for lighting that should have no impact on this distant subdivision.

Without evidence of any physical or tangible impact, property values are not at issue.

As MTA moves to design of a selected site, we will work with abutters and nearby residents to address any of their legitimate concerns.

3. Emily Rose

Substance of Comment

Ms. Rose questioned the conclusion that Mile 8.8 would be a safer location than mile 7.3, given that the number of accidents in the two locations was comparable (she cited 41 crashes at mile 8.8 and 49 crashes at the current location).

MTA Staff Response

The crash data presented in the Jacob's Draft Technical Memorandum was based upon summaries provided by MaineDOT. These are difficult to interpret. The MaineDOT system can associate crashes that are anywhere from several hundred feet to well over a mile from any specific point.

Rather than to rely on the MaineDOT system, Jacobs further analyzed the crash data and associated individual crash reports within a ½ mile on either side of both Mile 7.3 and 8.8. This further analysis shows that for the three years from 2012 through 2014, there were 42 crashes associated with Mile 7.3 (within a ½ mile) and only 13 crashes associated with Mile 8.8 (within a ½ mile). Stated another way, there were 4 times more crashes near the existing plaza. While this data by itself is not a predictor of future crashes, it does better establish the relative history which is a factor in site selection.

For a discussion of the significance of this data in the broader engineering and safety comparison of sites, please see the response to Mr. Lessard's comments under #18 below.

4. James O'Neil, Whippoorwill Neighborhood, York

Substance of Comment

Mr. O'Neil asked if the MTA could guarantee that his neighborhood would not experience an increase in noise or atmospheric pollution if the toll booth were built at mile 8.8.

MTA Staff Response

Given the distance between the subdivision and the proposed plaza at Mile 8.8, and the woods and topography between them, there is no reason to believe that members of Whippoorwill will see a change from what they experience today. If responsible observers can suggest any adverse impacts, we invite them to come forward so that they may be discussed and possibly mitigated during final design.

It is important to consider the net impacts to all York residents including those who live near the present plaza. The shift to ORT at a flatter location will significantly reduce sound, air quality and environmental impacts as a whole.

5. David Loane, 275 Chases Pond Road, York

Substance of Comment

Mr. Loane questioned Jacobs Engineering's use of a 1% growth rate when projecting future traffic. He stated that in 2004 there were 15.5 million vehicles using York Toll while in 2014 the number had only been 13.9 million.

MTA Staff Response

Figures for transactions recorded at the York Toll are significantly less than for actual traffic. Northbound transactions for Maine E-ZPass holders are counted at the point where the patron leaves the Turnpike and not at the point of entrance. Thus, transaction counts at York are always lower than the level of traffic. The rate of growth in transactions is also lower than the growth in traffic because the number of Maine accounts for electronic tolling has steadily risen since its introduction in 1997.

Jacobs has run their model at between 1% and 2% rates of growth because this is a likely range.

Annual figures between 2008 and 2013 are low relative to historic data because of the recession. Traffic growth in the past two years has been robust. Volume so far in 2015 is the highest ever, about 4% higher than for 2014. Traffic for 2014 was up 3.4% over 2013. Jacobs has run their most recent model using a 1.4% annual growth rate, which is a conservative estimate.

No one concerned with this project would be well served if MTA had to return to York in just a few years for another major capital project to add high speed lanes to a relatively new plaza.

Please see responses to the comments by Ms. Loane in #11 below and the second comment by Mr. Lessard in #18 below.

6. Vicki Carr, 3 Woods Run, York

Substance of Comment

Ms. Carr lives in the vicinity of the property purchased by the MTA from the Morrison family. She said that the MTA should consider the fact that the town's selectmen had twice voted in *favor of not relocating the current toll plaza and that citizens of the town had voted the same way in a referendum. She believes that Jacob's Evaluation Matrix should have included a category for public opinion.*

MTA Staff Response

The latest written communication from the Town to the MTA regarding this project is a letter of May 20, 2014, from the Town Selectmen recognizing that "certain technical and political impediments make adoption of this AET system unfeasible at this time." It continued that the York Board "remains steadfast in its belief that the current toll booth location is suitable for the location of an ORT system" and "encourage[d] the MTA Board of Directors to pursue engineering studies necessary to prove the viability of an ORT plaza at the current location".

The MTA did exactly that by hiring Jacobs in August of 2014. After a detailed look at the current toll location and other sites, Jacobs recommended in June of 2015 that MTA focus on the Mile 8.8 alternative because it would be safer, would have much less wetland and stream impact, would be less disruptive to travelers, toll collectors, and abutters, and would cost about $20 million less.

All governing bodies, like the MTA and the York Selectmen, are often called upon to make decisions in the best interests of all of the people they are charged to serve, even when public opinion is divided.

The primary purpose of the matrix is to assist the MTA Board and the regulatory agencies to select a proper location for the ORT plaza based on objective evidence. Because of the statewide and interstate nature of this project, MTA and the regulatory agencies must take a broad view of the public interest and abide by environmental laws.

Within the town of York are people who live close to the old plaza who are looking forward to having it closed. Public opinion even at the local level is divided on whether the plaza should be moved.

Opinion outside of York appears favorable to moving the plaza. For example, on July 21, 2015, the Portland Press Herald published an editorial entitled "*The time to move the York toll plaza is here*". It read, in part, as follows.

> "It's time to build an open-road tolling facility at a new location in York. This is the inescapable conclusion of studies that stretch back almost a decade, including exhaustive attempts to work with neighbors who want to keep the tollbooth where it is. . . . The current toll plaza, at the bottom of a hill in the center of a curve and sinking into a wetland is the wrong place for the facility. . . . The Maine Turnpike Authority is right to consider the neighbor's concerns, but ultimately this is an issue of statewide importance.

Although we decline to add a column on public opinion to the matrix, we are confident that the MTA Board and the regulatory agencies will be aware of the positions of all interested parties.

7. Joanne Rutherford, 191 Chases Pond Road, York

Substance of Comment - *Ms. Rutherford asked if MTA had considered the loss in property value experienced by people who bought property next to the Morrison's property on Chase's Pond Road before the Morrisons sold the property to the MTA.*

MTA Staff Response

The Morrison property consists of 32.8 acres of wooded and undisturbed land, including many acres of wetlands. It is hard to understand why ownership by the Turnpike is more detrimental than ownership by those with plans to develop an eight lot subdivision with associated driveways and a road.

8. Michael Walek, 271 Chases Pond Road, York

Substance of Comment

Mr. Walek asked the MTA to consider low impact lighting if and when a new toll booth was built. He said that the current toll booth location, in an area zoned industrial by the town, was a more appropriate location than mile 8.8, which was in a residential zone.

MTA Staff Response

Construction of a new plaza presents opportunities for lighting improvement as options are considered during final design. The current York toll plaza uses non-cut-off fixtures and high pressure sodium which emits a glow. Modern LED lighting provides a clean, focused light using fixtures that are fully "cut off", i.e. directed downward to minimize light escaping into the sky. They also use significantly less energy.

Where the lights will be located, how many and how high are matters to be determined in final design after a preferred site is adopted.

It appears from the zoning map of York that the basic zoning along each side of the Turnpike is the same at both Mile 8.8 and Mile 7.3. We see no industrial zones.

9. Patricia Benson, York

Substance of Comment

Ms. Benson stated that she assumed there were fewer crashes on the Tobin Bridge since that facility went to AET and asked if the MTA had considered the safety benefits of AET vs. ORT.

MTA Staff Response

We do not have crash data for the Tobin Bridge. ORT has significantly greater potential to reduce crashes than barrier plazas, and AET has potential to reduce crashes slightly more than ORT. New Hampshire has reported an 85% drop in crashes after the ORT plaza was constructed in Hampton.

As part of the MTA's analyses over the last 10 years, the relative safety benefits of AET and ORT were considered. The MTA Board determined on July 24, 2014, that AET is not feasible for the foreseeable future. If and when it does become feasible, the conceptual plaza design by Jacobs – with 3 ORT lanes in each direction – will allow a seamless transition to AET with few impacts to travelers or abutters.

10. Rep. Patty Hymanson (D-York)

Substance of Comment

Rep. Hymanson represents District 4. She thanked the MTA for providing this forum for public comment and urged the MTA to continue the process as an open and transparent one. She listed several issues she wanted the MTA to consider:

- *Light Pollution*
- *Property Values*
- *Noise Pollution*
- *Air Pollution*
- *Impact of Eminent Domain*
- *Neighborhood Character*
- *Ensuring that Construction allowed for Simple Transition to AET in the Future*

MTA Staff Response

Responses to each of her bulleted comments are set forth below.

- Light Impacts – This issue is premature for a site selection phase as the impacts are similar for all plaza locations. Construction of a new plaza presents opportunities to improve highway lighting with modern technology. For further information, please see the response to the comment by Mr. Walek in #8 above.

- Property Values – Please see the response to the comment by Mr. Don Rose in #2 above.

- Noise Impacts – As noted in the response to Mr. James O'Neil in #4 above, given the distance between the Turnpike and the proposed plaza, and the woods and topography between them, we expect conditions to be similar to what is experienced today.

- Air Emissions – This issue is premature as the impacts are similar for all plaza locations. However, an ORT plaza will greatly reduce air emissions because most vehicles will be free to pass through at highway speeds.

- Property Acquisition - The Mile 8.8 concept design shows the need for a slope on land owned by one abutter on the east side of the highway and for movement of a water line owned by York Water District on the east side. To what extent these will be necessary depends on further refinements to the final design if Mile 8.8 is the selected site.

- Neighborhood Character – If neighborhood character is reflected by local zoning, the zoning map of York indicates that zoning along each side of the Turnpike is similar at both the Mile 8.8 and Mile 7.3 sites. We see no industrial zones.

  If the type of land use is the concern, we note that on the Chases's Pond Road, uses are largely residential, although the York Public Works garage is located to the south, and a contractor and the York Water District are located to the north.

  If traffic through neighborhoods is the concern, we expect no additional traffic – during construction or thereafter – on either side of the Turnpike. With respect to the Chase's Pond Road, we expect traffic entering or leaving a potential employee driveway will be similar to the traffic that would have resulted from a fully developed 8 lot subdivision that was approved for the Morrison property.

  We expect no significant changes in sound, light or air quality affecting homes because the nearest homes are so far from the Mile 8.8 site.

- Ensuring that Construction allowed for Simple Transition to AET in the Future – If and when AET becomes feasible, it will be a simple matter to convert to AET under Jacob's conceptual plaza design.

The net impacts on all town residents and on all Maine citizens and Turnpike users are substantially more beneficial if an ORT plaza is built at Mile 8.8.

11. Kathleen Loane, 275 Chases Pond Road, York

<u>*Substance of Comment*</u>

Ms. Loane asked about the basis for three ORT lanes in each direction. She stated that HNTB had done a study on toll booth sizing for the Falmouth and New Gloucester ORT plazas and asked if a similar study had been done for York. She said that the Hampton Toll Plaza had 40% more traffic than York but only two lanes in each direction.

<u>MTA Staff Response</u>

At the regular MTA Board meeting on December 18, 2014, Jacobs presented its study on plaza sizing and justified the need for 6 ORT lanes (3 in each direction), 4 cash lanes northbound, and 5 cash lanes southbound, for a total of 15 lanes. Jacobs has prepared a Technical Memorandum documenting this analysis, which reflects the latest traffic data. It is available online.

The ORT plaza in Hampton, NH was a retrofit of an existing plaza in good condition, as opposed to a completely new plaza replacing one that is deteriorating and substandard. From a design perspective, the projects are quite different.

National design guidelines advise that new plazas (as opposed to retrofits) should have the same number of ORT lanes as the number of mainline approach lanes to minimize merging and weaving. This plaza size is also justified by operational needs for redundancy if a lane has to be taken out of service due to weather, accident, or repairs.

It would not be good planning to count on returning to York for another major construction project to add high speed lanes in a few years to a relatively new ORT plaza.

Plaza sizing is a function of multiple variables including projected traffic growth and the mix of payment methods between E-ZPass and cash. Other considerations include design guidelines for new plazas, desired customer service levels, frequency of tolerated backups, and needed redundancy for lanes out of service.

Jacobs has run their model at between 1% and 2% rates of growth because this is a likely range. Annual figures between 2008 and 2013 are low relative to historic data because of the recession. Traffic growth in the past two years has been robust. Volume so far in 2015 is the highest ever, about 4% higher than for 2014. Traffic for 2014 was up 3.4% over 2013.

Jacobs has run their most recent model using a 1.4% annual growth rate. At an even more conservative 1% rate, the Jacobs model predicted that the conceptual plaza design size should include 6 ORT lanes (3 in each direction) by 2031, just 12 years after the new plaza would be completed if construction commences in 2017. The plaza design also includes 9 cash lanes (4 northbound and 5 southbound), for a total of 15 lanes.

At a 1.4% growth rate, the Jacobs model predicts that 6 ORT lanes will be needed even earlier, by the year 2024, just 5 years after project completion. For more discussion on growth rates, please see the responses to the comment of Mr. Loane, #5 above, and the second comment from Mr. Lessard, #18 below.

Regarding E-ZPass usage, the current E-ZPass market share at York is approaching 70%. As E-ZPass rates increase, the need for ORT lanes increases. Despite aggressive E-ZPass promotion efforts, the growth in this market share is slowing, and the volume of cash transactions continues at substantial levels for 2015. The Jacobs model has run scenarios at 75%, 80%, and 85% E-ZPass rates. Six ORT lanes are justified in all of these scenarios.

12. Mary Collier, 195 Chases Pond Road, York

Substance of Comment

Ms. Collier questioned the premise that construction at the mile 8.8 site would be $20 million less than construction at mile 7.3. She said that she believed the cost of the Morrison property purchase and other items had not been included and asked the board to compile a more complete estimate before making a decision.

MTA Staff Response

Ms. Collier is correct that the $925,000 cost of the Morrison property was not part of the estimate for the site at Mile 8.8; nor were costs of acquisition considered in any of the site evaluations. Such costs are often not known at the point of site evaluation and it is important to conduct an "apples-to-apples" comparison for purposes of site selection.

13. Dick Bilden, 9 Lock Lane, York

Substance of Comment

Mr. Bilden said that he believed Jacobs Engineering was to approach this study with a "clean slate" but had instead seemingly based much of their work on possibly flawed studies previously done by HNTB and CDM Smith.

MTA Staff Response

Jacobs did approach this project with the instruction to go wherever the facts, standards, and environmental rules led them. They specifically were not required to follow the previous recommendations of HNTB. The fact that two expert engineering consulting firms end up with similar recommendations does not mean either study is flawed. In fact, one recommendation would be more often viewed as confirming the other.

As noted above, Mr. Bilden was a member of a designated team from York that was created to give York on-going access to Jacobs information. Special workshops with MTA staff, Jacobs, and this York team were held to review environmental and engineering information. They often got information at the same time as the Board. During this process, we have asked for any existing or anticipated analyses or reports that contradict those of our expert consultants. To date, we have received none. No significant concerns regarding Jacobs's work were raised until after Jacobs recommended further evaluation of the Mile 8.8 site in June of 2015.

Jacobs's work, as confirmed by others. is reliable for the purpose of selecting a preferred site.

14. Rev. Kari Pritchard, Chase's Pond Road, York

Substance of Comment

Reverend Pritchard said that CDM Smith had concluded that AET was not feasible in York "for the foreseeable future" but had not defined what "foreseeable future" meant.

MTA Staff Response

CDM Smith was retained by the MTA to analyze the impacts if AET were to be implemented. Their report shows a forecast out to the year 2030. Upon checking with CDM Smith to prepare this response, we understand that additional analyses to the year 2035 were also performed, and the projected impacts were not significantly different from those for 2030. Surcharges and diversion of traffic would still be challenges.

Regarding the AET question in general, MTA cannot convert the York plaza alone to AET without introducing a conflict in business rules and tolling protocols. We would need to convert all 19 toll plazas on the Turnpike.

In its letter of May 20, 2014, the Town of York acknowledged that the adoption of AET was not feasible. The MTA Board, which has the legal and fiduciary duty to make this judgment, also determined AET was not feasible on July 24, 2014. Thus the Town and the MTA were essentially aligned on this question.

Despite MTA's extensive study of this issue, some in York continue to argue that AET should be adopted due to advancements in toll technology. However, it is the nature of the York plaza, the Turnpike customer base, the collection challenges, and other factors – not technology -- that are the primary reasons why ORT is the right choice for this location. Those issues are not predicted to change significantly in the foreseeable future.

Recent developments support this determination in favor of ORT. Cash volume at York has leveled off and persists at levels greater than one-third of total traffic volume; New Hampshire has determined that ORT is the proper solution at several locations in their state; and the AET experiment in Massachusetts is experiencing challenges including public pushback on toll penalties on the Tobin Bridge leading to their suspension.

15. Don Lawton, Whippoorwill Neighborhood, York

Substance of Comment

He said that in the worksheet compiled by Jacobs Engineering the category "Abutter Impacts" was "green" for mile 8.8, meaning minimal impacts, he presumed. Mr. Lawton stated that he believed this category should be "red" for the mile 8.8 due to impact on abutters' property values.

MTA Staff Response

See the response to Mr. Rose, #2 above.

15. Suzie Lawton, Whippoorwill Neighborhood, York

Substance of Comment

Mrs. Lawton asked if there had been any studies done on the sound, light or air pollution that would result from construction of the plaza at mile 8.8.

MTA Staff Response

Please see our responses to the comments made by Mr. O'Neil, #4 above, Mr. Walek, #8 above, and Rep. Hymanson, #10 above.

16. Dave Linney, York

Substance of Comment

Mr. Linney asked if relocation of the York Water District's water line at mile 8.8 had been included in the preliminary construction estimates for that site. He asked if the cost of ledge removal had been included and said he felt that the amount of ledge that would have to be removed at that site was considerable. Mr. Linney said that he could see the light from the existing toll booth at his house now, even though it was a mile away. He asked if new information concerning AET that might have become available in the year since CDM Smith's report had been or would be considered.

MTA Staff Response

The cost of the relocation of the water line does not have a specific line item in the cost estimate for Mile 8.8, but it is well within the contingency amount provided. All sites at this phase have cost elements that are determined during final design after site selection.

The cost of ledge removal has been included based upon conceptual quantities. Test borings will further refine the estimate.

Discussion of lighting is premature for a site selection phase because the impacts are similar for all plaza locations. Measures to avoid and minimize impacts will be considered as part of the final design process after a preferred site is selected. Please see our response to the comments made by Mr. Walek, #8 above.

Regarding new information concerning AET, please see our response to the comment from Rev. Pritchard, #14 above.

17. Sen. Dawn Hill (D-York)

Substance of Comment

Senator Hill said that there was a big people factor involved. She was very proud of her constituents, who she described as taxpayer, tollpayers, and Mainers who have every right to be listened to. She urged the board to continue to work with them, and said this process should be looked at as a partnership rather than as a confrontation. She asked how the board intended to document the comments received.

MTA Staff Response

We agree with Senator Hill that her constituents deserve to be listened to. The history of this project demonstrates that we have done so.

We also agree with Senator Hill's sentiment to work collaboratively moving forward. As we move to permitting and final design at a preferred site, we will continue to work to mitigate the concerns of nearby residents.

This memorandum documents the comments received and MTA's response.

18. Dean Lessard, York Public Works Director, York Resident

Substance of Comments

Mr. Lessard asked that the MTA delay its decision on moving forward until further studies could be done. In particular, he said that the MTA should consider the crash reports individually, to get a sense of the type of accidents currently occurring, and said that he believed many of the accidents recorded at the present site would also occur at another location where a toll booth was present. He also asked what design year the MTA was using for the new toll plaza and what kind of study had been done to determine projected future volumes. Mr. Lessard proposed that the matrix developed by Jacobs be reconfigured, with "weighted" categories, with safety as the top tier, environmental and abutter impacts the second tier, and engineering considerations at the bottom.

MTA Staff Response

Given that Mr. Lessard was the only Town official to comment on September 3, and given that he asked for a delay to allow for more study, a reiteration of some process information may be helpful before responding to his three comments. Mr. Lessard was a member of a designated team from York that was created to give York on-going access to Jacobs information. Special workshops with MTA staff, Jacobs, and this York team were held to review environmental, plaza sizing, and engineering information. They often got information at the same time as the Board. During this process, we have asked for any existing or anticipated analyses or reports prepared for or on the behalf of the Town of York that contradict those of our expert consultants. To date, we have received none.

We understand that on October 19, 2015, the Town Selectmen decided to take the lead role in representing the local position, to ask a consultant working for the Town to complete his work, and to accept $13,000 in privately raised funds from Think Again to hire a lawyer.

For reasons explained in our response to the comment from Rev. Pritchard, #14 above, revisiting the AET question is unwarranted.

We again renew our request for any new written technical information that contradicts the site alternatives analysis work by Jacobs. The MTA has provided the Town with virtually real time access to Jacobs's information. It is only fair to share any conflicting technical information. We continue to seek a fact-based collaboration, as opposed to a legal confrontation.

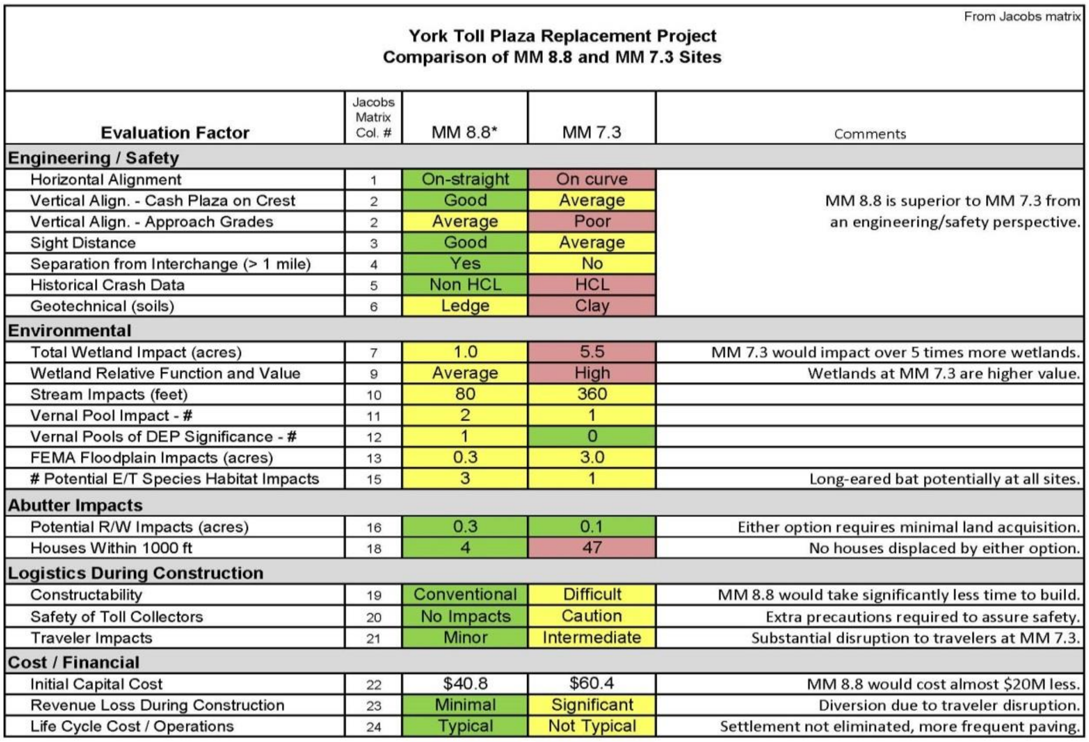
Responses to each of Mr. Lessard's three comments are set forth below.

First, regarding the historical crash data, the individual crash records were examined as part of the crash analysis. As set forth in our response to the comment by Emily Rose, #3 above, this examination showed that there were 4 times more crashes near the existing plaza than near Mile 8.8. We acknowledge that there is no definitive means to determine the number of crashes that are attributable to the toll plaza or to the nearby interchange. The safety and weaving issues at the existing plaza are a multi-faceted problem that is a function of several characteristics including its close proximity to the interchange at Exit 7, the overpass, and geometrics.

To be sure, some of the crashes associated with the Mile 7.3 site are likely attributable to the existence of the barrier plaza, which can cause rear-end crashes. Some of those crashes would "move" to any new toll plaza location. However, the number of plaza-related crashes will drop significantly at a new ORT plaza because toll booths are removed for E-ZPass customers and cash paying customers are safely separated to the right. The mainline plaza in New Gloucester had been a high crash location. After ORT was installed, the number of toll plaza related crashes dropped from 6 in 2011 to 1 in 2014. New Hampshire reported an 85% drop in crashes after the ORT plaza was constructed at Hampton, N.H. Although we agree that some of the crashes will "move" to any new plaza, the number will be greatly reduced.

More importantly with respect to site selection, there is little doubt that some of the crashes associated with the Mile 7.3 site were the result of weaving caused by the close proximity of the interchange at Exit 7, the closeness of an overpass, and other geometric deficiencies. That is why design standards contain special provisions for proximity to interchanges and overpasses, and for horizontal and vertical geometry. Although historical crash data alone cannot be a predictor of future crashes, it is relevant as a factor in the selection of a suitable site.

Even if one ignored the "Historical Crash Data" column (#5) on the Jacobs Evaluation Matrix, the Mile 8.8 site is superior to the Mile 7.3 site, as can be seen from the following chart.



From Jacobs matrix

York Toll Plaza Replacement Project
Comparison of MM 8.8 and MM 7.3 Sites

Evaluation Factor	Jacobs Matrix Col. #	MM 8.8*	MM 7.3	Comments
Engineering / Safety				
Horizontal Alignment	1	On-straight	On curve	MM 8.8 is superior to MM 7.3 from an engineering/safety perspective.
Vertical Align. - Cash Plaza on Crest	2	Good	Average	
Vertical Align. - Approach Grades	2	Average	Poor	
Sight Distance	3	Good	Average	
Separation from Interchange (> 1 mile)	4	Yes	No	
Historical Crash Data	5	Non HCL	HCL	
Geotechnical (soils)	6	Ledge	Clay	
Environmental				
Total Wetland Impact (acres)	7	1.0	5.5	MM 7.3 would impact over 5 times more wetlands.
Wetland Relative Function and Value	9	Average	High	Wetlands at MM 7.3 are higher value.
Stream Impacts (feet)	10	80	360	
Vernal Pool Impact - #	11	2	1	
Vernal Pools of DEP Significance - #	12	1	0	
FEMA Floodplain Impacts (acres)	13	0.3	3.0	
# Potential E/T Species Habitat Impacts	15	3	1	Long-eared bat potentially at all sites.
Abutter Impacts				
Potential R/W Impacts (acres)	16	0.3	0.1	Either option requires minimal land acquisition.
Houses Within 1000 ft	18	4	47	No houses displaced by either option.
Logistics During Construction				
Constructability	19	Conventional	Difficult	MM 8.8 would take significantly less time to build.
Safety of Toll Collectors	20	No Impacts	Caution	Extra precautions required to assure safety.
Traveler Impacts	21	Minor	Intermediate	Substantial disruption to travelers at MM 7.3.
Cost / Financial				
Initial Capital Cost	22	$40.8	$60.4	MM 8.8 would cost almost $20M less.
Revenue Loss During Construction	23	Minimal	Significant	Diversion due to traveler disruption.
Life Cycle Cost / Operations	24	Typical	Not Typical	Settlement not eliminated, more frequent paving.

*Recommended for further design and analysis.

The Mile 7.3 site is inferior to the Mile 8.8 site based upon almost all criteria and is inferior to all the other sites analyzed.

Regarding the design year and traffic volumes, we are using a 25 year design life for the plaza, given the project purpose and the fact that this is a completely new plaza replacing an aging, substandard plaza – not a retrofit of an existing one. Regarding traffic growth and plaza sizing, please see our responses to the comments by Mr. Loane, #5 above, and by Ms. Loane, #11 above.

Regarding Mr. Lessard’s suggestion for a tiered or weighted matrix, established federal and state environmental processes for alternative site analyses do not support this suggestion. The regulatory agencies require non-weighted and non-factored data for their consideration when determining practicable alternatives for permits.

We agree with Mr. Lessard that public safety is a primary concern. However, we reject his assertion that engineering considerations should be a lower tier criteria. Engineering standards and guidelines promote public safety and efficient operations, and they are inextricably intertwined with the safety of the estimated 30 million people who will pass through the York toll plaza every year. Although we understand that smaller projects with only local impacts can sometimes be tailored to meet local needs and desires, this project calls for building a new interstate highway toll plaza of statewide and national significance. Accordingly, it needs to meet national engineering standards and guidelines to the greatest extent practicable, consistent with environmental rules. These engineering standards and guidelines can be met at the Mile 8.8 site. They cannot be met at Mile 7.3.

Regarding engineering and safety considerations as a whole, the bottom line is this: Professional Civil Engineers having substantial experience with toll facilities would agree that an ORT plaza located on a straight section of highway at the crest of hill away from interchanges and overpasses will be safer than an ORT plaza located on a curve, at the bottom of a hill, near an interchange and overpass -- all other factors being equal. This conclusion also aligns with common sense. More study will not change this safety calculus.

In this case, we do not have a conflict between safety, the environment, and other factors. The Mile 8.8 site is not only one of the safest, it also has low environmental impacts and it costs less. The net local impact on York residents will be reduced as well, as noted in our response to Mr. O'Neil, #4 above.

More study is not necessary to select a preferred site.

19. Marshall Jarvis, York Harbor

Substance of Comment

Mr. Jarvis stated that the vicinity of the current toll booth on the southbound side had not been classified as a high crash location in the last ten years.

MTA Staff Response

Please see the responses to the comments of Emily Rose, #3 above, and the first comment of Dean Lessard, #18 above.

20. Todd Bezold, Chases Pond Road, York

Substance of Comment

Mr. Bezold said that he had been told noise and light pollution studies had not been done for the Mile 8.8 option. He said that a new toll booth would add ozone in an area where ozone was already too high. He stated that southbound traffic already backs up to Mile 9.2 on some Sundays and that putting the toll booth further north would cause the backup to stretch further north. He asked how the snow from snow plowing activities would be disposed of or stored. He asked about how the access road would be constructed, considering the vernal pools on the Morrison property. He asked if the MTA had considered the impact that a septic system for employees would have.

MTA Staff Response

Regarding light, noise and air impacts, please see our responses to the comments made by Mr. O’Neil, #4 above, Mr. Walek, #8 above, and Rep. Hymanson, #10 above.

Regarding traffic backups, volumes during busy summer travel days can back up traffic. However, the new ORT plaza proposed by Jacobs will be much more efficient than the existing barrier plaza. Backups will be significantly less. The new plaza will not eliminate traffic delays caused by constraints south of the plaza including the Piscataqua River Bridge and interchanges in New Hampshire.

Regarding snow and ice control, those maintenance activities will be performed in a manner similar to what is done along the entire Turnpike. No special technical challenges are anticipated. Any such issues will be fully considered as necessary during final design.

Regarding the potential access road, it will avoid all wetlands and vernal pools and incorporate appropriate Best Management Practices (BMPs) to manage stormwater. No special technical challenges are anticipated.

The septic system will be considered in final design. Any system will comply with the Maine Subsurface Wastewater Disposal Rules and all applicable inspection requirements. No special technical challenges are anticipated.

21. Joan Jarvis, York Harbor

Substance of Comment

Mrs. Jarvis urged the board to delay any further decisions until it had more information and the questions raised today during this public comment period had been answered.

MTA Staff Response

This memorandum documents the comments received and MTA’s response.

The last 10 years of study have generated more information to select a preferred alternative than decision makers normally have at this phase of a project. That information has been consistent over time and between different expert consultants. We do not know how more study or information would help in the selection of a preferred site.

Summary of Comments at the September 3 MTA Board Meeting
By Joan Jarvis, York Beach, Maine

(Received By MTA Board Secretary, 9/8/15)

1. *Realtors are required to provide full disclosure on a property to prospective buyers. You did not disclose your option to purchase the Morrison property, and at least one young couple*

made a major financial decision to buy a home adjacent to the Morrison property without the knowledge of potential impacts.

Regarding property values, please see our responses to Numbers 2, 4 and 7 above (all # references refer to the number of the MTA summary of comments above, not the numbers in the Jarvis summary).

Years ago, the Morrisons approached MTA about purchasing their property. Within a few weeks of entering into an option with them, a memorandum providing notice of it was recorded in the York County Registry of Deeds as a matter of public record. The sale, three years later, was also a matter of record and public discussion.

The Morrison property consists of 32.8 acres of wooded and undisturbed land, including many acres of wetlands. It is hard to understand why ownership by the Turnpike is more detrimental than ownership by those with plans to develop an eight lot subdivision with associated driveways and a road.

2. *We believe that the Jacobs decision matrix fails to prioritize some of the most important subjects. First should be safety, second should be abutter impacts and third should be engineering considerations.*

   MTA Response – Please see our response to the third comment from Mr. Lessard, #18 above. We note that environmental considerations are also important to regulators.

3. *The Whippoorwill subdivision homes are assessed on the tax records at over $40 million. If moving the plaza to MM 8.8 reduces their values by a minimum of 10%, abutters face a $4 to $5 million property loss.*

   MTA Response – Please see our response to the comment by Mr. Rose, #2 above.

4. *At the August 3rd Workshop we were told that no pollution studies have been conducted for air, noise and light pollution at MM8.8. Before taking a vote to move the plaza, air, noise and light pollution studies should be done.*

   MTA Response – Please see the Background section above, and our responses to the comments by Mr. O’Neil, #4 above, Mr. Walek, #8 above, Rep. Hymanson, #10 above, Mr. Linney, #16 above, and Mr. Bezold, #20 above.

5. *Before the Board makes a final decision, a study should be commissioned to show the Toll Plaza Sizing Analysis for the potential new York Plaza. This Traffic Volume and Lane Analysis should reflect a realistic evaluation of the actual traffic growth and a realistic number of lanes to handle the traffic.*

MTA Response – Please see our responses to the comments by Mr. Loane, #5 above and Ms. Loane, #11 above.

6. *At the August 3rd Workshop we were told that no pollution studies have been conducted for air, noise and light pollution at MM 8.8.*

   Currently York County in 2015 has slipped from a "D" to and "F" rating for ozone level, according to the American Lung Association 2015 report. York County 70 ppbv for ozone, borderline out of compliance. Ozone affects the quality of health for the elderly and even healthy people working outside, making it difficult to breath. There is a direct affect upon child development with families living two kilometers from a highway. Ozone levels are reduced with less traffic congestion. With the introduction of EZ-pass ozone levels drop dramatically. Open road tolling still creates highway obstructions and congestion. All electronic tolling would remove congestion and reduce ozone pollution. Today the traffic backs up from the tollbooth to mile 9.2. Placing the tollbooth at 8.8 will extend this line of traffic further up the highway, exposing more areas to increased air pollution. The sound of the highway is deafening throughout the day at mile 9.2 as trucks throttle in order to move up hill. Down shift throttling to pass through the new toll booth will not reduce the current noise. During the winter the current practice for snow removal is to dump the salt and dehydrate laden snow off the roadside and into the wetland surrounding the toll booth.

   MTA Response – An ORT plaza – including the 6 ORT lanes and 9 cash lanes – will reduce backups. Please see our responses to the comments by Mr. O'Neil, #4 above, Mr. Walek, #8 above, Rep. Hymanson, #10 above, and Mr. Bezold, #20 above.

   Will this also be a common practice in a new watershed that is not contaminated by road salts? Will there be studies on the affects of road salt pollution with the new access roads built across the Morison property, where there are vernal pools present?

   MTA Response – Please see our response to the comment by Mr. Bezold, #20 above.

   Will the MTA abide by the septic zoning laws set forth by the town of York? These laws are much stricter for the Cape Neddick River watershed.

   MTA Response – Please see our response to the comment by Mr. Bezold, #20 above.

   In addition to the affects of noise and particulate pollution on health, light pollution has a negative impact of the amphibian physical and hormonal development and maturation, as well as foraging activity. Vernal pools adjacent to mile 8.8 where there are no lights could show a reduction in local fauna.

   MTA Response – All relevant site-specific environmental issues will be considered after a site is selected during the permitting and final design phase.

7. *At the August 3rd, and previous workshops it was felt that numerous Jacobs conclusions were based on previous HNTB and CDM Smith summaries, which contained significant errors and flawed premises.*

   MTA Response – Please see our response to the comment by Mr. Bilden, #13 above.

8. *Jacobs Engineering, which recommends MM 8.8, indicates on its Matrix, that there would be no abutter impact if the Plaza is built at MM 8.8. Local real estate agents have told the Whippoorwill Homeowners Association they could face a 10% drop in their values. Jacobs has this as green on their Matrix…This should be changed to red.*

   MTA Response – Please see our responses to the comments by Mr. Rose, #2 above, and Mr. Lawton, # 15 above.

9. *You have stated that MM 8.8 will cost $20 million less than MM 7.3 to construct a new toll plaza. But, we learned that such items as the Morrison property purchase were not included and that other items will be further studied before costs will be known. No vote should be taken to proceed at MM 8.8 without a clear understanding of the total costs.*

   MTA Response – Please see our response to the comment by Ms. Rutherford, #7 above.

10. *We learned, after the August 3rd Workshop, that the MTA was unaware that York's water supply runs parallel to the turnpike at MM 8.8 and will have to be relocated. It makes better sense to meet with the York Water District to identify the problems and costs before proceeding to vote on relocating to MM 8.8.*

    MTA Response – Please see our response to the comment by Mr. Linney, #16 above. The water line relocation does not pose any special technical challenges. Discussions with the Water District will occur if the Mile 8.8 site is selected.

11. *Have you investigated using environmentally friendly low impact lighting? In 1998 Lisbon, built the then largest bridge in Europe over the Tagus River. A group of fishermen were going to be impacted by the bridge and its overhang. As we know, aquatic and land life are affected by artificial lighting. The lighting on the Vasco da Gama was tilted on the bridge reducing the affects of artificial light on the foraging and spawning activity of the fish. Once again are you planning to incorporate a design similar to this; so as to not impact the surrounding environment.*

    MTA Response – Please see our response to the comment by Mr. Walek, #8 above.

York residences voted 90% against moving the toll to prevent impact on an undeveloped rural area of their town.

MTA Response – Please see our responses to the comments by Ms. Carr, #6 above, Mr. Walek, #8 above, and Rep. Hymanson, #10 above.

12. *In looking at the traffic volume data that you provided, in 2004 the total volume was 15,560,000 vehicles. In 2014 the total volume had dropped to 13,860,000 vehicles. The drop in volume over 10 years of 1,700,000 vehicles, or 11%.*

    Your study began in 1998 – during those 16 years the traffic has increased from 13,490,000 to 13,859,000 or 1/5 of 1% per year, thru 2 economic downturns. In the material that you gave us – you use 1% as the annual growth rate, 5 times the actual growth.

    Please see our response to the comment by Mr. Loane, #5 above.

13. *According to the MDOT data that you provided, there were 41 crashes at MM 8.8 and 49 crashes at MM 7.3. Given that a barrier is at MM 7.3 that site may be safer that MM 8.8.*

    MTA Response – Please see our responses to the comments by Ms. Rose, #3 above, and Mr. Lessard, #18 above.

14. *It was stated at the August 3rd Workshop that public input was not included on the decision matrix because it cannot be measured quantitatively. The York Board of Selectmen has twice voted 5 to 0 to rebuild the plaza at its current location and the May 2008 York citizens referendum vote of over 90% to not relocate the York Toll Plaza. That should be included in the Matrix as a "red" area.*

    MTA Response – Please see our response to the comment by Ms. Carr, #6 above.

15. *The CDM Smith report states that AET is not feasible in the foreseeable future. Without being able to define the "foreseeable future", you should not be making a decision on the toll Plaza.*

    MTA Response – On July 24, 2014, the MTA Board determined that AET is not feasible on the Maine Turnpike or in the best interest of the MTA or Turnpike users for the foreseeable future. Please see the Background section above, and our response to the comment by Rev. Pritchard, #14 above.

16. *Based upon the questions that have been asked today, are you as a Board convinced that you have sufficient, accurate information to make a decision to proceed with Relocation of the York Toll Plaza to MM 8.8, and are you willing to vote on only design concepts?*

MTA Response – The work to date is extensive and reliable for the purpose of selecting a preferred site. Final design comes after site selection on all such projects. The question of whether the Board needs additional information or time to select a preferred location is ultimately a question for the Board. Please see the Background section above, and our response to the comment by Ms. Jarvis, #21 above.

17. *Senator Dawn Hill said, "Certainly there are engineering reports, but there's a big people factor here, too. The people here today are taxpayers, are toll payers but you know what? They are Mainers. They have every right to speak and they have every right to be listened to."*

    Please see the Background section above, our response to the comment by Sen. Hill, #17 above.

APPENDIX 10

PUBLIC MEETING INFORMATION

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PUBLIC NOTICE:

NOTICE OF INTENT TO FILE

Please take notice that

Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102
(207) 871-7771

is intending to file a Natural Resources Protection Act permit application with the Maine Department of Environmental Protection pursuant to the provisions of 38 M.R.S.A. §§ 480-A thru 480-BB on or about

October 17, 2016

The application is for:

<u>The construction of a new York Toll Plaza</u>

at the following location:

<u>Mile 8.8 U.S. I-95 Turnpike, York, Maine</u>

A request for a public hearing or a request that the Board of Environmental Protection assume jurisdiction over this application must be received by the Department in writing, no later than 20 days after the application is found by the Department to be complete and is accepted for processing. A public hearing may or may not be held at the discretion of the Commissioner or Board of Environmental Protection. Public comment on the application will be accepted throughout the processing of the application.

The application will be filed for public inspection at the Department of Environmental Protection's office in Portland during normal working hours. A copy of the application may also be seen at the municipal offices in York, Maine.

Written public comments may be sent to the regional office in Portland where the application is filed for public inspection:

MDEP, Southern Maine Regional Office, 312 Canco Road, Portland, Maine 04103

08/08

PUBLIC NOTICE FILING AND CERTIFICATION

Department Rules, Chapter 2, require an applicant to provide public notice for all Tier 2, Tier 3 and individual Natural Resources Protect Act projects. In the notice, the applicant must describe the proposed activity and where it is located. **"Abutter"** for the purposes of the notice provision means any person who owns property that is BOTH (1) adjoining and (2) within one mile of the delineated project boundary, including owners of property directly across a public or private right of way.

1. **Newspaper:** You must publish the Notice of Intent to File in a newspaper circulated in the area where the activity is located. The notice must appear in the newspaper within 30 days prior to the filing of the application with the Department. You may use the attached Notice of Intent to File form, or one containing identical information, for newspaper publication and certified mailing.

2. **Abutting Property Owners:** You must send a copy of the Notice of Intent to File by certified mail to the owners of the property abutting the activity. Their names and addresses can be obtained from the town tax maps or local officials. They must receive notice within 30 days prior to the filing of the application with the Department.

3. **Municipal Office:** You must send a copy of the Notice of Intent to File and a **duplicate of the entire application** to the Municipal Office.

   ATTACH a list of the names and addresses of the owners of abutting property.

CERTIFICATION

By signing below, the applicant or authorized agent certifies that:

1. A Notice of Intent to File was published in a newspaper circulated in the area where the project site is located within 30 days prior to filing the application;
2. A certified mailing of the Notice of Intent to File was sent to all abutters within 30 days of the filing of the application;
3. A certified mailing of the Notice of Intent to File, and a duplicate copy of the application was sent to the town office of the municipality in which the project is located; and
4. Provided notice of and held a public informational meeting, if required, in accordance with Chapter 2, Rules Concerning the Processing of Applications, Section 13, prior to filing the application. Notice of the meeting was sent by certified mail to abutters and to the town office of the municipality in which the project is located at least ten days prior to the meeting. Notice of the meeting was also published once in a newspaper circulated in the area where the project site is located at least seven days prior to the meeting.

The Public Informational Meeting was held on ____.
Date

Approximately _________ members of the public attended the Public Informational Meeting.

____________________________________ ______________________
Signature of Applicant or authorized agent Date

FOR IMMEDIATE RELEASE
September 23, 2016

Erin Courtney
513-2982
ecourtney@maineturnpike.com

Notice of public meeting pertaining to York Toll Plaza - October 5, 2016

Public Meeting will take place on at York Maintenance at 7:00 p.m.

On October 5, the Maine Turnpike Authority will hold a public informational meeting in preparation for applying for a Tier 3 permit under Maine's Natural Resources Protection Act. The purpose of the permit is to relocate the York Toll Plaza to mile 8.8 on the turnpike. For the same project, the MTA will also file a Notice of Intent under its General Permit issued under the Site Location of Development Act.

The application will be processed under the Natural Resources Protection Act, 38 M.R.S.A. 480-A, et. Seq. and its associated regulations and under a General Permit issued to the Maine Turnpike Authority on February 29, 2016, by the DEP under the Site Location of Development Act pursuant to 38 M.R.S.A. 486-B.

The purpose of the meeting is for the Turnpike to inform the public about the project and its anticipated environmental impacts and to educate the public about opportunities to provide comment to the Department of Environmental Protection during the application process.

The meeting will be held October 5, 2016, at 7pm at the Turnpike's York Maintenance Facility at 10 Spur Road, York Maine. The facility is on the west side of the Turnpike near Exit 7.

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The York Toll Project:
A Modern Open Road Tolling Plaza at Mile 8.8

Project Description

Background. After a decade of analysis, the Maine Turnpike Authority (MTA) is applying for state and federal environmental permits to construct a modern Open Road Tolling (ORT) plaza at Mile 8.8 in York and to demolish the existing barrier plaza at Mile 7.3.

ORT plazas allow travelers to cruise through in open center lanes and pay tolls electronically at highway speeds (70 mph), and also allow non-E-ZPass customers to pay cash at staffed toll booths to the right. ORT facilities are already built and operating on I-95 in Hampton, New Hampshire and on the Maine Turnpike in New Gloucester. Two other MTA ORT plazas are under construction in West Gardiner and Falmouth, and another is in design in Scarborough.

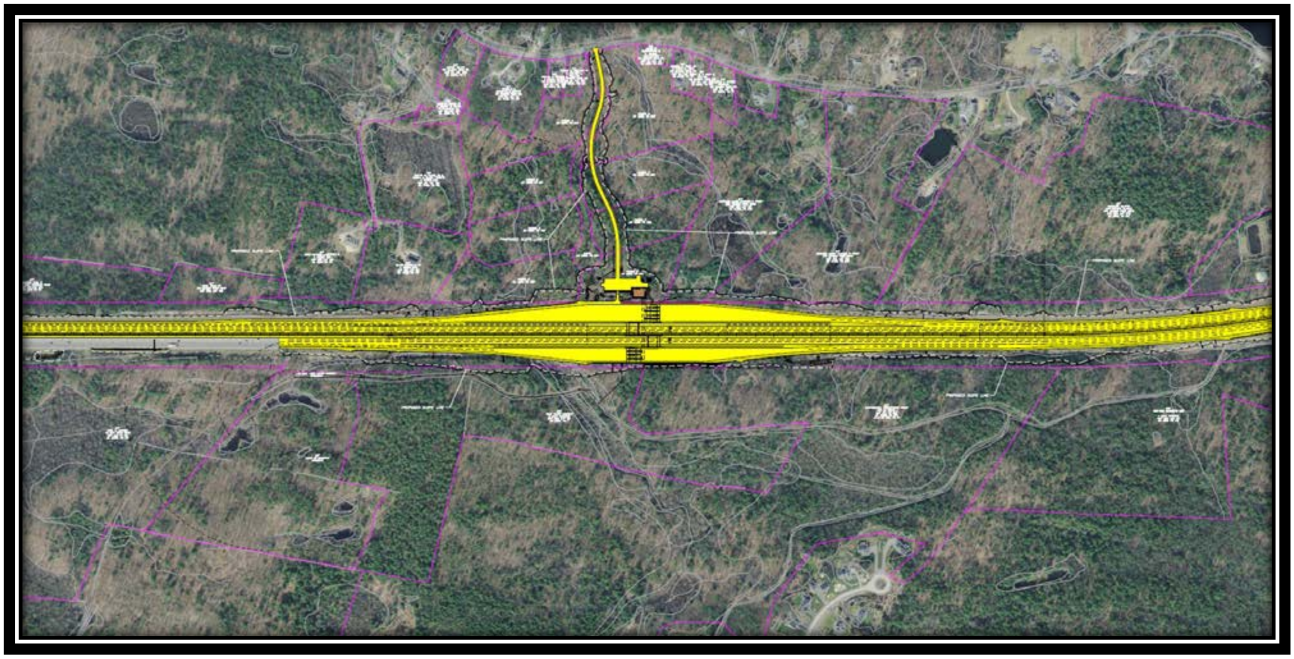
While the York will be the fifth ORT plaza on the Maine Turnpike, it is clearly the most important. Located at the gateway to Maine, the York plaza handles about 30 million travelers and collects over $50 million per year, which represents about 40% of all MTA revenue.

The Problem. The existing barrier plaza at Mile 7.3 has serious safety, operational, and condition deficiencies. Originally designed in the late 1960's as a temporary barrier plaza for all vehicles to stop to take paper tickets and pay cash, it has approaches sinking into clay soils, is surrounded by wetlands, has a leaking tunnel full of electrical components, and uses outdated software and toll equipment held together with used parts. Further, it is located on a curve at the bottom of a hill near an interchange and overpass, which causes sight distance restrictions, weaving, and other safety concerns. And it does not allow tolling at highway speeds as travelers now expect. Accordingly, the USACE-approved purpose of this project is to address these deficiencies by replacing the existing barrier toll plaza with highway speed electronic tolling lanes and cash (non-EZ pass) lanes.

The Solution. The project calls for the construction of a modern ORT plaza at Mile 8.8.

The project has an estimated construction cost of $40 million. The scope includes:

- 6 open, high-speed (70 mph) E-ZPass center lanes (3 in each direction) with overhead open frame gantries with electronic toll collection equipment
- Construction of 9 cash lanes with toll booths (4 northbound and 5 southbound)
- Service tunnel for toll equipment, utilities, and safe passage of staff
- Highway reconstruction of mainline to accommodate approach and departure lanes
- Driveway and utilities from Chases Pond Road
- Administration building and parking lot near the Turnpike
- Construction of stormwater management measures within the Turnpike right of way
- Demolition of the existing 17-lane barrier plaza, administration building and driveway at Mile 7.3.



Plan view showing improvements at Mile 8.8.

If permitting goes as planned, travelers will be enjoying the new ORT plaza by 2020.

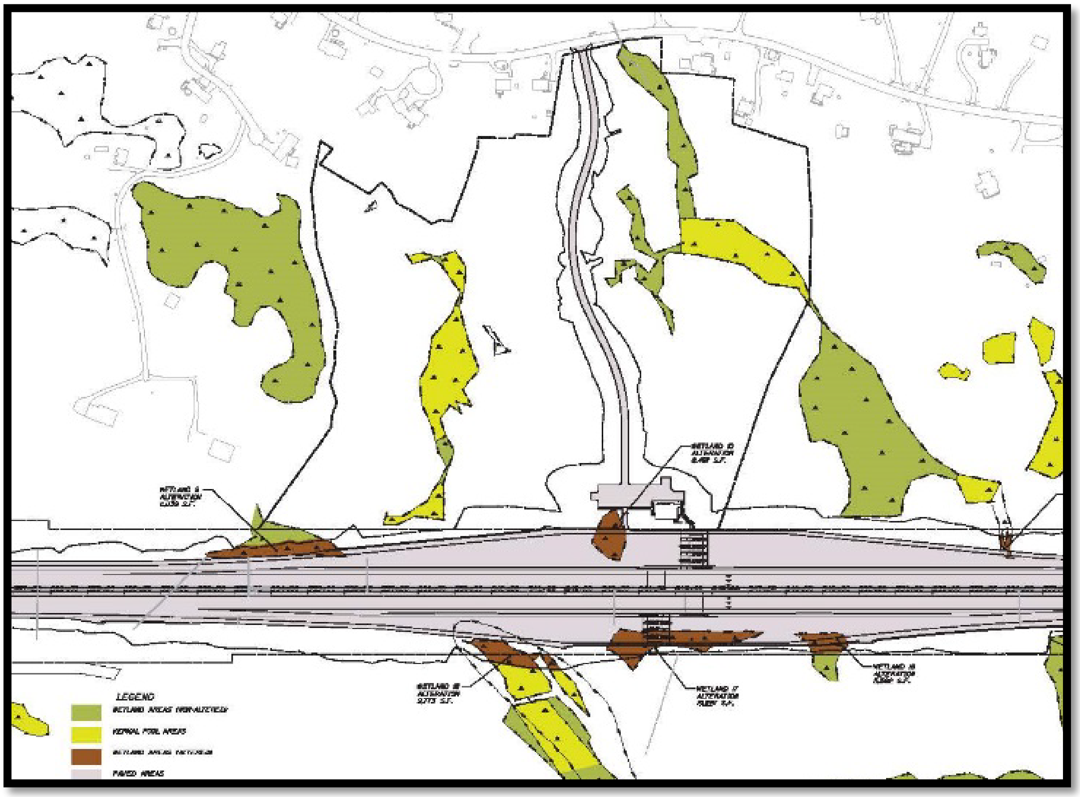
You may submit permitting-related comments to Robert Green at the Maine Department of Environmental Protection via email at Robert.Green@maine.gov or by mail at 312 Canco Road, Portland, Maine 04103.

The York Toll Project:
A Modern Open Road Tolling Plaza at Mile 8.8

Minimal Impacts

Although a substantial piece of construction, careful design and siting in close collaboration with environmental agencies has resulted in minimal environmental impacts.

- 1.46 acres of total wetland impact, being mostly forested wetlands with relatively low functions & values. (*Direct impacts are shown in brown in the map below.*)
- No direct impacts to significant vernal pool impacts. 1.41 ac of impact to buffers of significant vernal pools.
- 24 linear feet of stream impacts.
- No impacts to any federally listed Threatened and Endangered species.
- 0.13 acres of impact to the habitat of two state Threatened and Endangered Species.
- All impacts are being mitigated in cooperation with federal and state agencies at an estimated cost of over $450,000.



By USACE definition, this project has “no more than **minimal** . . . adverse effects on the aquatic environment”.

This project does not displace any home. In fact, there are only 4 houses within 1,000 feet of the new site.

From dozens of meetings with York officials and residents over the years, it is apparent that there have been local concerns regarding air, noise, and light. The MTA commissioned expert analyses of all these issues. Full copies of these analyses are available on the MTA website. Taken together, they show that this project generally will **reduce impacts and affect fewer York residents**.

Air

- The new ORT plaza is located on the top of a hill and on a straight stretch of highway and allows 70% of cars and 85% of trucks to pass without braking and accelerating.
- Jacobs Engineering studied air impacts using state-of-the-science air and traffic models.
- This study found that **net emissions will be cut by 16% overall.**

Noise

- Although vehicle noise from public ways is exempt from permitting consideration, the MTA commissioned a detailed noise analysis from Jacobs due to local concerns.
- The audible change in sound that is perceivable by the typical human ear is 3 dB(A). The largest difference between existing and future noise levels caused by this project will be 1 dB(A).
- Residences in the Whippoorwill subdivision or along Chase's Pond Road will not experience perceptible noise impacts from this project. Two homes built in close proximity to the Turnpike on Woods Run already experience relatively high noise levels. This project will not make that existing situation perceptibly worse.
- The use of engine brakes at the proposed ORT plaza should be virtually eliminated given that 85% of trucks now use E-Z Pass and will not be slowing, and the location of the plaza on the crest of a hill will help to slow down the remaining 15% of trucks that pay cash.
- Jacobs bottom line conclusion: **There will be no perceptible noise impacts due to the relocation of the toll plaza to Mile 8.8**.

Light

- Jacobs Engineering is designing the lighting using the latest design standards and fixtures. Modern LED "fully cut off" lighting complying with dark sky laws will be used. House-side light shields will control light trespass. These fixtures direct the light in a narrower beam, "painting" the road and other points of interest. The glow from a distance is extremely limited.
- The color of light will be toward the "warmer" end of the spectrum, as opposed to the cooler, blueish hues that some LEDs emit.
- Due to the fixtures used and the height of the trees that surround the proposed plaza, Jacobs expects that **lighting will be practically undetectable to abutters** in the vicinity of the proposed toll plaza.
- Two homes built in close proximity to the Turnpike on Woods Run likely will see the lighted highway, at least when the leaves are off the trees. Residences in the Whippoorwill subdivision or along Chase's Pond Road will not.

You may submit permitting-related comments to Robert Green at the Maine Department of Environmental Protection via email at Robert.Green@maine.gov or by mail at 312 Canco Road, Portland, Maine 04103.

4

Maine Turnpike Authority
York Toll Plaza Replacement Project
October 5, 2016
7PM

NAME	ADDRESS	EMAIL/PHONE
Carl Corsello	201 Chases Pond Rd, York	carl.Corsello@gmail.com 408-2999
Dawne Hill	Pine Hill Rd Cape Neddick ME	
Robert Green	342 North St #209 Saco, ME 04072	bungeesdad@yahoo.com 571-4399
Todd Frederick	581 Cider Hill Road York	TFreder2@Maine.rr.com

⑩

Maine Turnpike Authority
York Toll Plaza
October 5, 2016
7PM

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WINDOL C WEAVER	4 WEAVERS WAY	wcw63@Aol.com.
Marsh + Joan Jarvis	19 Stage Neck Rd York Harbor	
Robert Palmer	126 Fieldstone Estates Rd	
RICHARD BILDEN		
CHARLES STEEDMAN	2 CLARKS LANE YORK HARBOR	csteedma@maine.rr.com
Bobbie McGANN	1 RIVERMOUTH RD YORK HARBOR	destiny03911@yahoo.com
Steve Burns	York Town Hall	sburns@yorkmaine.org
Denise Johnson	N. Village Rd, Cape Neddick	denise@agamenticus.org

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Maine Turnpike Authority
York Toll Plaza Replacement Project
October 5, 2016
7PM

NAME	ADDRESS	EMAIL/PHONE
CAROL & LOU POTVIN	YORK 114 FERNALD AVE	blclow@AOL.COM 207 363 2317
Jim Clifford	12 Smith Field Lane	jcliffo2@maine.rr.com 207-363-5082
Herb Perry	1434 Tatnic Rd, Wells	herbperry104@gmail.com
Rena Little	2 Pine Mountain Rd - C.N.	
JACKIE GRANT	2 WithamWay, York	JACKIE@SEAGLASSVILLAGE.COM
Kinley Gregg	P.O. Box 415 (Lindsay Road)	
Wendy & Dick Bilden	PO Box 440	DICK_BILDEN@YAHOO.C
Lydia Blume	P.O. Box 738 York Beach ME 03910	lydiablum@gmail.com
JON SPEERS	P.O. BOX 41, York HARBOR, ME 03911	jonathanspeers@yahoo.com

(10)

Maine Turnpike Authority
York Toll Plaza
October 5, 2016
7PM

NAME	ADDRESS	EMAIL/PHONE
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Norma Clark	147 Chase's Pond Rd York	363-5558
C. WALER	271 CHASES POND RD YORK	351-3189
Todd Bezold	271 Chases Pond R York	—
ERIC + Kristina Young	16 Sparrow Lane York Me	kyoung@bluewatermtg.com oarweed1@yahoo.com
DEAN LESSARD	25 LONG BEACH AVE	DLESSARD@YORKMAINE.ORG
Mike ESTES	4 Carrie Lynn Lane York	207-351-5801
Kelly Dignam	2 Cider Hill Creek Lane York	Kdignam@maine.rr.com 363 8213
Maryann Corsello	201 Chases Pond Rd, York	363-5810 maryann.corsello@gmail.com

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Maine Turnpike Authority
York Toll Plaza
October 5, 2016
7PM

NAME	ADDRESS	EMAIL/PHONE
Curtis Clark	147 Chases Pond Rd York	363-5558
Vicki Carr	3 Woods Run York	363-5914
Rebecca L Finney	6 Peregrine Way Cape Neddick ME	361-2345
David L. Finney	" " " " "	361-1300
Kellis Williard	50 Orchard Farm Rd	351-8585
Barbara Matthews	319 Chases Pond Rd York	351-8695
Peter McGuire	Portland PRESS HERALD	791-6325
Amy Catling	55 Meadowlark Dr York	251-0633
Sandy & Tom Vanesse	13 Norwood Ave York	207 3613122

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Maine Turnpike Authority
York Toll Plaza Replacement Project
October 5, 2016
7PM

NAME	ADDRESS	EMAIL/PHONE
Peter Smith	8 Kestrel Circle York	PRSMITH@MAINE.RR.COM
Patty Hymanson	34 High Pine Rd York	patty.hymanson@aol.com
Stephen Kosacz	38 Groundnut Hill Rd Cape Neddick	stephen@auto-works.com
Paula Potvin	34 Greenleaf Parson's Rd Cape Neddick	~~Paula@~~ Pbanville@maine.rr.com
Scott Collin	195 Chases Pond Rd	
Pete Mantell	9 Scott Ave	petemantell.yorkhd3rep@gmail.com
Tan Wolel	38 Groundnut Hill Cape Neddick	Tannye@auto-works.com

SEBAGO TECHNICS
CIVIL ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE

STORMWATER MANAGEMENT PLAN

For

York Toll Plaza
York, Maine

Prepared for

Maine Turnpike Authority
Under Contract with Jacobs Engineering

October 14, 2016

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Appendix 2: Stormwater Quality Calculations
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Appendix 4: Highway Closed Drainage System Watershed Plans and Calculations
Appendix 5: Inspection, Maintenance and Housekeeping Plan

STORMWATER MANAGEMENT PLAN

York Toll Plaza
York, Maine

Executive Summary

The Maine Turnpike Authority (MTA) plans to develop a new toll plaza facility at Mile 8.8. Included in this project is the construction of an administrative building with an associated parking lot, access driveway and utilities at Mile 8.8, infill of the existing turnpike median from Mile 9.6 to Mile 8.2 and the removal of existing toll facilities at Mile 7.3.

Stormwater management requirements for this project are identified in the State of Maine Site Location of Development Act General Permit for the Maine Turnpike Authority (General Permit) and its attached Appendix A Memorandum of Agreement for Stormwater Management Between the Maine Department of Transportation, Maine Turnpike Authority and Maine Department of Environmental Protection effective July 19, 2007 (MOA). These documents reference standards found in the Maine Department of Environmental Protection's Chapter 500 Stormwater Management Rules (Chapter 500) including the Chapter 500 Basic, General and Flooding Standards.

Section II.D of the General Permit identifies stormwater and erosion control requirements for different categories of projects including:

a) A linear portion of a project associated with an existing travel corridor;
b) A linear portion of a project that is not associated with an existing corridor; and
c) A non-linear portion of a project.

The proposed construction project includes areas within each of these three categories.

Linear Portion of the Project within an Existing Travel Corridor

The improvements within the existing MTA right of way are considered a linear portion of a project associated with an existing travel corridor. This includes the proposed toll plaza, associated lane widening at Mile 8.8 and the removal of impervious areas associated with the existing toll plaza at Mile 7.3. The project creates approximately 14.21 acres of new impervious area and 8 acres of new developed disturbed/vegetated area.

This area has been designed to meet the General Standards for a linear portion of a project by providing treatment and mitigation for more than 75% of the newly created impervious area associated with the travel corridor.

The new impervious area created is offset in part by the removal of approximately 5 acres of existing impervious area at Mile 7.3, including the administrative building, access driveway, and toll lanes. In addition to the pavement removal, eight of the nine underdrain soil filters proposed (USF-1, USF-2, USF-3, USF-4, USF-5, USF7, USF-8, and USF-9) will treat approximately 5.76 acres of proposed or existing impervious highway surface. This design provides a treatment/mitigation level of 75.5%, which exceeds the required treatment of 75% for the linear portion of a project per Chapter 500 Section 4.C.(5)(c).

Linear Portion of the Project Not Associated with an Existing Travel Corridor and Non-Linear Portion of the Project

The administrative building, access driveway from Chases Pond Road and parking lot at Mile 8.8 are located outside of the existing MTA right of way and are considered a project not associated with an existing travel corridor.

The administrative access driveway from Chases Pond Road to the parking lot, approximately 1,266 linear feet, is considered a linear portion of a project that is not associated with an existing corridor and must meet the General Standards to the extent practicable. The proposed administrative building and associated parking lot are considered a non-linear portion of a project not associated with an existing travel corridor and must meet the General Standards.

Linear Portion Not Associated with an Existing Travel Corridor (Access Driveway)

Treatment is provided for 79% of the access driveway's impervious area and 85.5% of the access driveway's developed area; exceeding the requirements found in Chapter 500.4.C.(5)(c) Exceptions from the General Standards for the linear portion of the project which requires treatment for no less than 75% of the impervious area and 50% of the developed area.

Treatment is provided by roadside buffers and stone bermed buffers. Approximately 580 linear feet of access road is being treated within a proposed underdrain soil filter, USF-6, which is also treats portions of the administrative site.

Non-Linear Portion (Parking area and Administrative Building)

Treatment is provided for 96.7% of the impervious area and 85.9% of the site's developed area associated with the non-linear administrative building site. This treatment level exceeds the required level of 95% and 80%, respectively, pursuant to Chapter 500 4.C.(2)(a)(i).

Treatment is achieved utilizing two of the nine underdrained soil filters (USF-6 and USF-7) proposed for the project.

STORMWATER MANAGEMENT PLAN
York Toll Plaza
York, Maine

1. Introduction

This Stormwater Management Plan has been prepared to address the potential impacts associated with this project due to the proposed modification in stormwater runoff characteristics. The stormwater management controls that are outlined in this plan have been designed to best suit the proposed development and to comply with applicable regulatory requirements.

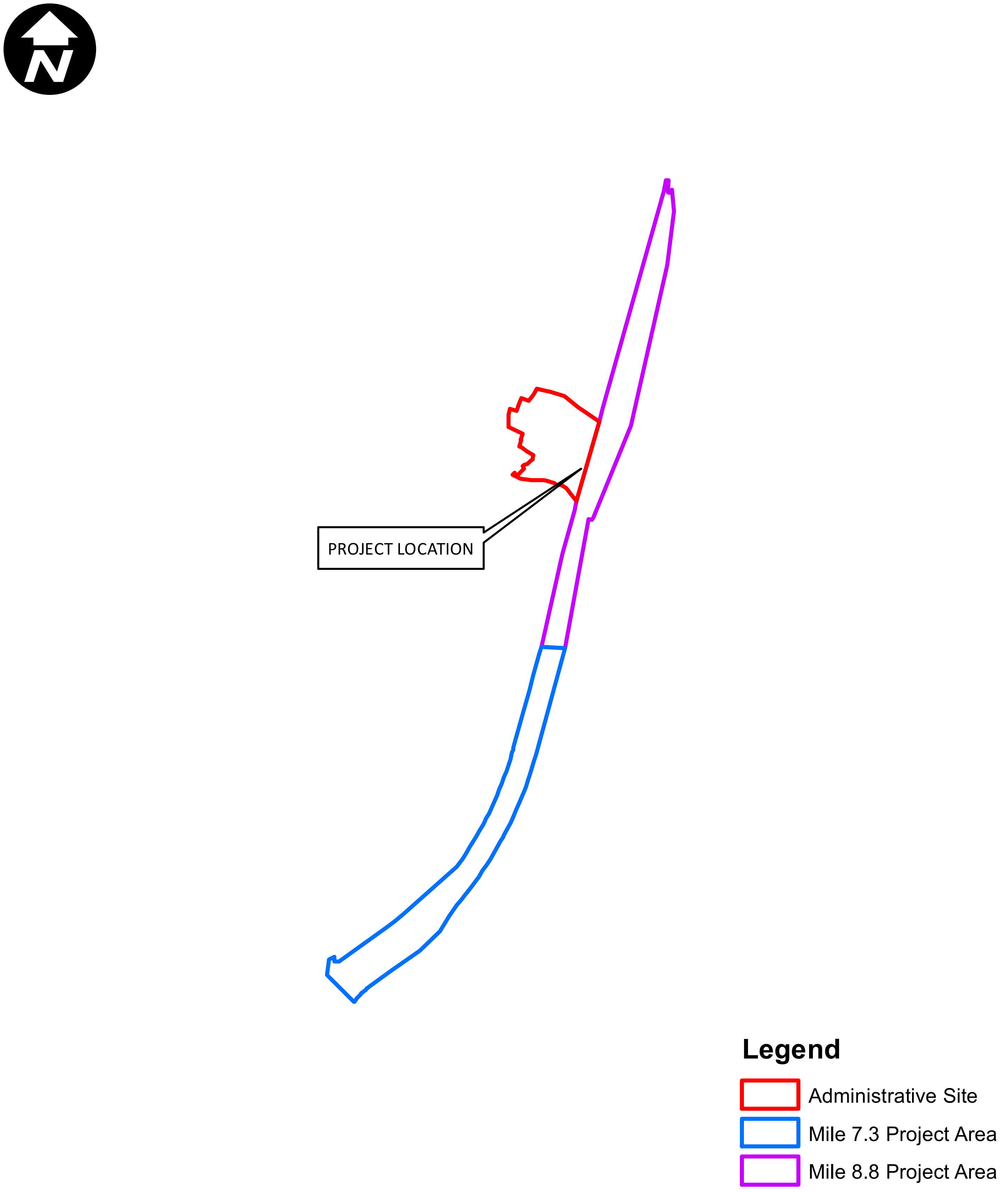
2. Existing Conditions

The project site consists of the Maine Turnpike from Mile 7.0 to Mile 9.5 (MTA Turnpike Sta. 249+45 to Sta. 384+00) as well undeveloped land approximately 32.6 acres in size, within the Town of York, Maine. The 32.6 acre undeveloped land was purchased by the Maine Turnpike Authority to be developed into a new Toll Plaza Administration Building with associated parking and access from Chases Pond Road.

Figure 1 identifies the project location and the three (3) focus areas discussed in this report including the Mile 7.3 project area, the Mile 8.8 project area and the Administrative Building Site.

The project site for the Administrative building, parking lot and driveway are located on 32.6 acres of land acquired by the MTA in 2014. The land is undeveloped property subdivided into 8 parcels with a 50’ private right of way as shown on a plan titled Division of Land Plan for The Morrison Family Chases Pond Road, York Maine recorded in the York County Registry of Deeds in in Plan Book 346 Page 46. The property is shown as Lots 145, 146, 148, 150, 152, 154, 156, and 158 on Town of York Tax Map 222.

The property is located in the watershed of unnamed tributaries draining to the Little River and the Cape Neddick River ultimately discharging to the Atlantic Ocean. The property is not located in a lake or urban impaired stream watershed most at risk from development as identified in Maine Department of Environmental Protection Chapter 502.



[redacted]

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75 John Roberts Rd. - Suite 1A
South Portland, ME 04106
Tel. 207-200-2100

250 Goddard Rd. - Suite B
Lewiston, ME 40240
Tel. 207-783-5656

PROJECT LOCATION MAP OF SOUTHERN MAINE TOLL PLAZA

SCALE: 1 " = 2,000 '

DATE: 9/15/2016

LOCATION:
MAINE TURNPIKE
YORK, MAINE

INFORMATION:
2011 USGS QUADRANGLE
(YORK HARBOR, MAINE)

[redacted]

14181_LOCATION.MXD

PROJECT NUMBER: 14181

Land Cover: The site administrative building site is undeveloped land consisting of wooded land cover. The development site abuts the Maine Turnpike to the east, Chases Pond Road to the west and single family residential properties and undeveloped land to the north and south. The turnpike right of way includes the existing turnpike and abutting shoulder areas in a maintained meadow condition as well as exposed rock outcroppings.

Site Topography: The site of the administrative building and driveway generally drains to the northeast to a large offsite wetland area tributary to the Cape Neddick River. Portions of the site's east end drains east to the turnpike right of way and then south along the roadway embankment, eventually crossing the turnpike and draining east via unnamed streams and wetlands to the Atlantic Ocean. Slopes on site range from 5% to over 25%.

Stormwater runoff from the turnpike corridor from mile 7.0 to mile 9.6 generally flows in a southeasterly direction towards the Atlantic Ocean via the Little River, the Cape Neddick River and unnamed tributaries. Stormwater is conveyed via closed drainage systems which outlet to roadside ditches that drain to the receiving tributaries prior to discharging into the Atlantic Ocean.

Surface Water Features: Wetland areas occupy areas of the north and south of the proposed administrative building driveway and adjacent to area of the proposed administrative building and parking lot at the turnpike right of way.

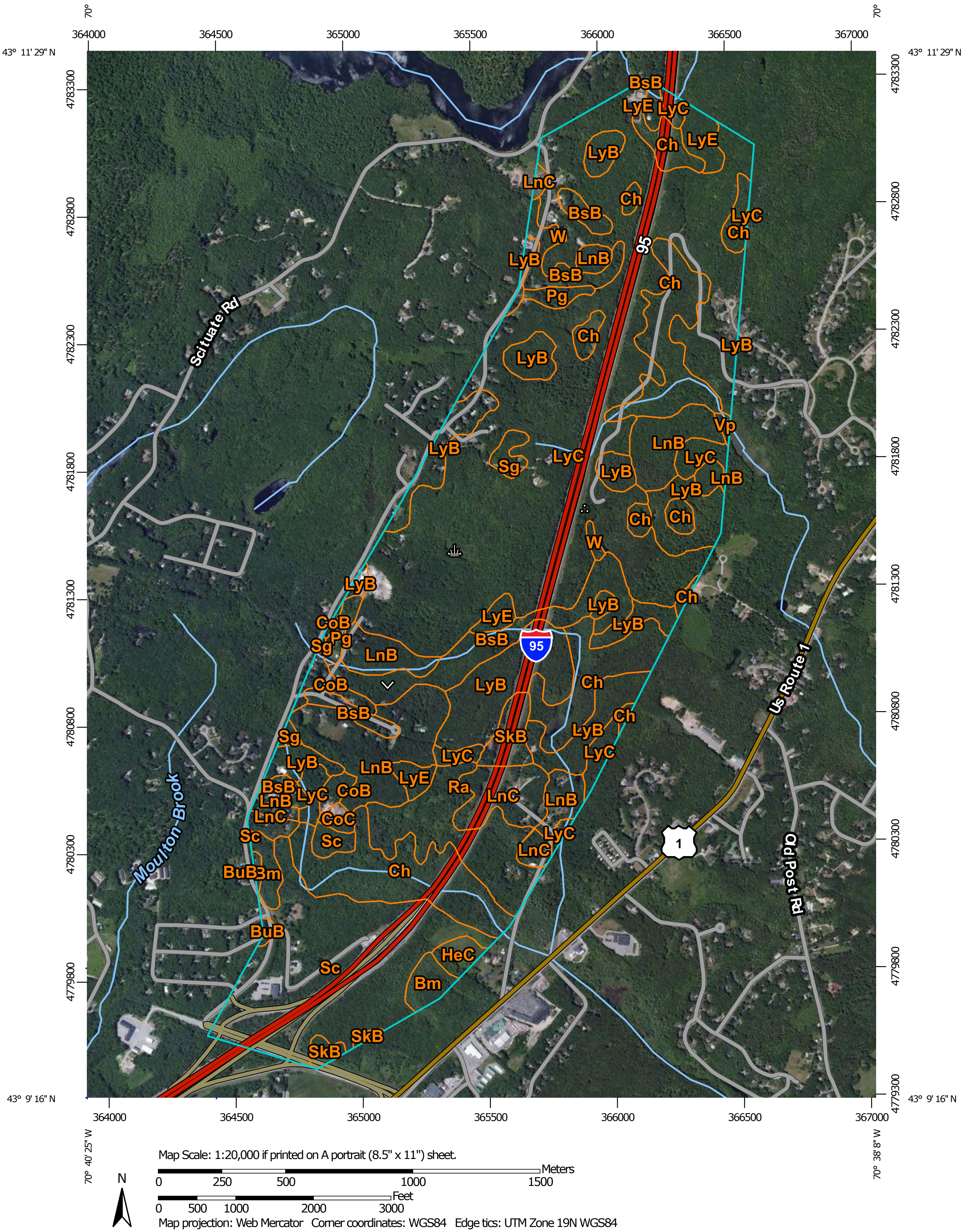
Wetland areas exist within the MTA right of way along the travel corridor. Impacts to wetlands are discussed in the project's Natural Resource Protection Act (NRPA) permit application.

Soils: Soil characteristics were obtained from the Soil Conservation Service (SCS) Medium Intensity Soil Survey of York County. Soils identified in the developed areas of the site (or within proposed buffer areas) are identified below in Table 1. These soil boundaries are identified on the attached watershed maps.

Table 1 –Soil Types and Characteristics

Soil Type	Symbol	HSG
Lyman Rock Outcrop	LyB/LyC	D
Biddeford Mucky Peat	Bm	D
Brayton/Westbury sandy loam	BsB	D
Chocorua Peat	Ch	D
Hermon sandy loam	HeC	A
Lyman Loam	LnB/LnC	D
Lyman Rock Outcrop	LyB/LyC/LyE	D
Raynam Silt Loam	Ra	B/D
Scantic Silt Loam	Sc	D
Skerry Fine Sandy Loam	SkB	C
Pits, Gravel	Pt	varies

Soil Map—York County, Maine
(14181 - Maine Turnpike York)



Map Scale: 1:20,000 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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 1:20,000.

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: York County, Maine
Survey Area Data: Version 14, Sep 11, 2015

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

Date(s) aerial images were photographed: Jun 20, 2010—Jul 18, 2010

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

York County, Maine (ME031)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Bm	Biddeford mucky peat, 0 to 3 percent slopes	12.1	1.2%
BsB	Brayton and Westbury very stony fine sandy loams, 0 to 8 percent slopes	56.3	5.6%
BuB	Buxton silt loam, 3 to 8 percent slopes	2.0	0.2%
Ch	Chocorua peat	127.7	12.8%
CoB	Colton gravelly loamy coarse sand, 0 to 8 percent slopes	9.7	1.0%
CoC	Colton gravelly loamy coarse sand, 8 to 15 percent slopes	2.7	0.3%
HeC	Hermon fine sandy loam, 8 to 15 percent slopes	5.1	0.5%
LnB	Lyman loam, 3 to 8 percent slopes, rocky	84.3	8.4%
LnC	Lyman loam, 8 to 15 percent slopes, rocky	26.5	2.6%
LyB	Lyman-Rock outcrop complex, 3 to 8 percent slopes	110.3	11.0%
LyC	Lyman-Rock outcrop complex, 8 to 15 percent slopes	366.1	36.6%
LyE	Lyman-Rock outcrop complex, 15 to 80 percent slopes	17.5	1.7%
Pg	Pits, gravel	8.1	0.8%
Ra	Raynham silt loam	40.2	4.0%
Sc	Scantic silt loam, 0 to 3 percent slopes	110.3	11.0%
Sg	Sebago peat	5.8	0.6%
SkB	Skerry fine sandy loam, 0 to 8 percent slopes	13.3	1.3%
Vp	Vassalboro peat, ponded	1.1	0.1%
W	Water bodies	1.9	0.2%
Totals for Area of Interest		**1,001.1**	**100.0%**

The Hydrologic Soil Group (HSG) designation is based on a rating of the relative permeability of a soil, with Group "A" being extremely permeable such as coarse sand, to Group "D" having low permeability such as clay.

Historic Flooding: The Federal Emergency Management Agency (FEMA) lists the project site as Zone X, "Areas determined to be outside the 500 year floodplain based on the published Flood Insurance Rate Map (FEMA Community Panel Number 2300159 0022 D, dated June 17, 2002).

3. Proposed Development

The Applicant is proposing a 2,400 sf administrative building, parking lot and access driveway outside of the existing right of way. Development within the right of way includes toll plaza construction, lane widening, and lane removals.

Alterations to Land Cover: Completion of the proposed project will result in the following.

Linear Portion of the Project within the right of way from Mile 7.3 through Mile 8.8 project areas.

1. Existing impervious area[1] = 42.69 acres
2. Proposed disturbed area[2] = 53 acres
3. Redeveloped impervious area = 38.5 acres
4. Proposed new impervious area (on previously vegetated surface)[3] = 14.21 acres
5. Proposed "New" developed disturbed/vegetated area[4] = 8 acres

Linear portion outside of the right of way (administrative access driveway)

1. Proposed disturbed area = 2.86 acres
2. Redeveloped impervious area = 0 acres
3. Proposed new impervious area (on previously vegetated surface) = 0.58 acres
4. Proposed developed area = 2.86 acres
5. Existing 7.3 administrative access driveway (to be removed) = 0.63 acres

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[1] As defined in MDEP Chapter 500 Stormwater Management Rules (500.3.K). Measurements based on existing conditions survey, site aerial photography, on-site observations

[2] As defined in MDEP Chapter 500 Stormwater Management Rules (500.3.F).

[3] As defined in MDEP Chapter 500 Stormwater Management Rules (500.3.K)

[4] As defined in MDEP Chapter 500 Stormwater Management Rules (500.3.D)

Non Linear Portion of the Project:

1. Proposed disturbed area = 1.33 acres
2. Redeveloped impervious area = 0 acres
3. Proposed new impervious area (on previously vegetated surface) = 0.43 acres
4. Proposed developed area = 1.33 acres
5. Existing administrative building (to be removed) = 0.36 acres

4. Downstream Ponds and Waterbodies

The majority of the administrative building project site off Chases Pond Road is tributary to the Cape Neddick River and the Atlantic Ocean, watersheds which are not listed by the Maine Department of Environmental Protection as impaired or threatened.

The MTA corridor drains in a southeasterly direction to the Little River, the Cape Neddick River and unnamed tributaries prior to outletting at the Atlantic Ocean. The Little River and unnamed tributaries are not listed by the Maine Department of Environmental Protection as impaired or threatened.

5. Regulatory Requirements

Stormwater management requirements for MTA projects are identified in the State of Maine Site Location of Development Act General Permit for the Maine Turnpike Authority (General Permit) and its attached Appendix A Memorandum of Agreement for Stormwater Management Between the Maine Department of Transportation, Maine Turnpike Authority and Maine Department of Environmental Protection effective July 19, 2007 (MOA). These documents reference standards found in the Maine Department of Environmental Protection's Chapter 500 Stormwater Management Rules (Chapter 500) including the Chapter 500 Basic, General and Flooding Standards.

The General Permit Section II.D.1 Basic Standards Requires an Erosion and Sedimentation Control Plan developed by the contractor for all projects in accordance with the Maine Department of Transportation's Best Management Practices for Erosion and Sedimentation Control (BMP's) dated February 2008. All projects meeting the General Permit are required to comply with the Chapter 500 Basic Standards.

The General Permit Section II.D.2 General Standards differentiates requirements for three categories of projects subject to the MDEP Chapter 500 General Standards.

a) A Linear portion of a project associated with an existing travel corridor shall meet the General Standards to the extent practicable using existing available right of way.

b) A Linear portion of a project not associated with an existing travel corridor shall meet the General Standards to the extent practicable.

c) A non-linear portion of a project shall meet the General Standards, except that redevelopment of existing impervious area may qualify for an exemption under DEP's Chapter 500 rules.

The General Permit Section II.D.5 requires that MTA design the project and engineering measures to the extent practicable such that the project drainage avoids adverse impacts to offsite property resulting from project related peak flows.

The following sections describe how this project will address these stormwater management performance standards.

Chapter 500 Basic Standards: These standards include various erosion and sedimentation controls, inspection and maintenance procedures, and general housekeeping requirements. These performance standards are to be addressed by the Contractor's Erosion and Sedimentation Control plan.

An Inspection, Maintenance, and Housekeeping Plan is attached in Appendix 5. This plan outlines requirements for inspection and maintenance of the BMPs proposed for this project.

General Standards: This standard presents minimum treatment thresholds for new non-vegetated areas and new developed areas to be treated by stormwater Best Management Practices (BMPs). The standards are referenced in the Maine Department of Environmental Protection Chapter 500 Stormwater Management Rule, Revision Date August 2015.

General Standard BMPs have been defined by the MDEP and are described thoroughly in their publication "Stormwater Management for Maine: Best Management Practices Manual". Volume III of this manual contains additional information and sizing requirements for the treatment measures proposed for the proposed development.

Urban Impaired Stream Standard: This standard is not applicable to this project.

Flooding Standards: The General Permit requires that MTA design and apply engineering measures to the extent practicable such that the project drainage avoids adverse impacts to offsite property resulting from project related peak flows.

6. Stormwater Management BMPs

In order to meet the applicable regulations, the project will utilize buffers along the access road, two underdrained soil filters within the administrative building development site, and several under drained soil filters within the right of way for treatment of the Maine Turnpike corridor. In addition to these structural and Buffer BMPs, mitigation for new impervious area within the existing highway right of way is provided by the removal and revegetation of existing impervious areas at the existing Mile 7.3 toll plaza.

The BMP locations are indicated on the attached plans contained within Appendix 1 *Watershed Plans and Stormwater Treatment Plans.*

A. Buffers

Buffers are proposed to provide treatment for runoff associated with the proposed access driveway (Linear portion of the project). The buffers have been sized in accordance with the guidelines presented in the Chapter 500 Appendix F Vegetated Buffers and include the following.

- Buffers adjacent to the downhill side of the road
- Stone Bermed Buffer

The locations of the proposed buffers are shown on the plan titled Access Road Buffer/Treatment Plan and is included in Appendix 1: *Watershed Plans and Stormwater Treatment Plans*. The areas treated by these BMPs are summarized in the stormwater treatment calculations attached in Appendix 2: *Stormwater Quality Calculations*.

B. Underdrained Soil Filter

A total of nine (9) underdrained soil filters are proposed to meet the General Standards for portions of the linear access road, non-linear administration building site, and the linear Maine Turnpike travel corridor. An underdrained soil filter designed to meet the General Standards must provide a runoff volume equal to 1" times the tributary impervious area and 0.4" times the tributary landscaped areas. The surface area of the system must be at least equal to 5% the impervious area and 2% of the landscaped area. The runoff volume shall be discharged over a period of time not less than 24 hours and not greater than 48 hours.

A copy of the designs plan and the stormwater treatment calculations for the BMPs are attached in Appendix 1 and Appendix 2.

Table 2 – Underdrain Soil Filter Locations		
Underdrain Filter ID	Station	Treatment Provided
USF-1	263+00, LT	MTA Travel Corridor
USF-2	267+00, LT	MTA Travel Corridor
USF-3	291+00, LT	MTA Travel Corridor
USF-4	295+00, RT	MTA Travel Corridor
USF-5	313+00, RT	MTA Travel Corridor
USF-6	342+00, LT	Admin Access Road, Admin Site
USF-7	342+50, LT	Admin Site, MTA Travel Corridor
USF-8	353+50, RT	MTA Travel Corridor
USF-9	355+00, RT	MTA Travel Corridor

7. Peak Flow Analysis

A hydrologic model has been prepared to evaluate the peak runoff rates at several study points along the Maine Turnpike Travel Corridor to evaluate the project's effect on runoff rates. The modeling calculations are attached in Appendix 3: *HydroCAD Output Pre-Development and Post-Development Model.*

The General Permit requires design and application of engineering measures to the extent practicable such that the project drainage avoids adverse impacts to offsite property resulting from project related peak flows. The closed drainage system has been designed to provide various outfall locations to mitigate the increase in peak runoff being directed to downstream channels.

A. Modeling Technique

In order to evaluate drainage characteristics in pre and post-development conditions, a quantitative analysis was performed to determine peak rates of runoff for the 2, 10, and 25-year storm events. Runoff calculations were performed following the methodology outlined in the USDA Soil Conservation Service’s “Urban Hydrology for Small Watersheds, Technical Release #55” and HydroCAD Stormwater Modeling System Software. A 24-hour, SCS Type III storm distribution for the 2, 10, and 25-year storm frequencies were used for analysis.

The 24-hour rainfall values utilized in the hydrologic model for York County are as follows:

Table 3 - Storm Frequency Precipitation (in./24 hr)	
2-year	2.6
10-year	3.3
25-year	6.2

*Appendix H, MDEP Chapter 500, amended date August 2015

B. Drainage Characteristics (Pre and Post-Development Watershed Delineation)

The peak runoff analysis consists of the eight (8) Study Points located along the existing Turnpike travel corridor from Mile 7.0 to Mile 9.6. There are two (2) study points located within the project area identified as 7.3, (SP-1 and SP-2). The remaining six (6) study points are within the Mile 8.8 project area, (SP-100, SP-200, SP-500, SP-700, SP-750 and SP-1000.) All study points are located on the east side of the turnpike corridor.

SP1 represents an existing box culvert located on Newtown Road in York. There is a large wetland complex which has a tributary drainage area of approximately 350 acres, which includes roughly 5,000 linear feet of the Maine Turnpike as well as the existing York Toll plaza and associated administration building. Upstream of the existing box culvert are two large wetland complexes which attenuate runoff from the Maine Turnpike and additional offsite drainage areas. The wetland complex on the west side of the turnpike is connected to the east side wetland via a 54” culvert.

SP2 is located on the east side of the Maine Turnpike at approximate Sta. 299+00 where runoff from the project crosses the existing Right of Way (ROW) line.

SP100 is located at approximate Sta. 311+50 and is a drainage ditch which receives runoff from an existing culvert and conveys runoff from the project across the ROW. There is a wetland complex on the west side of the turnpike which attenuates runoff from both the travel corridor and an offsite area prior to discharging through a 48” cross culvert at Sta. 311+50 to SP100.

SP200 represents the discharge location of a shallow ditch into an existing wetland complex located roughly at the ROW line at Sta. 314+00. There is a wetland complex on the west side of the turnpike which attenuates runoff from both the travel corridor and an offsite area prior to discharging through an 18” cross culvert at Sta. 314+50 to SP200.

SP500 represents the inlet side of an existing cross culvert located along the York Water District maintenance road at approximate Sta. 326+80, just outside the MTA ROW. This study point receives runoff from both the travel corridor as well as a large offsite drainage area which is attenuated by a small wetland complex on the west side of the travel corridor before discharging through an 18” cross culvert at Sta.327+75. SP500 also receives runoff from a 30” cross culvert at Sta. 331+00 with an upstream wetland complex which attenuates runoff.

SP700 is a wetland complex located on the east side of the travel corridor. Runoff is impounded within this area by the York Water District maintenance roadway to the east and the turnpike embankment sideslope to the west.

SP750 is a small wetland area located at approximate Sta. 349+00 which receives runoff from approximately 550 linear feet of roadway and associated embankment slope.

SP1000 represents the location were a drainage channel on the east side of the right of way enters the Cape Neddick River, immediately downstream of an existing twin 8’x8’ box culvert installation under the turnpike. SP1000 represents the location where an unnamed tributary channel originates at the downstream end of an existing 36” culvert located at Sta. 374+75, which crosses the Maine Turnpike in a west to east direction. This culvert, identified as node 8P in the model, drains an approximately 255 acre watershed that includes the York Water District’s treatment facility located between the Turnpike and Chases Pond Road. The Cape Neddick River watershed tributary to SP 1000 encompasses an additional 2,130 acres upstream of SP1000 including nearly 2,100 acres impounded at Chases Pond, a water supply reservoir for the York water district.

Portions of the existing York Water District Treatment facility, upstream of Culvert 8P at Sta 374+75 are constructed approximately 2 feet lower than existing highway shoulder elevation and have experienced flooding in larger storm events over the past ten years. The August 2015 Chapter 500 Rule update significantly increases the depth or rainfall in the 25 year and larger storms and the modeling predicts headwater elevations at the existing 36” culvert will inundate portions of the treatment facility’s lagoons in these larger events, under existing pre-development conditions.

To protect the highway and the York Water District treatment lagoons from flooding in larger storm events, a new 48-inch diameter culvert is proposed at Sta. 374+75 to parallel the existing 36” culvert. The proposed culvert installation includes an inlet control structure designed to minimize increases in runoff at the Cape Neddick River during the 25-year storm at SP1000.

Due to the elevation of the existing Water District Facility, and the increased design rainfall required by the August 2015 Chapter 500 rules, a moderate increase in runoff at SP100 is anticipated during the 25-year storm.

The Cape Neddick River and Chases Pond watershed area was evaluated in a report by HNTB dated June 28, 2011 on file with the Maine Turnpike Authority. This study included an evaluation of the watershed tributary to the Chases Pond Dam and to the 8x8 culverts at SP1000. This model was validated to a May 2006 “Mother’s Day Storm” (7.3” of rain) based on rainfall records and dam release records recorded by the York Water District. This modeling has been used in this report to estimate the runoff in the Cape Neddick River at SP1000. The runoff hydrograph from this study model is entered as Link 1L the Hydrocad modeling.

C. Comparison

The watershed areas and times of concentration of the post-development watersheds vary from the existing conditions based on the proposed site development and grading. Table 4 and Table summarize the results of the hydrologic analysis of the project under pre-development and post-development conditions in the Mile 7.3 and Mile 8.8 focus areas.

Table 4 – Stormwater Runoff Summary Table
Mile 7.3 Pre-Development vs. Post-Development

Study Point	Total Watershed Area (Ac)		Percent Impervious		Peak Rates of Runoff (cfs)					
					2-year		10-year		25-year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SP1	354.84	355.21	8.9%	7.5%	63.1	60.9	100.5	98.9	121.8	120.8
SP2	2.63	2.15	34.5%	27.1%	4.5	3.3	8.6	6.6	12.1	9.5

The table above indicates that the peak runoff rates will not increase at the Mile 7.3 study points in the post-development condition, which would be expected with the proposed removal of existing impervious surface associated with the existing toll plaza and administration building.

Table 5 – Stormwater Runoff Summary Table
Mile 8.8 Pre-Development vs. Post-Development

Study Point	Total Watershed Area (Ac)		Percent Impervious		Peak Rates of Runoff (cfs)					
					2-year		10-year		25-year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SP100	150.5	150.7	6.4%	7.2%	53.4	53.6	84.8	85.2	102.1	102.8
SP200	5.3	4.7	46.8%	51.5%	10.4	9.1	18.5	16.2	25.2	22.1
SP500	83.2	82.9	8.1%	14.1%	21.0	23.8	32.8	42.2	45.3	57.0
SP700	6.7	6.2	16.0%	38%	7.1	7.7	13.8	13.7	19.5	18.8
SP750	1.5	1.2	19.1%	46.6%	2.9	2.9	5.5	5.1	7.7	6.8
SP1000	2,424	2,426.5	7.9%	8.1%	131.0	133.3	227.5	223.7	440.5	452.1

The stormwater water quantity analysis performed to address the Flooding Standard indicates an increase in peak runoff rates in the post development condition of 12 cfs (25%) at SP500 in the 25 year storm event. The increase in flow at this location is due to minor changes in the outfall locations of the highway closed drainage system necessitated by the highway widening. The post development tributary area to this point of analysis has been reduced to the greatest extent practical while providing safe conveyance and discharge of the closed drainage system within the Turnpike right of way. The velocities within the receiving channel were evaluated during 10-year storm event to confirm that the velocities do not exceed the permissible velocities for the location's soil type and vegetative cover. The peak velocity during the 10-year storm event was calculated to be 3.25 fps, which is less than the permissible 3.5 fps for vegetated Lyman soil.

The stormwater quantity analysis indicates an increase in peak runoff rates in the post development condition of 11.6 cfs (2.2%) at SP1000 during the 25 year storm event.

SP1000 represents the location were a drainage channel on the east side of the right of way enters the Cape Neddick River, immediately downstream of an existing twin existing twin 8'x8' box culvert under the turnpike.

The increase in runoff at this location is due to the proposed removal of an existing 18-inch culvert at STA.365+25 which currently drains east to west through a wetland complex at Station 375+00 and due to the installation of a new 48" culvert with an inlet control structure (node 8P) crossing the turnpike at Station 374+50.

The Maine Turnpike Authority has noted that the 18" culvert at STA 365+25 is undersized, frequently inundated, and is causing flooding concerns within the turnpike right of way and potentially affecting abutting properties. The 18" culvert is to be removed and the runoff tributary to it will be conveyed in the proposed highway ditch line on the east side of the right of way. The runoff will be conveyed north to the existing drainage channel discharging to the main stem of the Cape Neddick River at study point SP1000. The proposed ditch line is within the existing right of way and has capacity to convey the flow without impacting abutting properties.

The capacity of an existing 36" culvert crossing the turnpike at STA 374+50 (model node 8P) will be increased by the installation of a new 48" diameter culvert. The proposed culvert has been sized to reduce the 100 year headwater elevation to elevation 126.0 to mitigate potential flooding conditions at the upstream York Water District facility based on the revised design rainfall depths presented in the August 2015 MDEP Chapter 500 rules. The revised rainfall is significantly larger than the rainfall depth considered when the existing culvert and treatment facility were constructed. An inlet control structure is proposed at the inlet of the new 48" pipe to minimize increases in flow rate to the extent practicable at study point SP1000 during the 25 year storm event.

The receiving channel at SP1000 is the main stem of the Cape Neddick River, immediately downstream of twin 8-foot by 8-foot box culverts. These culverts convey runoff from a watershed in excess of 2,130 acres (3.26 square miles), including the areas tributary to and controlled by the Chases Pond Dam. The total area tributary to SP 1000 is in excess of 2,400 acres. The removal of the 18" culvert and associated ditching affect the drainage pattern of less than 40 acres, or 1.7% of the overall watershed.

The runoff at SP100 during the 25-year storm is calculated to increase from 440.4cfs to 452.1 cfs from pre-development to post development conditions. This represents a 2.6% increase. The size of the upstream watershed, impoundments at Chases Pond Dam and the large wetlands west of the turnpike, indicates that the peak rate of runoff in the larger watershed will occur much later in a storm event and will not be coincident with the peak runoff from the area affected by project improvements In addition, flows from the majority of the watershed (2,086 acres, 86%) are controlled by the Chases Pond Dam. As such, the operation of the dam has a significant impact on runoff rates when compared to the proposed project modifications. We anticipate that any calculated increase in runoff at SP1000 due to proposed project improvements will be relatively small when compared to the potential impact of the dam operation. It is our opinion that this variation is within the tolerance of the modeling method's accuracy and project related impacts will not have a significant impact on the receiving waters in the Cape Neddick River during the 25-year storm event.

D. Highway Closed Drainage System

Appendix 5: *Highway Closed Drainage System Watershed Plans and Calculations* includes watershed plans, pipe capacity analysis and pavement spread calculations for the proposed closed drainage system.

The closed drainage system has been sized to convey the 10 year storm without reaching full flow capacity, with a minimum pipe diameter specified of 15-inches for all proposed pipes. Several existing closed drainage networks were retained based on discussions with the Maine Turnpike Authority and their preference to not create a cross trench within the high speed ORT lane if feasible. The results of the closed drainage analysis are contained in Appendix 4.

8. Stormwater Quality Treatment Analysis

A. Linear Portion of the Project Associated with an Existing Travel Corridor (Highway Closed Drainage System)

The development has been designed to provide water quality treatment meeting the General Standards for a linear portion of a project.

The new impervious area created within the existing travel corridor, is partially offset by the removal of approximately 5 acres of existing impervious area at Mile 7.3, including the administrative building, administrative building access driveway, and toll lanes. In addition to the pavement removal, Underdrained Vegetated Soil Filters have been designed to treat runoff from portions of the corridor.

Table 6 – Linear Portion
Associated with an Existing Travel Corridor

	Impervious Area (acre)	Percent of Proposed Imp. Area Treated
Total Proposed Impervious	**14.21**	**100%**
Removal	5.07	35.7%
USF-1	0.30	2.1%
USF-2	0.44	3.1%
USF-3	0.99	7.0%
USF-4	0.74	5.2%
USF-5	0.61	4.3%
USF-7	0.38	2.7%
USF-8	1.04	7.3%
USF-9	1.10	7.8%
Total Mitigated Impervious	**10.67**	**75.1%**

As can be seen in the table above, the design of the linear portion of the project associated within the existing travel corridor has been designed to meet the General Standards for a linear portion of a project by providing treatment and mitigation for greater than 75% of the newly created impervious area associated with the travel corridor.

B. Linear Portion of the Project Not Associated with an Existing Travel Corridor (Administrative Building Access Driveway)

To achieve the required water quality treatment requirements for the administrative building access driveway, roadside buffers and stoned bermed buffers are proposed. Portions of the access driveway are also treated in the Administrative Building treatment system underdrain soil filter.

The locations of proposed buffers are identified in Appendix 1. Buffer sizing calculations are attached in Appendix 2.

The development has been designed to provide water quality treatment through implementation of approved BMP's which provide treatment for 79% of the access driveway's impervious area and 85.5% of the access driveway's developed area. The proposed treatment provided exceeds the required treatment levels of 75% and 50%, respectively, for the linear portion of the project in accordance with MaineDEP Chapter 500, Section 4.C.(5)(c) amended date August 2015.

C. Non Linear Portion of the Project (Administrative Building and Parking Lot)

To achieve the required water quality treatment for the non-linear portion of the project, two underdrain soil filters (USF-6 and USF-7) are proposed. This treatment measure has been designed and sized in accordance with the current Maine DEP Stormwater Best Management Practices handbook. Water Quality Volumes, BMP sizing volume calculations, and other supporting calculations are attached in Appendix 3.

The Administrative Building project site that is not associated with an existing travel corridor comprises a total of approximately 32.6 acres. Approximately 0.6 acres or 2% of the site is developed.

The development has been designed to provide water quality treatment through implementation of approved BMP's which provides treatment for 96.7% of the impervious area and 85.9% of the developed area, exceeding the required treatment levels.

9. Conclusions

The proposed development has been designed to address stormwater management requirements as identified in the State of Maine Site Location of Development Act General Permit for the Maine Turnpike Authority (General Permit), which requires treatment of a linear portion of a project within an existing corridor, to the greatest extent practicable. The linear portion of the proposed not within an existing travel corridor and the non-linear portion of the project have been designed to meet the stormwater standards of Chapter 500, as last updated August 2015. This analysis results in 75.5% treatment of impervious area of the linear portion within the existing corridor, 79% treatment of impervious area for linear portion of the project not within the existing corridor and 96.7% treatment of non-linear impervious area.

The stormwater water quantity analysis performed to address the Flooding Standard indicates an increase in peak runoff rates in the post development condition of 12 cfs (25%) at SP500 in the 25 year storm event. The increase in flow at this location is due to minor changes in the outfall locations of the highway closed drainage system necessitated by the highway widening. The post development tributary area to this point of analysis has been reduced to the greatest extent practical while providing safe conveyance and discharge of the closed drainage system within the Turnpike right of way. The velocities with the receiving channel were evaluated during 10-year storm event to confirm the velocities do not exceed the permissible velocities for the location's soil type and vegetative cover. The peak velocity during the 10-year storm event was calculated to be 3.25 fps, which is less than the permissible 3.5 fps for vegetated Lyman soil.

The stormwater quantity analysis indicates an increase in peak runoff rates in the post development condition of 11.6 cfs (2.2%) at study point SP1000 during the 25 year storm event.

The receiving channel at SP1000 is the main stem of the Cape Neddick River, immediately down stream of twin 8-foot by 8-foot box culverts crossing the turnpike. Project modifications affecting the flow rate at SP1000 include the removal of an existing 18” culvert at STA 365+25 and the installation of a new 48” culvert at STA 374+50.

The Cape Neddick River culverts at SP1000 convey runoff from a watershed in excess of 2,400 acres including 2,100 acres (3.28 square miles) impounded by Chases Pond Dam. The removal of the 18” culvert and associated ditching affect the drainage pattern of less than 40 acres, or 1.7% of the overall watershed.

The installation of the proposed 48” culvert at STA 374+25 has been designed to mitigate potential flooding based on changes in design rainfall events. In August 2015, the 24 hour, 25-yr design rainfall depth for York County increased (15%) to 6.2” and the 100 year rainfall depth increased 32% to 8.7”. Using the current rainfall depths, the existing conditions model indicates potential flooding of portions of the York Water District’s treatment facility during the 25 year storm. The proposed culvert and its inlet structure will provide additional capacity to protect the facility in storms up to a 100 year event while mitigating to the extent practicable increases in runoff during a 25 year event.

The size of the upstream watershed and impoundments at Chases Pond Dam and in large wetlands west of the turnpike implies that the peak rate of runoff in the larger watershed will occur later in a storm event and will not be coincident with the peak runoff from the area affected by the project. As such, we anticipate that the small calculated increase in runoff at SP1000 will not have a measurable impact to the receiving waters in the Cape Neddick River during the 25-year storm event.

Prepared by,

SEBAGO TECHNICS, INC.

Paul D. Ostrowski

STATE OF MAINE
DANIEL
L
RILEY
No. 9967
LICENSED
PROFESSIONAL ENGINEER

Paul D. Ostrowski, P.E. Daniel L. Riley, P.E. October 14, 2016
Project Engineer Senior Project Manager

DLR/PDO:pdo/jf

Appendix 1

Watershed Plans and Stormwater Treatment Plans

ATTACHED SEPARATELY

Appendix 2

Stormwater Quality Calculations

Table 1: MDEP GENERAL STANDARD CALCULATIONS
MTA Administrative Building Access Driveway
Job #14181

LINEAR PORTION OF A PROJECT

AREA ID	Start Sta	End Sta (Ac.)	Roadway Side	Length	Lane Width	Shoulder/Ditch Width	NEW ONSITE IMPERVIOUS AREA (SF.)	NEW ONSITE LANDSCAPED AREA (SF.)	NEW DEVELOPED AREA (SF.)	TREATMENT PROVIDED?	IMPERVIOUS AREA TREATED* (Ac.)	LANDSCAPED AREA TREATED* (Ac.)	DEVELOPED AREA TREATED* (Ac.)	TREATMENT BMP	Reference Table # from Chapter 500 Appendix F Updated August 2015
UNTREATED	20+12.00	20+40.00	LEFT	28	10	20	280	560	840	NO	0.000	0.000	0.000	UNTREATED	
BUFFER A	20+40.00	21+75.00	LEFT	135	10	20	1,350	2,700	4,050	YES	0.031	0.062	0.093	BUFFER (ROADSIDE)	TABLE 7: WOODED, ONE TRAVEL LANE, 50' total (25' meadow inslope, 25' wooded TOS)
BUFFER B	21+75.00	22+65.00	LEFT	90	10	15	900	1,350	2,250	YES	0.021	0.031	0.052	BUFFER (STONE BERMED)	TABLE 6: WOODED, D Soil, 9-15%, ASSUME 35' BERM SPREADER
BUFFER C	22+65.00	23+55.00	LEFT	90	10	35	900	3,150	4,050	YES	0.021	0.072	0.093	BUFFER (ROADSIDE)	TABLE 7: WOODED, ONE TRAVEL LANE, 50' total (30' meadow inslope, 20' wooded TOS)
UNTREATED	23+55.00	24+55.00	LEFT	100	10	15	1,000	1,500	2,500	NO	0.000	0.000	0.000	UNTREATED	
BUFFER D	24+55.00	25+77.00	LEFT	122	10	50	1,220	6,100	7,320	YES	0.028	0.140	0.168	BUFFER (ROADSIDE)	TABLE 7: WOODED, ONE TRAVEL LANE, 50' total (50' meadow inslope)
UNTREATED	25+77.00	26+73.00	LEFT	96	10	15	960	1,440	2,400	NO	0.000	0.000	0.000	UNTREATED	
BUFFER E	26+73.00	27+56.00	LEFT	83	10	30	830	2,490	3,320	YES	0.019	0.057	0.076	BUFFER (ROADSIDE)	TABLE 7: WOODED, ONE TRAVEL LANE, 50' total (30' meadow inslope, 20' wooded TOS)
BMP TREAT	27+56.00	32+78.00	LEFT	522	10	0	5,220	0	5,220	YES	0.120	0.000	0.120	CONSTRUCTED BMP	Underdrain Soil Filter, USF-6
BMP TREAT	27+56.00	32+78.00	LEFT	522	0	50	0	26,100	26,100	YES	0.000	0.599	0.599	CONSTRUCTED BMP	Underdrain Soil Filter, USF-6
							xref								
UNTREATED	20+12.00	21+25.00	RIGHT	113	10	30	1,130	3,390	4,520	NO	0.000	0.000	0.000	UNTREATD	
BUFFER B	21+25.00	24+43.00	RIGHT	318	10	40	3,180	12,720	15,900	YES	0.073	0.292	0.365	BUFFER (STONE BERMED)	TABLE 6: WOODED, D Soil, 9-15%, ASSUME 35' BERM SPREADER
UNTREAT	24+43.00	26+38.00	RIGHT	195	10	30	1,950	5,850	7,800	NO	0.000	0.000	0.000	UNTREATED	
BMP TREAT	26+38.00	32+78.00	RIGHT	640	10	0	6,400	0	6,400	YES	0.147	0.000	0.147	CONSTRUCTED BMP	Underdrain Soil Filter, USF-6
BMP TREAT	26+38.00	32+78.00	RIGHT	640	0	50	0	32,000	32,000	YES	0.000	0.735	0.735	CONSTRUCTED BMP	Underdrain Soil Filter, USF-6
TOTAL (SF.)				**2,532.000**			**25,320.000**	**99,350.000**	**124,670.000**		**0.459**	**1.988**	**2.447**		

TOTAL NEW IMPERVIOUS AREA (Ac.)	**0.581**	**TOTAL DEVELOPED AREA (Ac.)**	**2.862**
TOTAL IMPERVIOUS AREA RECEIVING TREATMENT (Ac.)	**0.459**	**TOTAL DEV. AREA RECEIVING TREATMENT (Ac.)**	**2.447**
% OF IMPERVIOUS AREA RECEIVING TREATMENT	**78.99%**	**% OF DEV. AREA RECEIVING TREATMENT**	**85.51%**
MINIMUM TREATMENT REQUIRED*	**75.00%**	**MINIMUM TREATMENT REQUIRED***	**50.00%**
EXCEEDS MINIMUM?	**YES**	**EXCEEDS MINIMUM?**	**YES**

*BASED ON LINEAR PORTION OF THE PROJECT PURSUANT TO MAINEDEP CHAPTER 500, SECTION 4.C.(5).(c) REQUIRING 75% TREATMENT FOR IMPERVIOUS AREA AND NO LESS THAN 50% OF DEVELOPED AREA.

Table 1: MDEP GENERAL STANDARD CALCULATIONS
MTA Administrative Building Access Driveway
Job #14181

NON-LINEAR PORTION OF A PROJECT

AREA ID	NON-LINEAR WATERSHED SIZE (SF.)	NEW NON-LINEAR IMPERVIOUS AREA (SF.)	NEW NON-LINEAR LANDSCAPED AREA (SF.)	NEW NON-LINEAR DEVELOPED AREA (Ac.)	NON-LINEAR TREATMENT PROVIDED?	NON-LINEAR IMPERVIOUS AREA TREATED* (Ac.)	NON-LINEAR LANDSCAPED AREA TREATED* (Ac.)	NON-LINEAR DEVELOPED AREA TREATED* (Ac.)	TREATMENT BMP
USF-6	33,400.000	16,562.000	16,838.000	0.767	YES	0.380	0.387	0.767	UNDERDRAIN SOIL FILTER USF-6
USF-7	16,463.000	1,569.000	14,894.000	0.378	YES	0.036	0.342	0.378	UNDERDRAIN SOIL FILTER USF-7
UNTREATED	8,180.000	616.000	7,564.000	0.188	NO	0.000	0.000	0.000	NONE
TOTAL (Ac.)	**58,043.000**	**18,747.000**	**39,296.000**	**1.332**		**0.416**	**0.728**	**1.145**	

TOTAL NEW IMPERVIOUS AREA REQUIRING TREATMENT (Ac.)	**0.430**	**TOTAL DEVELOPED AREA REQUIRING TREATMENT (Ac.)**	**1.332**
TOTAL IMPERVIOUS AREA RECEIVING TREATMENT (Ac.)	**0.416**	**TOTAL DEV. AREA RECEIVING TREATMENT (Ac.)**	**1.145**
% OF IMPERVIOUS AREA RECEIVING TREATMENT	**96.71%**	**% OF DEV. AREA RECEIVING TREATMENT**	**85.91%**
MINIMUM TREATMENT REQUIRED	**95.00%**	**MINIMUM TREATMENT REQUIRED**	**75.00%**
EXCEEDS MINIMUM?	**YES**	**EXCEEDS MINIMUM?**	**YES**

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JOB	14181 - MTA York Toll Plaza		
SHEET NO.	1	OF	1
CALCULATED BY	GJH	DATE	9/8/2016
FILE NAME	14181 WQV CALCS_10-14-16.xlsx	PRNT DATE	10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter UDF#1_STA 263+00 LEFT, OLD ADMIN BUILDING

Landscaped Area	15,094.00	SF	0.347	ac
Impervious Area	12,835.00	SF	0.295	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	15,094.00	SF	Area	301.9	SF	
Total Impervious Area	12,835.00	SF	Area	641.8	SF	
		Required Minimum Surface Area		943.6	SF	
		Provided Surface Area		2,512.0	SF	266.21%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

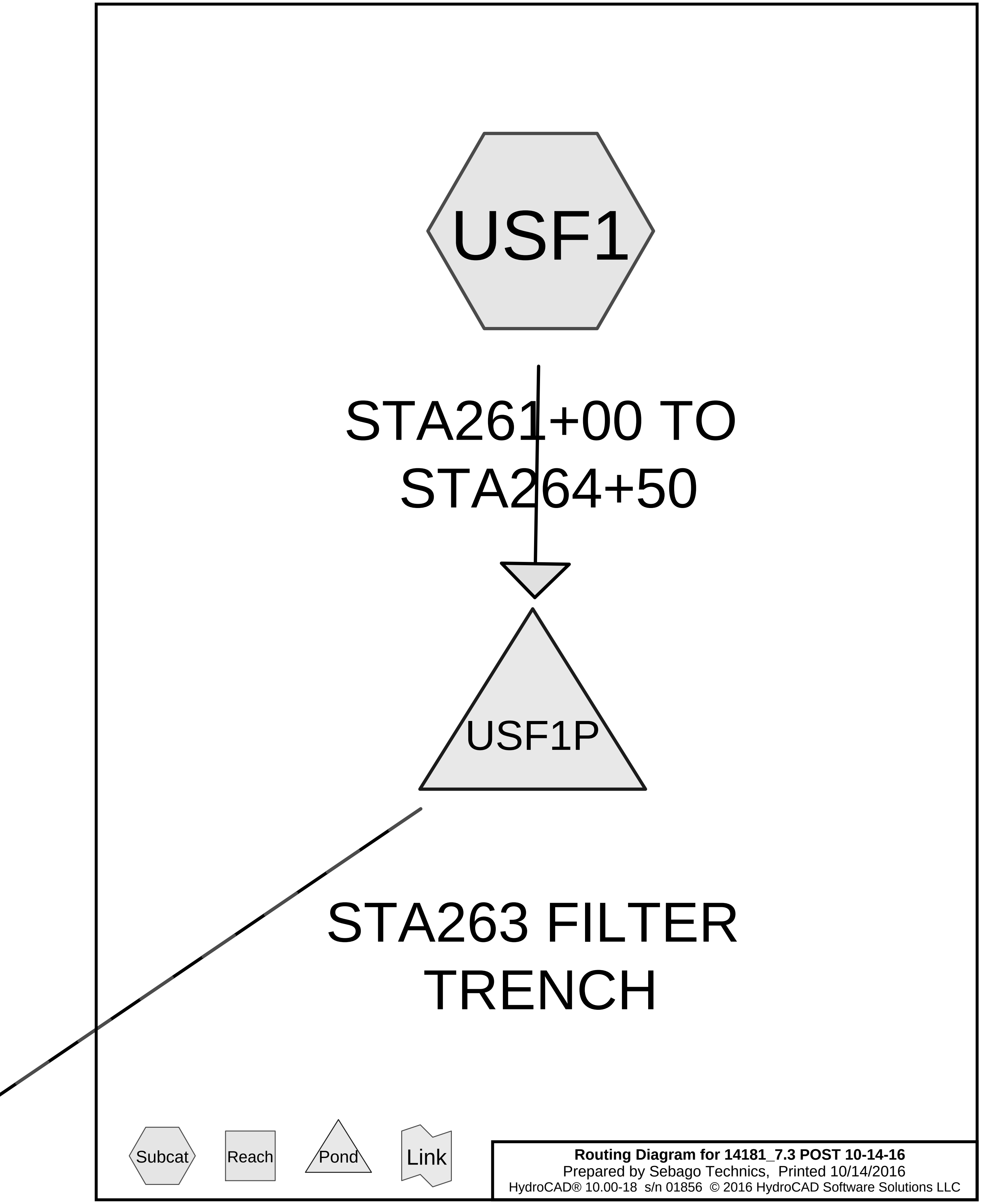
Landscaped Area	15,094.00	SF	Volume	503.1				
Impervious Area	12,835.00	SF	Volume	1,069.6				
		CPV Required		1,572.7	CF	0.036	AF	
		Provided CPV		1,938.0	CF	(Elevation 43.00 to 43.50)		123.23%

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	12,835.00	SF	
Sediment Volume	15	CF	
Provided		CF	10-foot wide grass shoulder



Routing Diagram for 14181_7.3 POST 10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.347	80	>75% Grass cover, Good, HSG D (USF1)
0.295	98	MTA CORRIDOR (USF1)
0.641	**88**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment USF1: STA261+00 TO STA264+50 Runoff Area=27,929 sf 45.96% Impervious Runoff Depth=0.67"
Tc=6.0 min CN=88 Runoff=0.50 cfs 0.036 af

Pond USF1P: STA263 FILTER TRENCH Peak Elev=43.27' Storage=875 cf Inflow=0.50 cfs 0.036 af
Primary=0.02 cfs 0.036 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.036 af

Total Runoff Area = 0.641 ac Runoff Volume = 0.036 af Average Runoff Depth = 0.67"
54.04% Pervious = 0.347 ac 45.96% Impervious = 0.295 ac

Summary for Subcatchment USF1: STA261+00 TO STA264+50

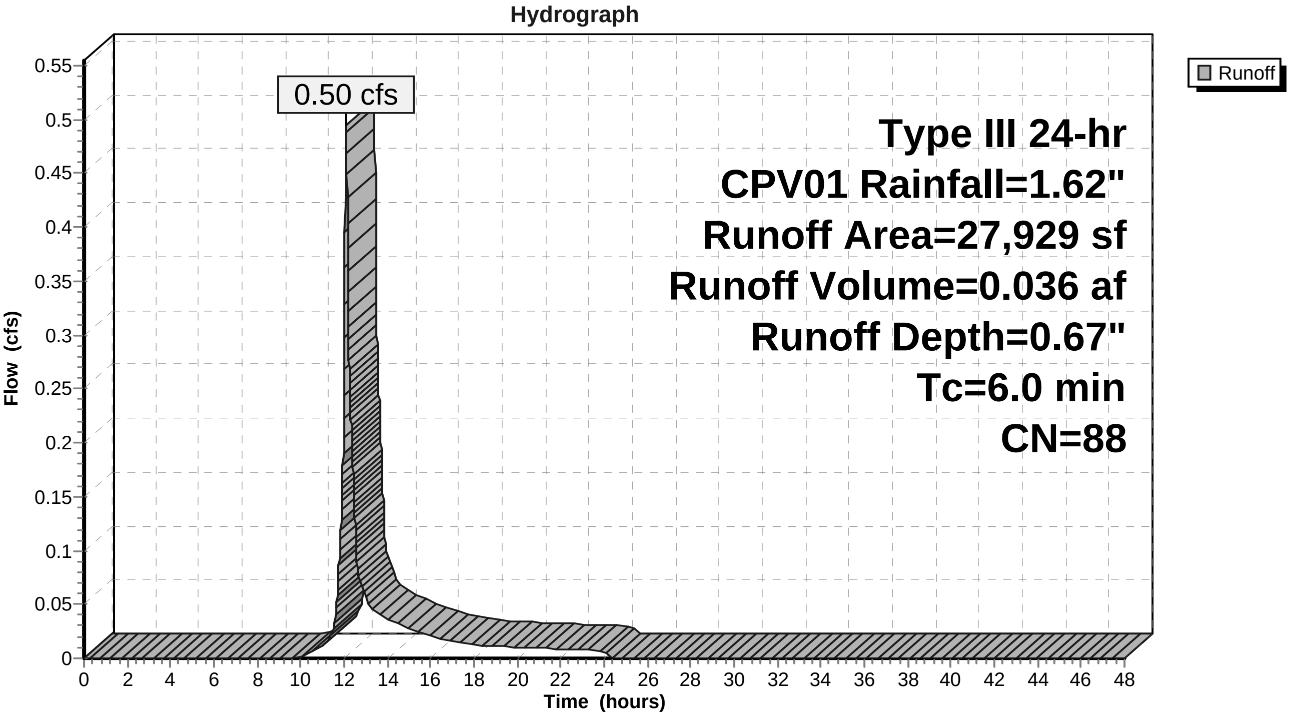
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV01 Rainfall=1.62"

	Area (sf)	CN	Description
	15,094	80	>75% Grass cover, Good, HSG D
*	12,835	98	MTA CORRIDOR
	27,929	88	Weighted Average
	15,094		54.04% Pervious Area
	12,835		45.96% Impervious Area

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

Subcatchment USF1: STA261+00 TO STA264+50



Summary for Pond USF1P: STA263 FILTER TRENCH

```
Inflow Area =      0.641 ac,  45.96% Impervious,  Inflow Depth =   0.67"    for  CPV01 event
Inflow      =      0.50 cfs @   12.09 hrs,  Volume=         0.036 af
Outflow     =      0.02 cfs @   15.93 hrs,  Volume=         0.036 af,  Atten= 96%,  Lag= 230.3 min
Primary     =      0.02 cfs @   15.93 hrs,  Volume=         0.036 af
Secondary =        0.00 cfs @    0.00 hrs,  Volume=         0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 43.27' @ 15.93 hrs Surf.Area= 3,981 sf Storage= 875 cf

Plug-Flow detention time= 452.2 min calculated for 0.036 af (100% of inflow)
Center-of-Mass det. time= 452.2 min (1,298.9 - 846.7)

Volume	Invert	Avail.Storage	Storage Description
#1	43.00'	5,240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

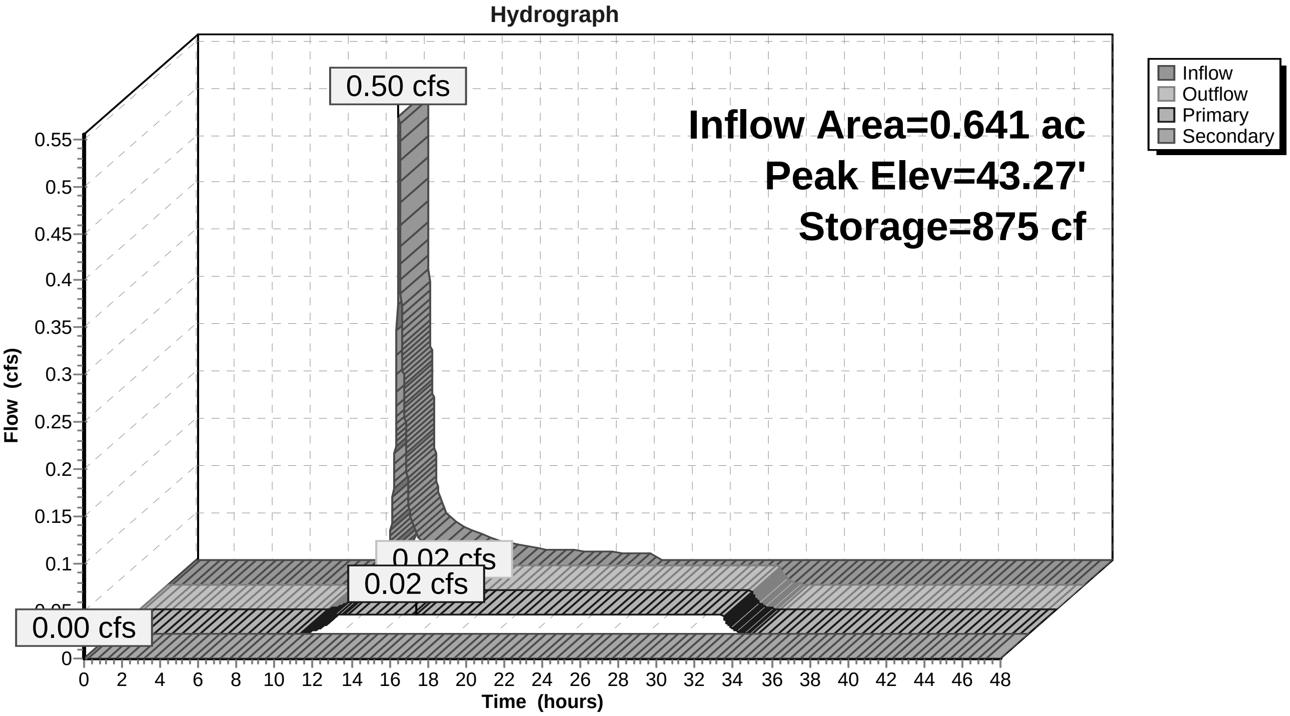
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
43.00	2,512	0	0
44.00	7,967	5,240	5,240

Device	Routing	Invert	Outlet Devices
#1	Primary	40.57'	**12.0" Round Outlet Pipe** L= 81.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 40.57' / 40.16' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	40.67'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	40.67'	**0.7" Vert. Orifice at OCS** C= 0.600
#4	Device 1	43.40'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	43.60'	**10.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.02 cfs @ 15.93 hrs HW=43.27' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.02 cfs of 4.55 cfs potential flow)
  ├─**2=Header Pipe** (Passes 0.02 cfs of 2.53 cfs potential flow)
  │ └─**3=Orifice at OCS** (Orifice Controls 0.02 cfs @ 7.72 fps)
  └─**4=Catch Basin Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=43.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond USF1P: STA263 FILTER TRENCH



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JOB 14181 - MTA York Toll Plaza
SHEET NO. 1 OF 1
CALCULATED BY GJH DATE 9/8/2016
FILE NAME 14181 WQV CALCS_10-14-16.xlsx PRNT DATE 10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References 1. Maine DEP Chapter 500, Section 4.B.(2)(b)
a. "must detain a runoff volume equal to 1.0 inch times
the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"

2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
a. "surface should represent 5% of impervious area and 2% of landscaped area"

<u>Tributary to Underdrained Filter</u> UDF#2, STA 267+00 LEFT

Landscaped Area	24,778.00	SF	0.569	ac
Impervious Area	18,946.00	SF	0.435	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	24,778.00	SF	Area	495.6	SF
Total Impervious Area	18,946.00	SF	Area	947.3	SF

Required Minimum Surface Area	1,442.9	SF	
Provided Surface Area	3,258.0	SF	225.80%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	24,778.00	SF	Volume	825.9
Impervious Area	18,946.00	SF	Volume	1,578.8

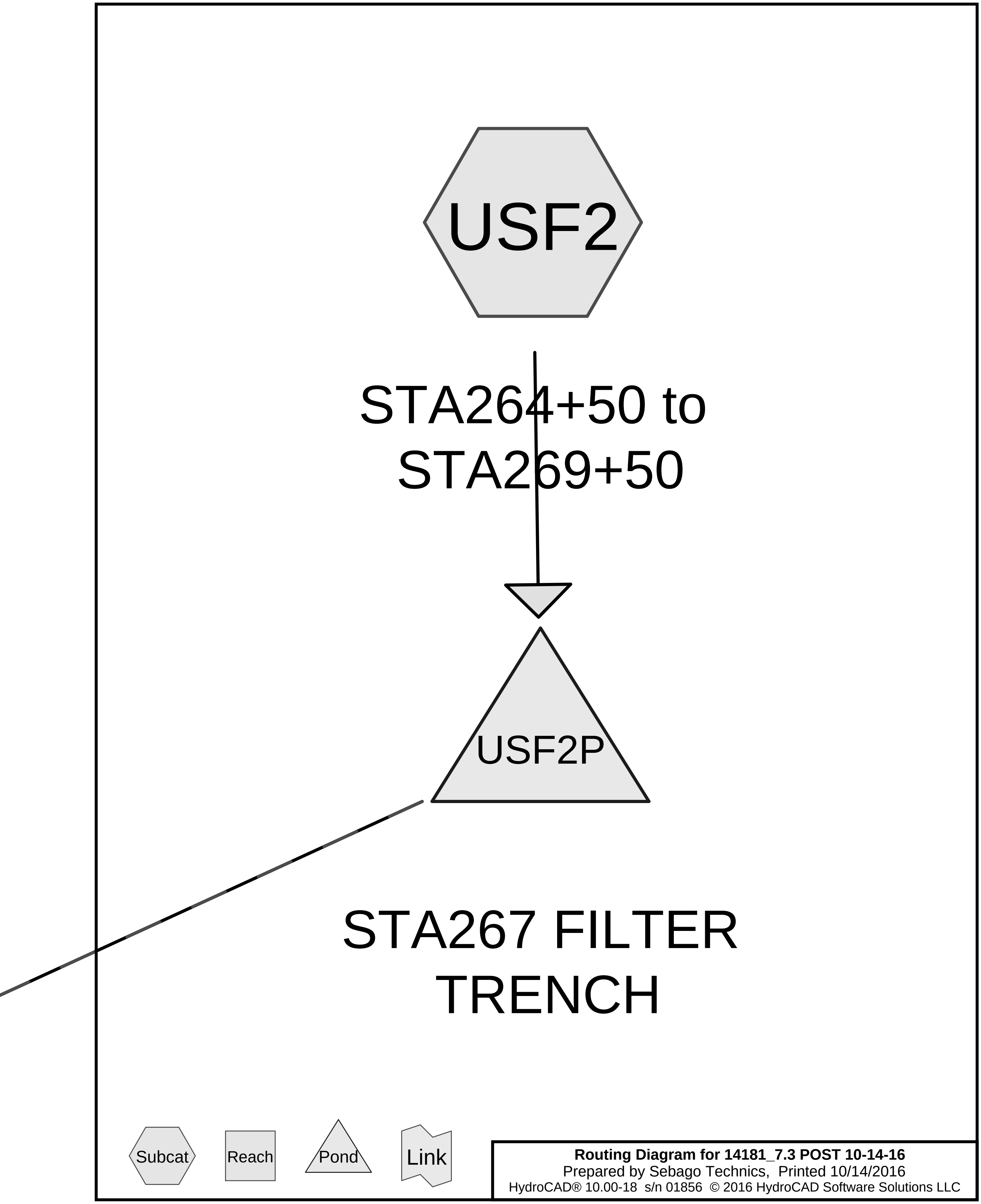
CPV Required	2,404.8	CF	0.055	AF	
Provided CPV	2,430.0	CF	(Elevation 41.00 to 41.50)		101.05%

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	18,946.00	SF					
Sediment Volume	22	CF					
Provided	52	CF	6	Inch Deep Forebay	with area of	104	sf



Routing Diagram for 14181_7.3 POST 10-14-16
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.569	80	>75% Grass cover, Good, HSG D (USF2)
0.435	98	MTA CORRIDOR (USF2)
1.004	**88**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment USF2: STA264+50 to STA269+50 Runoff Area=43,724 sf 43.33% Impervious Runoff Depth=0.65"
Tc=6.0 min CN=88 Runoff=0.76 cfs 0.055 af

Pond USF2P: STA267 FILTER TRENCH Peak Elev=42.33' Storage=1,411 cf Inflow=0.76 cfs 0.055 af
Primary=0.03 cfs 0.055 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.055 af

Total Runoff Area = 1.004 ac Runoff Volume = 0.055 af Average Runoff Depth = 0.65"
56.67% Pervious = 0.569 ac 43.33% Impervious = 0.435 ac

Summary for Subcatchment USF2: STA264+50 to STA269+50

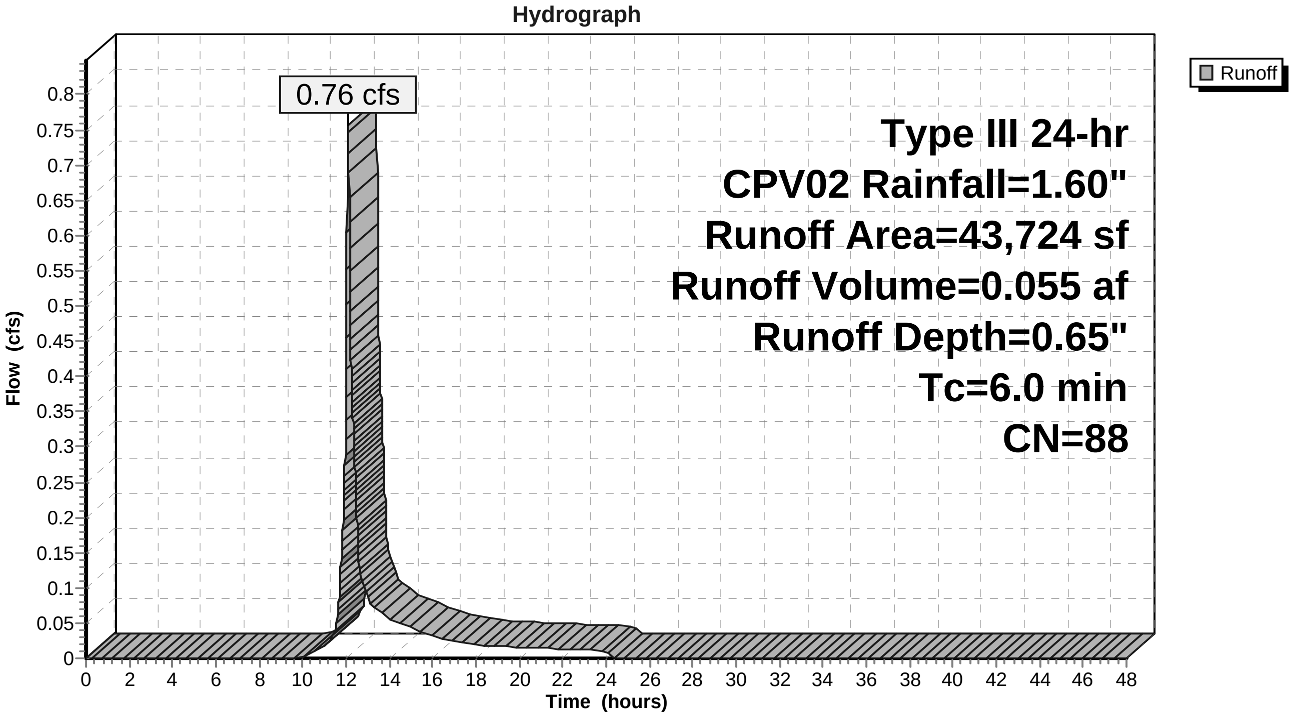
Runoff = 0.76 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV02 Rainfall=1.60"

	Area (sf)	CN	Description
	24,778	80	>75% Grass cover, Good, HSG D
*	18,946	98	MTA CORRIDOR
	43,724	88	Weighted Average
	24,778		56.67% Pervious Area
	18,946		43.33% Impervious Area

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

Subcatchment USF2: STA264+50 to STA269+50



Summary for Pond USF2P: STA267 FILTER TRENCH

Inflow Area = 1.004 ac, 43.33% Impervious, Inflow Depth = 0.65" for CPV02 event
Inflow = 0.76 cfs @ 12.09 hrs, Volume= 0.055 af
Outflow = 0.03 cfs @ 16.53 hrs, Volume= 0.055 af, Atten= 96%, Lag= 266.3 min
Primary = 0.03 cfs @ 16.53 hrs, Volume= 0.055 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 42.33' @ 16.53 hrs Surf.Area= 5,312 sf Storage= 1,411 cf

Plug-Flow detention time= 548.9 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 549.0 min (1,396.3 - 847.3)

Volume	Invert	Avail.Storage	Storage Description
#1	42.00'	6,361 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

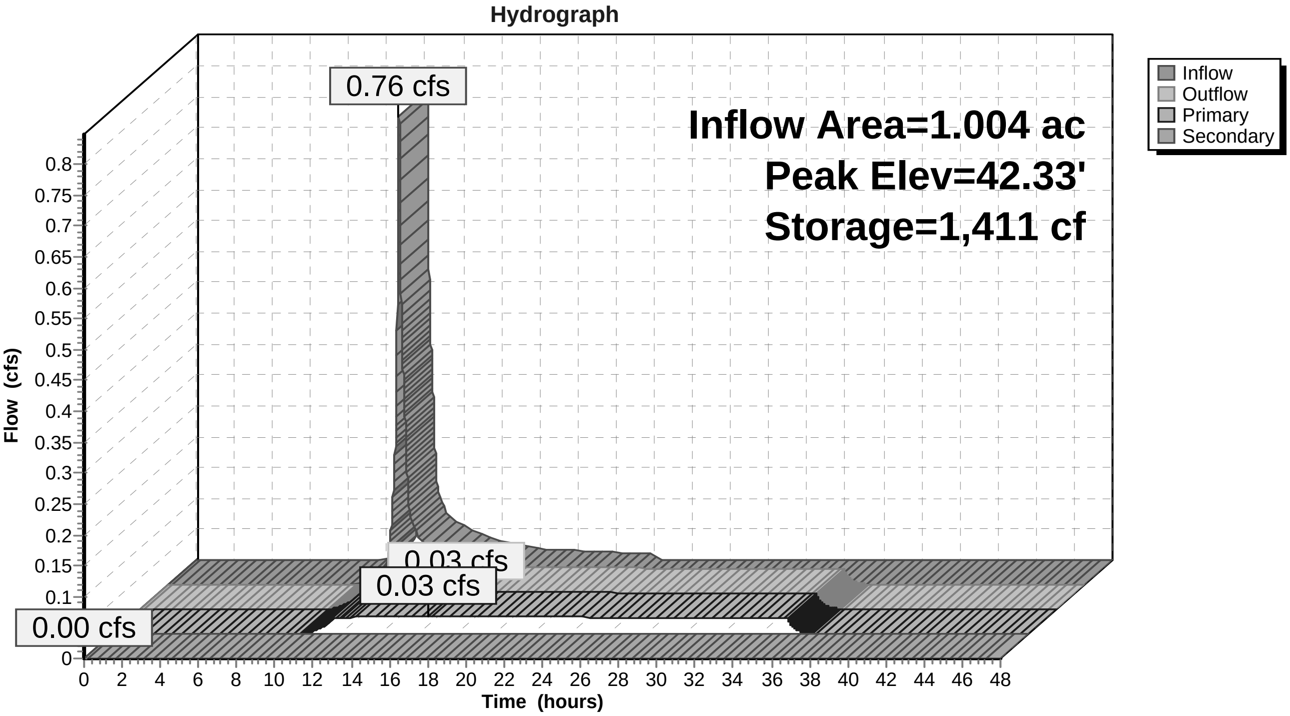
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.00	3,358	0	0
43.00	9,363	6,361	6,361

Device	Routing	Invert	Outlet Devices
#1	Primary	39.15'	**12.0" Round Outlet Pipe** L= 62.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.15' / 38.53' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	39.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	39.65'	**0.8" Vert. Orifice at OCS** C= 0.600
#4	Device 1	42.40'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	42.60'	**10.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.03 cfs @ 16.53 hrs HW=42.33' (Free Discharge)
↑**1=Outlet Pipe** (Passes 0.03 cfs of 5.68 cfs potential flow)
  ↑**2=Header Pipe** (Passes 0.03 cfs of 2.57 cfs potential flow)
    ↑**3=Orifice at OCS** (Orifice Controls 0.03 cfs @ 7.83 fps)
  4=Catch Basin Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=42.00' (Free Discharge)
↑**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond USF2P: STA267 FILTER TRENCH



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JOB	14181 - MTA York Toll Plaza		
SHEET NO.	1	OF	1
CALCULATED BY	GJH	DATE	2/10/2016
FILE NAME	14181 WQV CALCS_10-14-16.xlsx	PRNT DATE	10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

<u>Tributary to Underdrained Filter</u> UDF#3, STA291+00 LEFT

Landscaped Area	72,500.00	SF	1.664	ac
Impervious Area	43,180.00	SF	0.991	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	72,500.00	SF	Area	1,450.0	SF		
Total Impervious Area	43,180.00	SF	Area	2,159.0	SF		
			Required Minimum Surface Area	3,609.0	SF		
			Provided Surface Area	3,630.0	SF		100.58%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

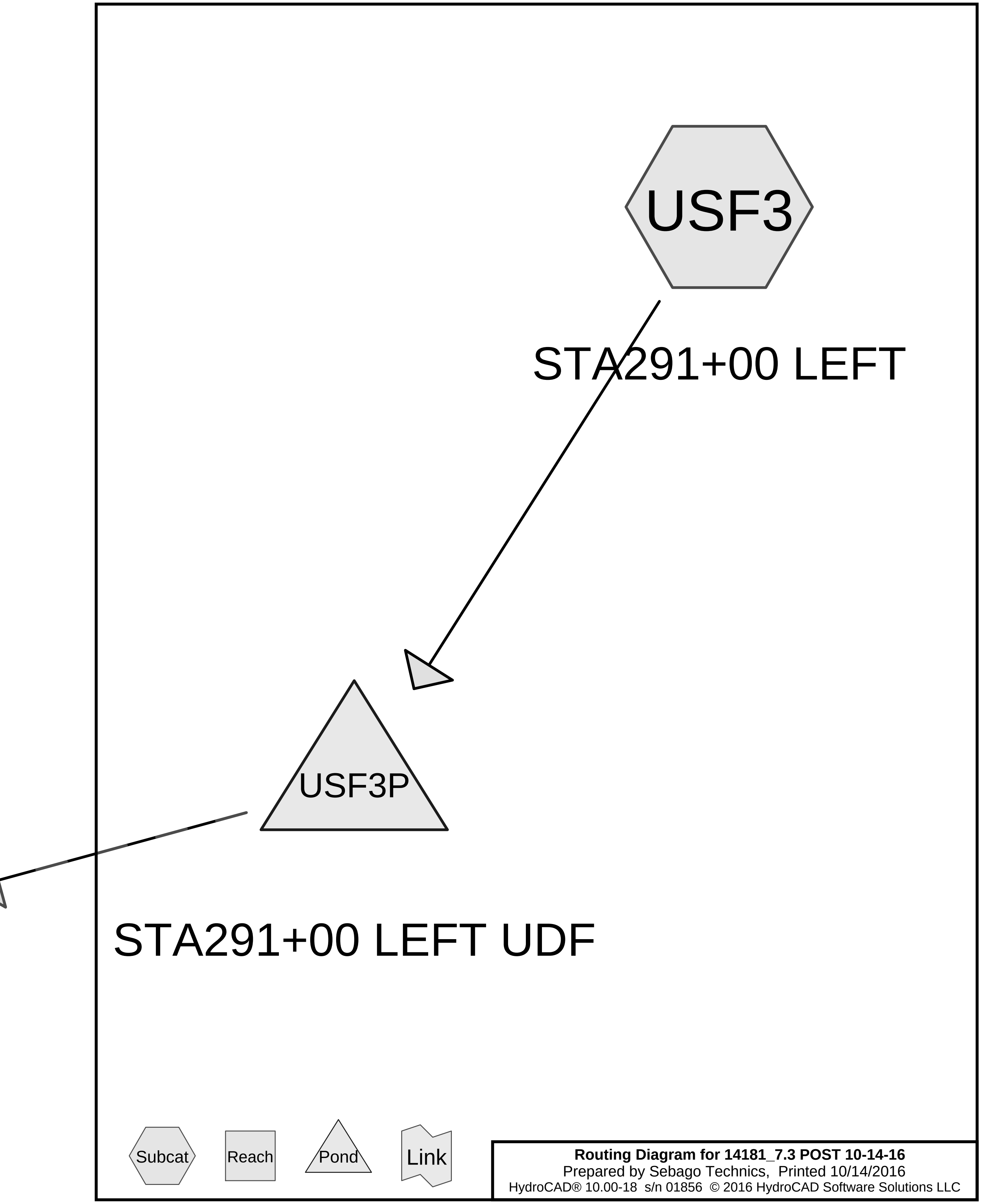
Landscaped Area	72,500.00	SF	Volume	2,416.7				
Impervious Area	43,180.00	SF	Volume	3,598.3				
			CPV Required	6,015.0	CF	0.138	AF	
			Provided CPV	6,545.0	CF	(Elevation 83.00 to 84.50)		108.81%

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	43,180.00	SF					
Sediment Volume	50	CF					
Provided	205	CF	6	Inch Deep Forebay	with area of	409	sf



Routing Diagram for 14181_7.3 POST 10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.664	80	>75% Grass cover, Good, HSG D (USF3)
0.991	98	MTA CORRIDOR (USF3)
2.656	**87**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment USF3: STA291+00 LEFT Runoff Area=115,680 sf 37.33% Impervious Runoff Depth=0.63"
Tc=6.0 min CN=87 Runoff=1.91 cfs 0.139 af

Pond USF3P: STA291+00 LEFT UDF Peak Elev=83.85' Storage=3,427 cf Inflow=1.91 cfs 0.139 af
Primary=0.08 cfs 0.139 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.139 af

Total Runoff Area = 2.656 ac Runoff Volume = 0.139 af Average Runoff Depth = 0.63"
62.67% Pervious = 1.664 ac 37.33% Impervious = 0.991 ac

Summary for Subcatchment USF3: STA291+00 LEFT

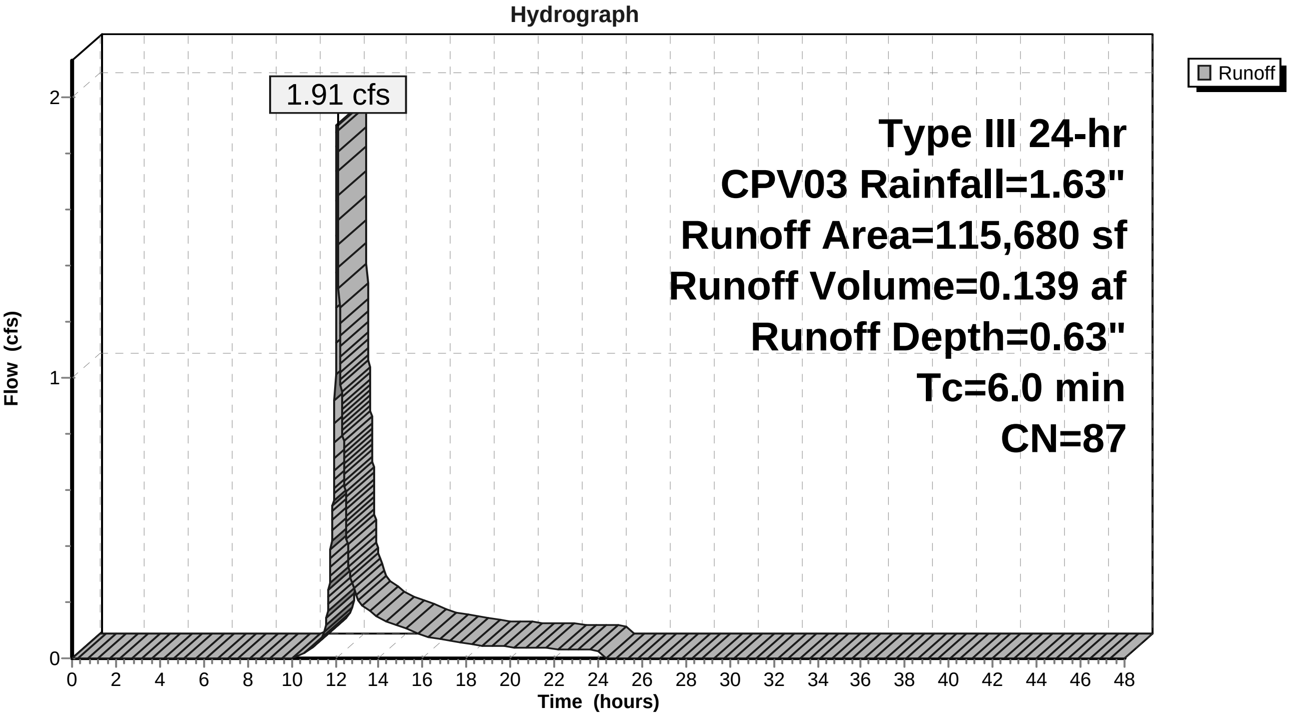
Runoff = 1.91 cfs @ 12.09 hrs, Volume= 0.139 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV03 Rainfall=1.63"

	Area (sf)	CN	Description
	72,500	80	>75% Grass cover, Good, HSG D
*	43,180	98	MTA CORRIDOR
	115,680	87	Weighted Average
	72,500		62.67% Pervious Area
	43,180		37.33% Impervious Area

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

Subcatchment USF3: STA291+00 LEFT



Summary for Pond USF3P: STA291+00 LEFT UDF

Inflow Area = 2.656 ac, 37.33% Impervious, Inflow Depth = 0.63" for CPV03 event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.139 af
Outflow = 0.08 cfs @ 16.05 hrs, Volume= 0.139 af, Atten= 96%, Lag= 237.2 min
Primary = 0.08 cfs @ 16.05 hrs, Volume= 0.139 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 83.85' @ 16.05 hrs Surf.Area= 4,472 sf Storage= 3,427 cf

Plug-Flow detention time= 476.7 min calculated for 0.139 af (100% of inflow)
Center-of-Mass det. time= 476.7 min (1,328.1 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	9,265 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

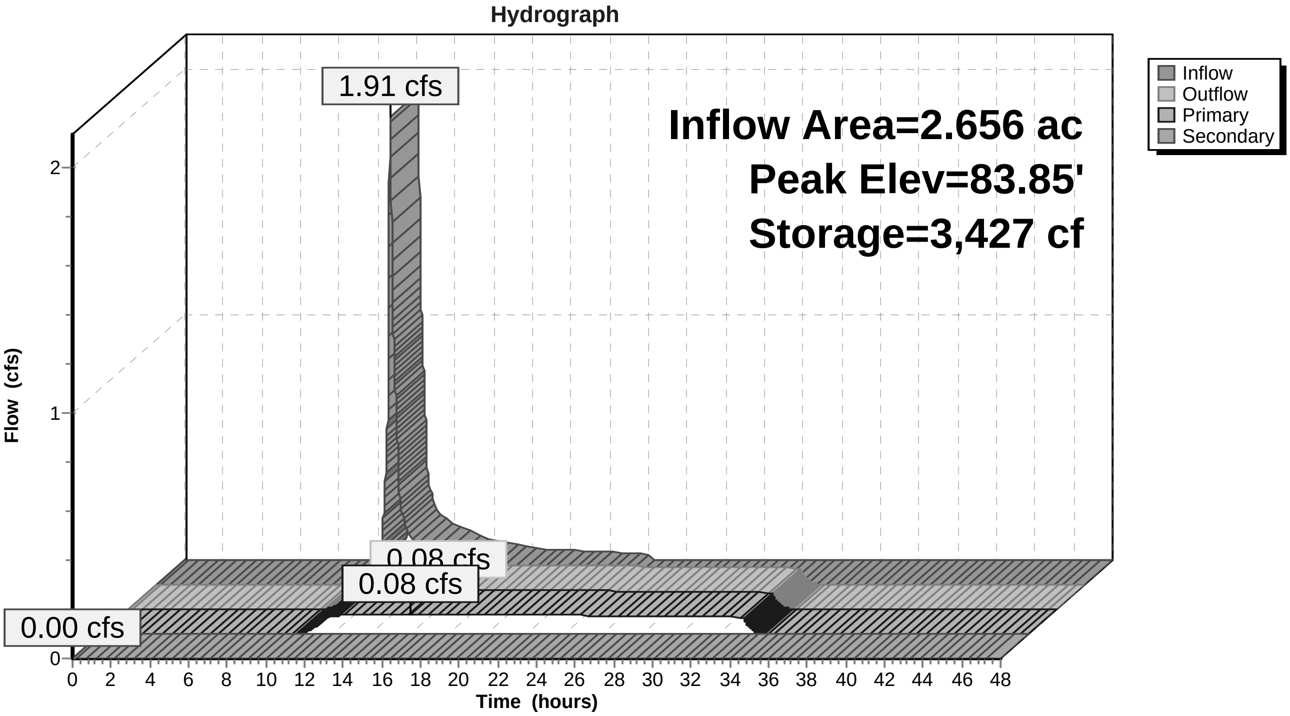
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	3,630	0	0
84.00	4,625	4,128	4,128
85.00	5,650	5,138	9,265

Device	Routing	Invert	Outlet Devices
#1	Primary	80.15'	**12.0" Round Outlet Pipe** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 80.15' / 79.00' S= 0.0523 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	80.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	80.65'	**1.3" Vert. Orifice at OCS** C= 0.600
#4	Device 1	84.00'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	84.50'	**12.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.08 cfs @ 16.05 hrs HW=83.85' (Free Discharge)
↑—**1=Outlet Pipe** (Passes 0.08 cfs of 6.76 cfs potential flow)
  ↑—**2=Header Pipe** (Passes 0.08 cfs of 2.84 cfs potential flow)
    ↑—**3=Orifice at OCS** (Orifice Controls 0.08 cfs @ 8.53 fps)
  —**4=Catch Basin Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=83.00' (Free Discharge)
↑—**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond USF3P: STA291+00 LEFT UDF



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JOB 14181 - MTA York Toll Plaza
SHEET NO. 1 OF 1
CALCULATED BY GJH DATE 9/8/2016
FILE NAME 14181 WQV CALCS_10-14-16.xlsx PRNT DATE 10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

<u>Tributary to Underdrained Filter</u> UDF#4, STA295+00

Landscaped Area	38,930.00	SF	0.894	ac
Impervious Area	32,089.00	SF	0.737	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	38,930.00	SF	Area	778.6	SF	
Total Impervious Area	32,089.00	SF	Area	1,604.5	SF	
			Required Minimum Surface Area	2,383.1	SF	
			Provided Surface Area	3,057.0	SF	128.28%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

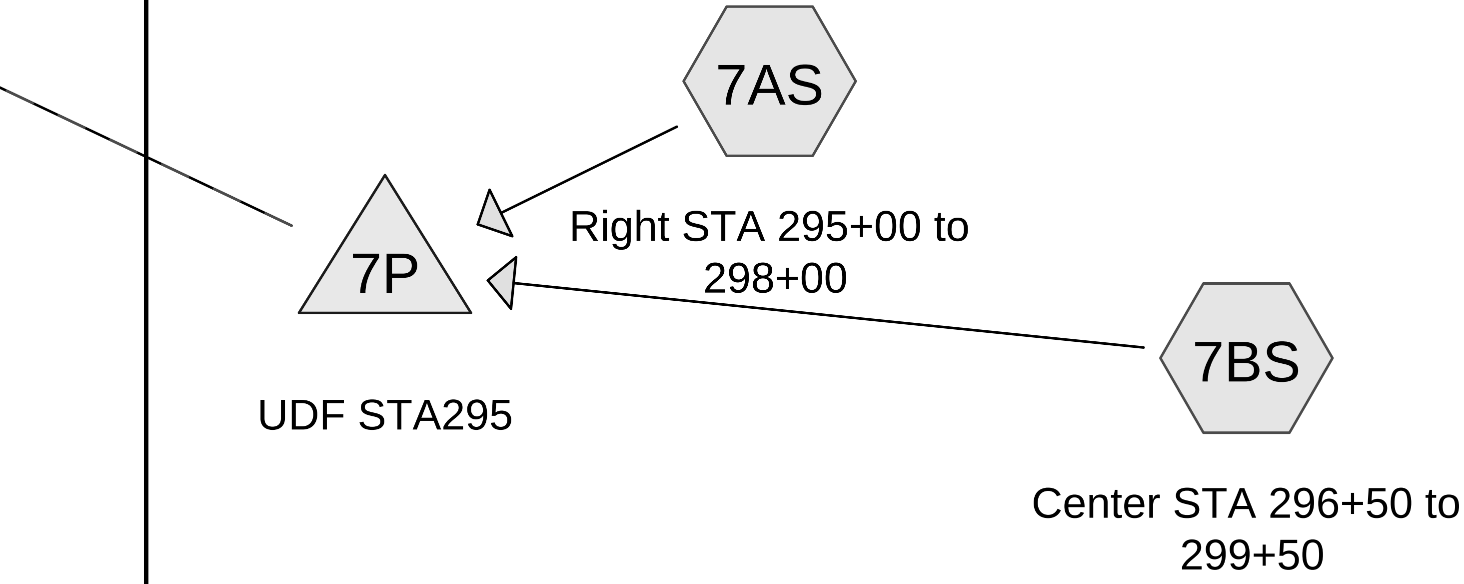
Landscaped Area	38,930.00	SF	Volume	1,297.7			
Impervious Area	32,089.00	SF	Volume	2,674.1			
			CPV Required	3,971.8	CF	0.091 AF	
			Provided CPV	6,086.0	CF	(Elevation 103.00 to 104.50)	153.23%

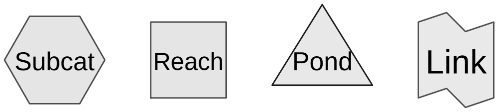
Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	32,089.00	SF						
Sediment Volume	37	CF						
Provided	205	CF	6	Inch Deep Forebay	with area of	409	sf	





Routing Diagram for 14181_7.3 POST 10-14-16
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.530	74	>75% Grass cover, Good, HSG C (7AS, 7BS)
0.364	65	Brush, Good, HSG C (7AS)
0.242	98	Paved parking, HSG C (7BS)
0.269	98	Unconnected pavement, HSG C (7AS)
1.404	**80**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 7AS: Right STA 295+00 to 298+00 Runoff Area=46,170 sf 25.34% Impervious Runoff Depth=0.08"
Tc=6.0 min UI Adjusted CN=73 Runoff=0.03 cfs 0.007 af

Subcatchment 7BS: Center STA 296+50 to 299+50 Runoff Area=14,989 sf 70.24% Impervious Runoff Depth=0.60"
Tc=6.0 min CN=91 Runoff=0.24 cfs 0.017 af

Pond 7P: UDF STA295 Peak Elev=103.07' Storage=215 cf Inflow=0.24 cfs 0.024 af
Primary=0.07 cfs 0.024 af Secondary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.024 af

Total Runoff Area = 1.404 ac Runoff Volume = 0.024 af Average Runoff Depth = 0.21"
63.65% Pervious = 0.894 ac 36.35% Impervious = 0.510 ac

Summary for Subcatchment 7AS: Right STA 295+00 to 298+00

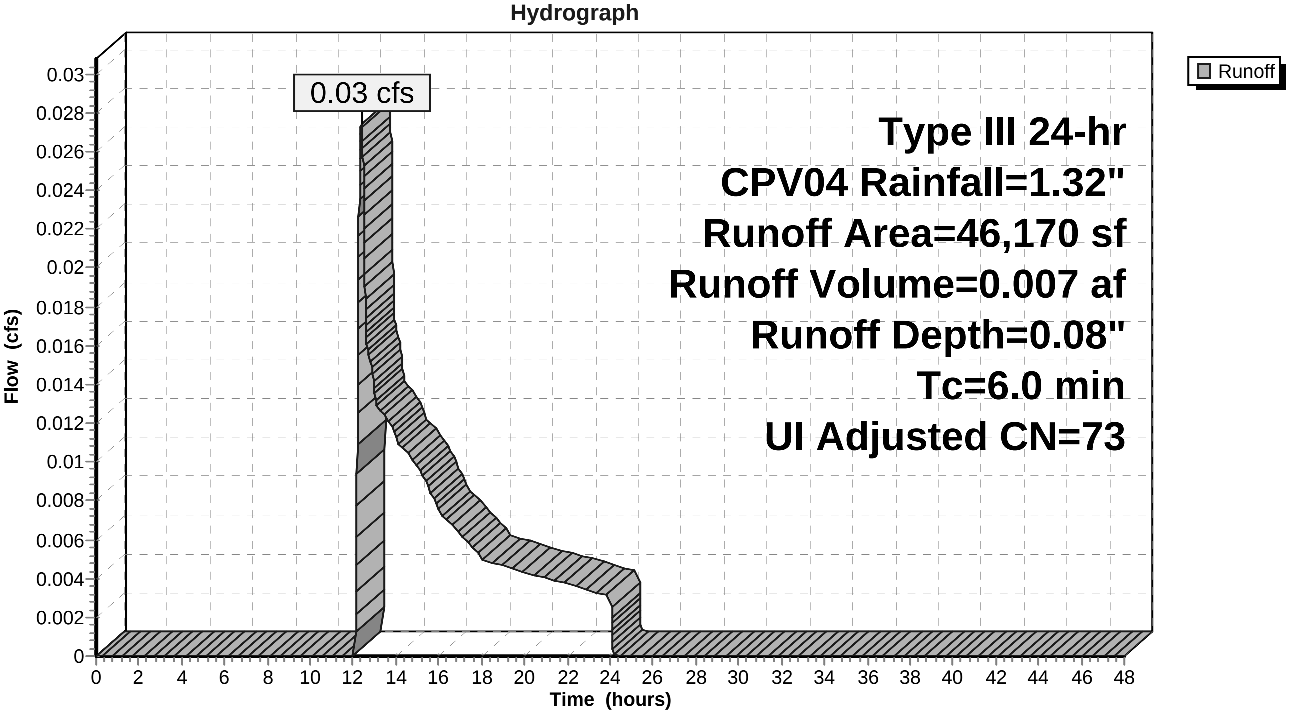
Runoff = 0.03 cfs @ 12.39 hrs, Volume= 0.007 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV04 Rainfall=1.32"

Area (sf)	CN	Adj	Description
11,701	98		Unconnected pavement, HSG C
18,631	74		>75% Grass cover, Good, HSG C
15,838	65		Brush, Good, HSG C
46,170	77	73	Weighted Average, UI Adjusted
34,469			74.66% Pervious Area
11,701			25.34% Impervious Area
11,701			100.00% Unconnected

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

Subcatchment 7AS: Right STA 295+00 to 298+00



Summary for Subcatchment 7BS: Center STA 296+50 to 299+50

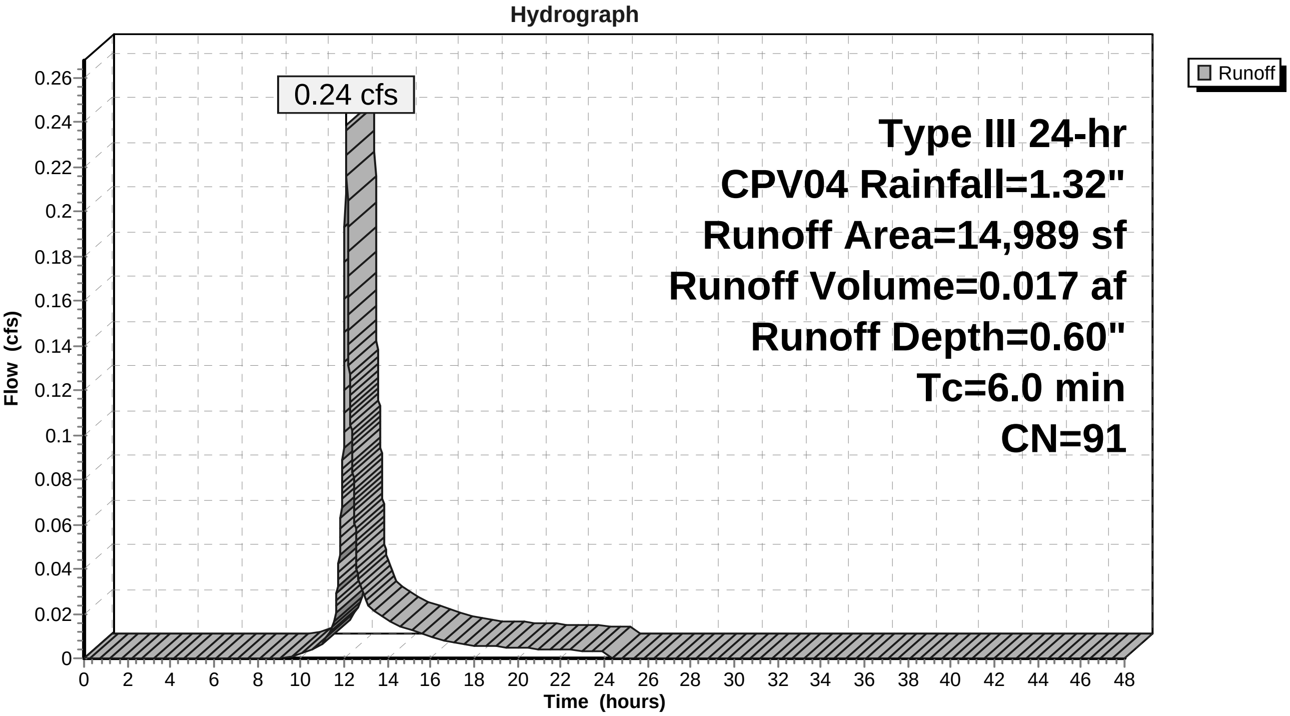
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV04 Rainfall=1.32"

Area (sf)	CN	Description
10,528	98	Paved parking, HSG C
4,461	74	>75% Grass cover, Good, HSG C
14,989	91	Weighted Average
4,461		29.76% Pervious Area
10,528		70.24% Impervious Area

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

Subcatchment 7BS: Center STA 296+50 to 299+50



Summary for Pond 7P: UDF STA295

Inflow Area = 1.404 ac, 36.35% Impervious, Inflow Depth = 0.21" for CPV04 event
Inflow = 0.24 cfs @ 12.09 hrs, Volume= 0.024 af
Outflow = 0.07 cfs @ 12.55 hrs, Volume= 0.024 af, Atten= 72%, Lag= 27.7 min
Primary = 0.07 cfs @ 12.55 hrs, Volume= 0.024 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 103.07' @ 12.55 hrs Surf.Area= 3,002 sf Storage= 215 cf

Plug-Flow detention time= 27.7 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 27.8 min (907.8 - 880.0)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	9,698 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

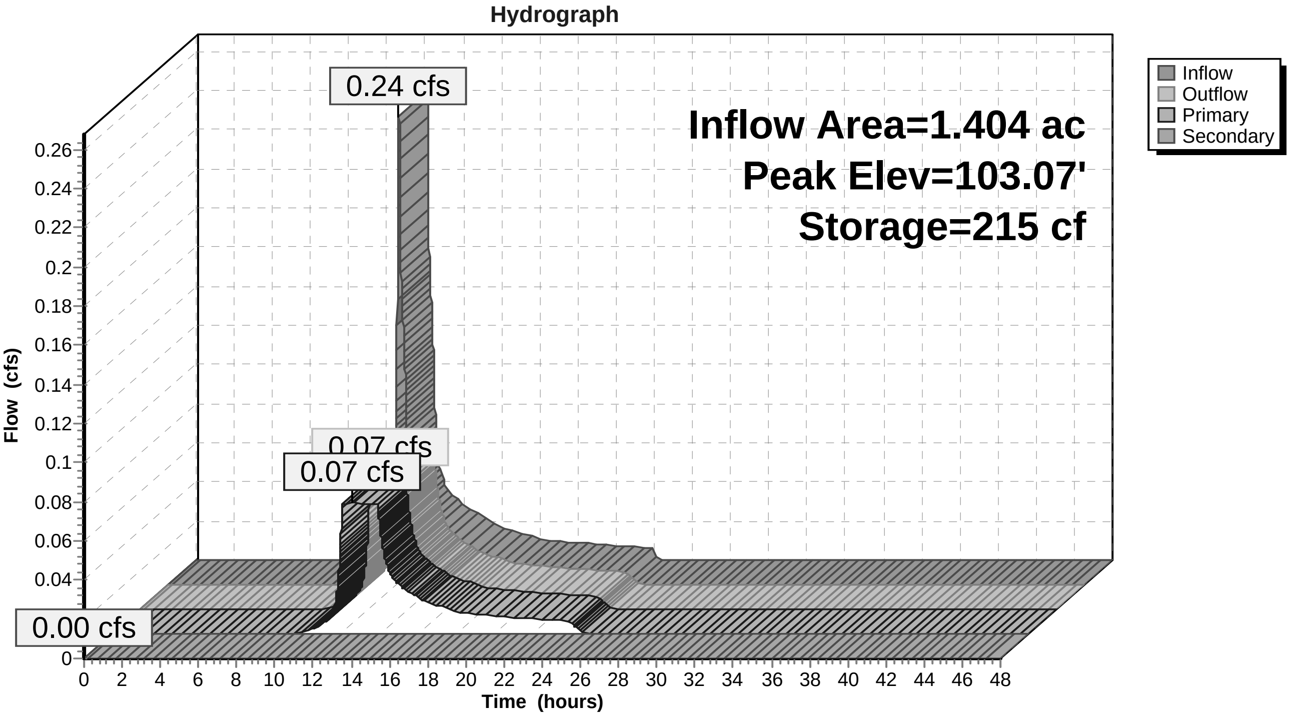
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	2,952	0	0
104.00	3,639	3,296	3,296
105.00	4,383	4,011	7,307
105.50	5,183	2,392	9,698

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	**15.0" Round RCP_Round 15"** L= 111.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 96.00' S= 0.0450 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	101.00'	**2.0" W x 0.7" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	104.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	104.75'	**10.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.07 cfs @ 12.55 hrs HW=103.07' (Free Discharge)
└**1=RCP_Round 15"** (Passes 0.07 cfs of 7.11 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 6.88 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: UDF STA295



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JOB 14181 - MTA York Toll Plaza
SHEET NO. 1 OF 1
CALCULATED BY GJH DATE 2/10/2016
FILE NAME 14181 WQV CALCS_10-14-16.xlsx PRNT DATE 10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

<u>Tributary to Underdrained Filter</u> UDF#5, STA313+00 RIGHT

Landscaped Area	15,303.00	SF	0.351	ac
Impervious Area	26,674.00	SF	0.612	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	15,303.00	SF	Area	306.1	SF
Total Impervious Area	26,674.00	SF	Area	1,333.7	SF

Required Minimum Surface Area 1,639.8 SF

Provided Surface Area 2,345.0 SF 143.01%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	15,303.00	SF	Volume	510.1
Impervious Area	26,674.00	SF	Volume	2,222.8

CPV Required 2,732.9 CF 0.063 AF

Provided CPV 2,744.0 CF (Elevation 115.00 to 116.00 100.40%

Sediment Pre-Treatment

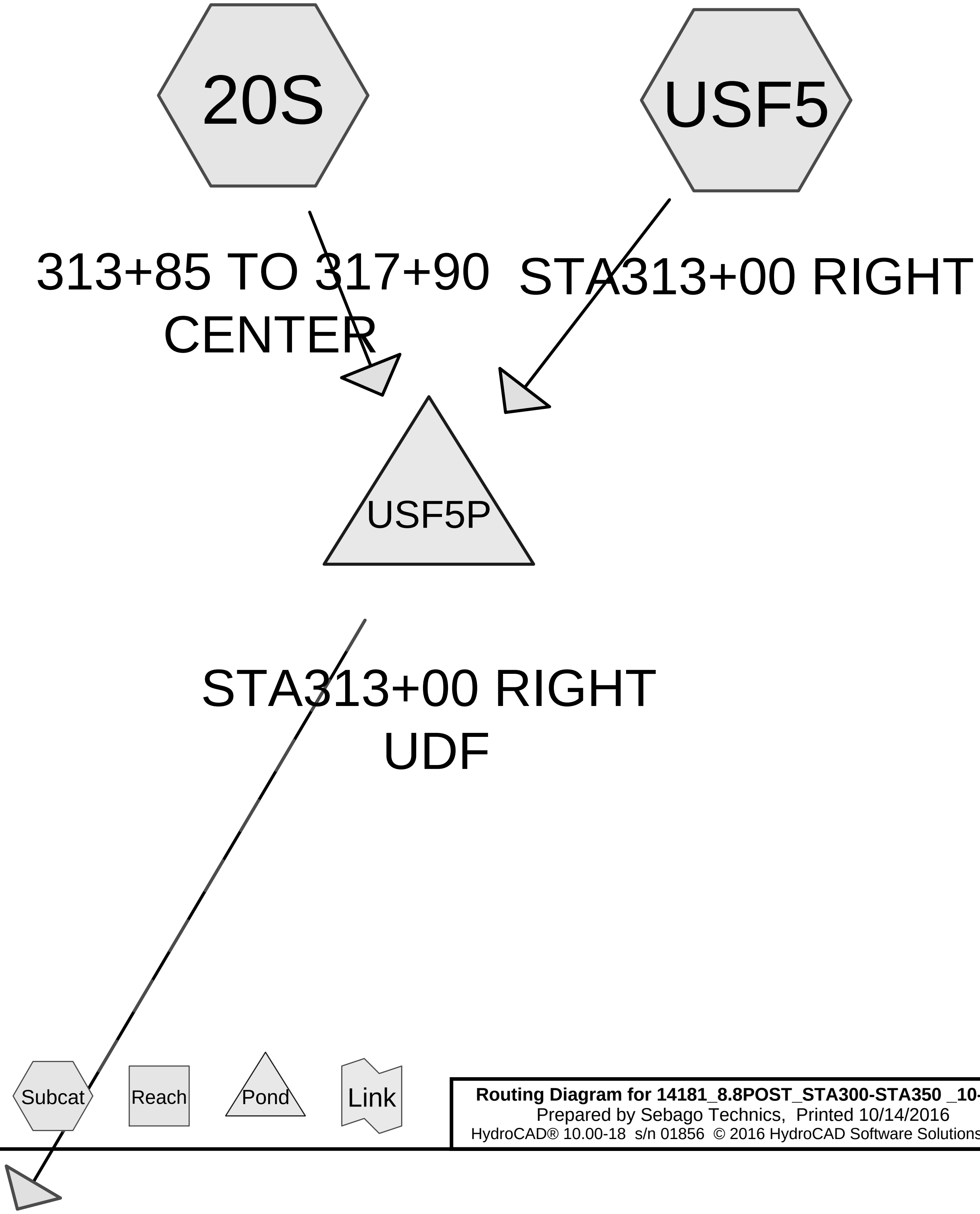
Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded: 26,674.00 SF

Sediment Volume 31 CF

Provided 205 CF 6 Inch Deep Forebay with area of 409 sf



Routing Diagram for 14181_8.8POST_STA300-STA350 _10-14-16
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.351	80	>75% Grass cover, Good, HSG D (USF5)
0.134	98	MTA CORRIDOR (USF5)
0.478	98	MTA PAVEMENT (20S)
0.964	**91**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 20S: 313+85 TO 317+90 CENTER Runoff Area=20,843 sf 100.00% Impervious Runoff Depth=1.18"
Tc=5.0 min CN=98 Runoff=0.64 cfs 0.047 af

Subcatchment USF5: STA313+00 RIGHT Runoff Area=21,134 sf 27.59% Impervious Runoff Depth=0.39"
Tc=6.0 min CN=85 Runoff=0.20 cfs 0.016 af

Pond USF5P: STA313+00 RIGHT UDF Peak Elev=115.60' Storage=1,547 cf Inflow=0.84 cfs 0.063 af
Primary=0.03 cfs 0.063 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.063 af

Total Runoff Area = 0.964 ac Runoff Volume = 0.063 af Average Runoff Depth = 0.78"
36.46% Pervious = 0.351 ac 63.54% Impervious = 0.612 ac

Summary for Subcatchment 20S: 313+85 TO 317+90 CENTER

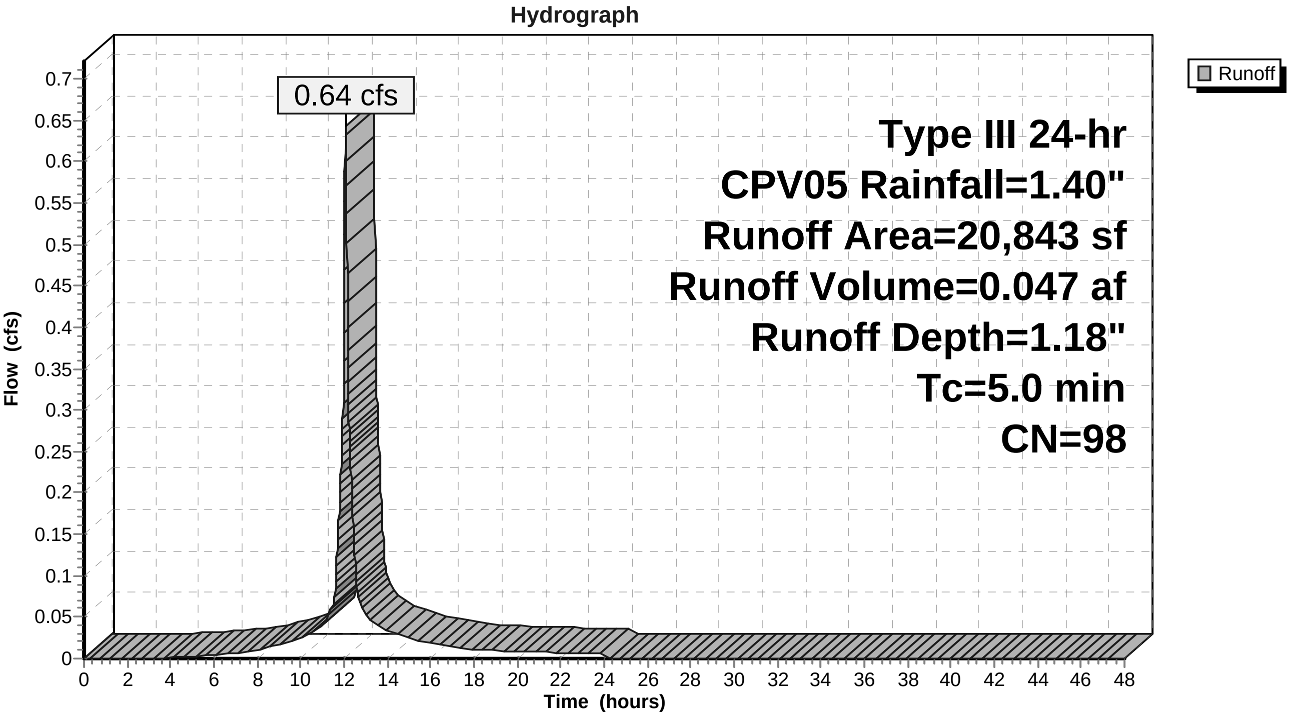
Runoff = 0.64 cfs @ 12.07 hrs, Volume= 0.047 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV05 Rainfall=1.40"

	Area (sf)	CN	Description
*	20,843	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	20,843	98	Weighted Average
	20,843		100.00% Impervious Area

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

Subcatchment 20S: 313+85 TO 317+90 CENTER



Summary for Subcatchment USF5: STA313+00 RIGHT

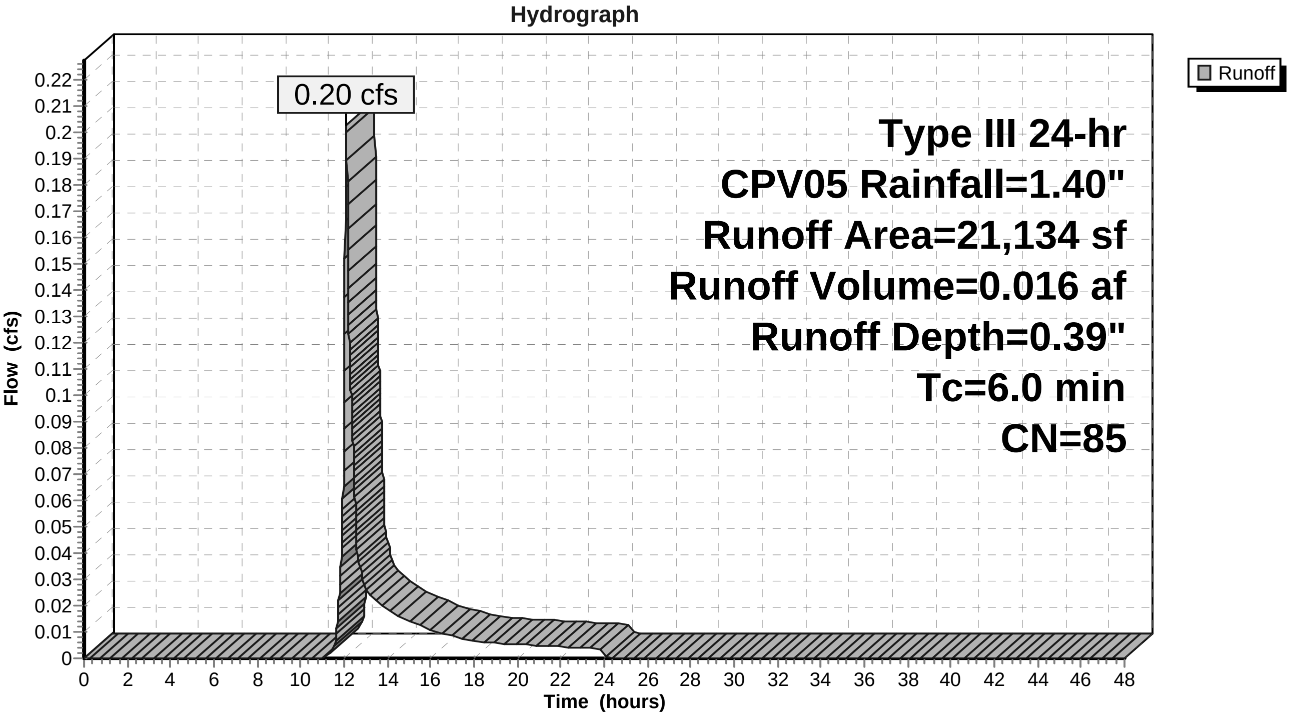
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV05 Rainfall=1.40"

	Area (sf)	CN	Description
	15,303	80	>75% Grass cover, Good, HSG D
*	5,831	98	MTA CORRIDOR
	21,134	85	Weighted Average
	15,303		72.41% Pervious Area
	5,831		27.59% Impervious Area

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

Subcatchment USF5: STA313+00 RIGHT



Summary for Pond USF5P: STA313+00 RIGHT UDF

Inflow Area = 0.964 ac, 63.54% Impervious, Inflow Depth = 0.78" for CPV05 event
Inflow = 0.84 cfs @ 12.08 hrs, Volume= 0.063 af
Outflow = 0.03 cfs @ 15.95 hrs, Volume= 0.063 af, Atten= 97%, Lag= 232.3 min
Primary = 0.03 cfs @ 15.95 hrs, Volume= 0.063 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 115.60' @ 15.95 hrs Surf.Area= 2,822 sf Storage= 1,547 cf

Plug-Flow detention time= 525.8 min calculated for 0.063 af (100% of inflow)
Center-of-Mass det. time= 525.8 min (1,326.0 - 800.2)

Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	6,343 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

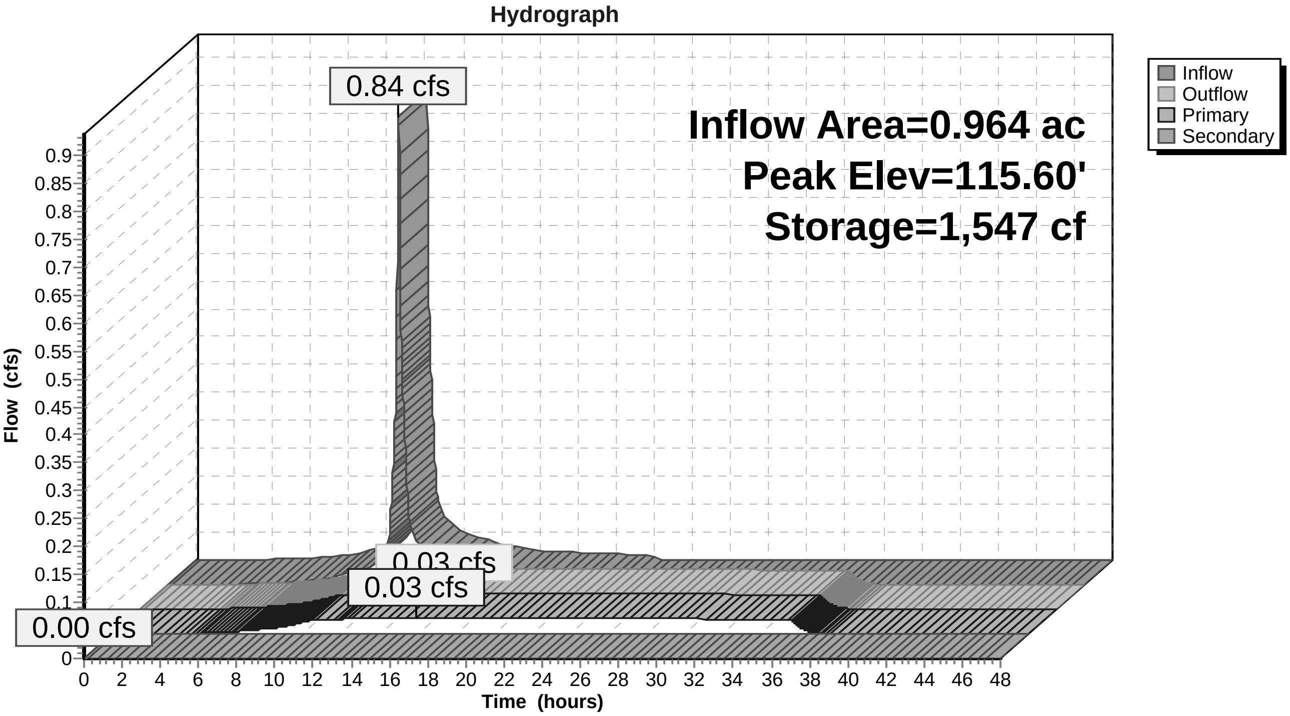
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	2,345	0	0
116.00	3,142	2,744	2,744
117.00	4,057	3,600	6,343

Device	Routing	Invert	Outlet Devices
#1	Primary	112.15'	**12.0" Round Outlet Pipe** L= 63.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 112.15' / 110.00' S= 0.0341 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	112.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	112.65'	**0.8" Vert. Orifice at OCS** C= 0.600
#4	Device 1	116.00'	**1.2" x 1.2" Horiz. Orifice/Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	117.00'	**112.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.03 cfs @ 15.95 hrs HW=115.60' (Free Discharge)
1=Outlet Pipe (Passes 0.03 cfs of 6.49 cfs potential flow)
  2=Header Pipe (Passes 0.03 cfs of 2.72 cfs potential flow)
    3=Orifice at OCS (Orifice Controls 0.03 cfs @ 8.22 fps)
  4=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.00' (Free Discharge)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond USF5P: STA313+00 RIGHT UDF



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SHEET NO. 1 OF 1
CALCULATED BY GJH DATE 2/10/2016
FILE NAME 14181 WQV CALCS_10-14-16.xlsx PRNT DATE 10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References 1. Maine DEP Chapter 500, Section 4.B.(2)(b)
a. "must detain a runoff volume equal to 1.0 inch times
the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"

2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter UDF#6, STA342+00 LEFT, LARGE ADMIN FILTER

Landscaped Area	74,938.00	SF	1.720	ac
Impervious Area	28,182.00	SF	0.647	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	74,938.00	SF	Area	1,498.8	SF	
Total Impervious Area	28,182.00	SF	Area	1,409.1	SF	
		Required Minimum Surface Area		2,907.9	SF	
		Provided Surface Area		3,067.0	SF	105.47%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

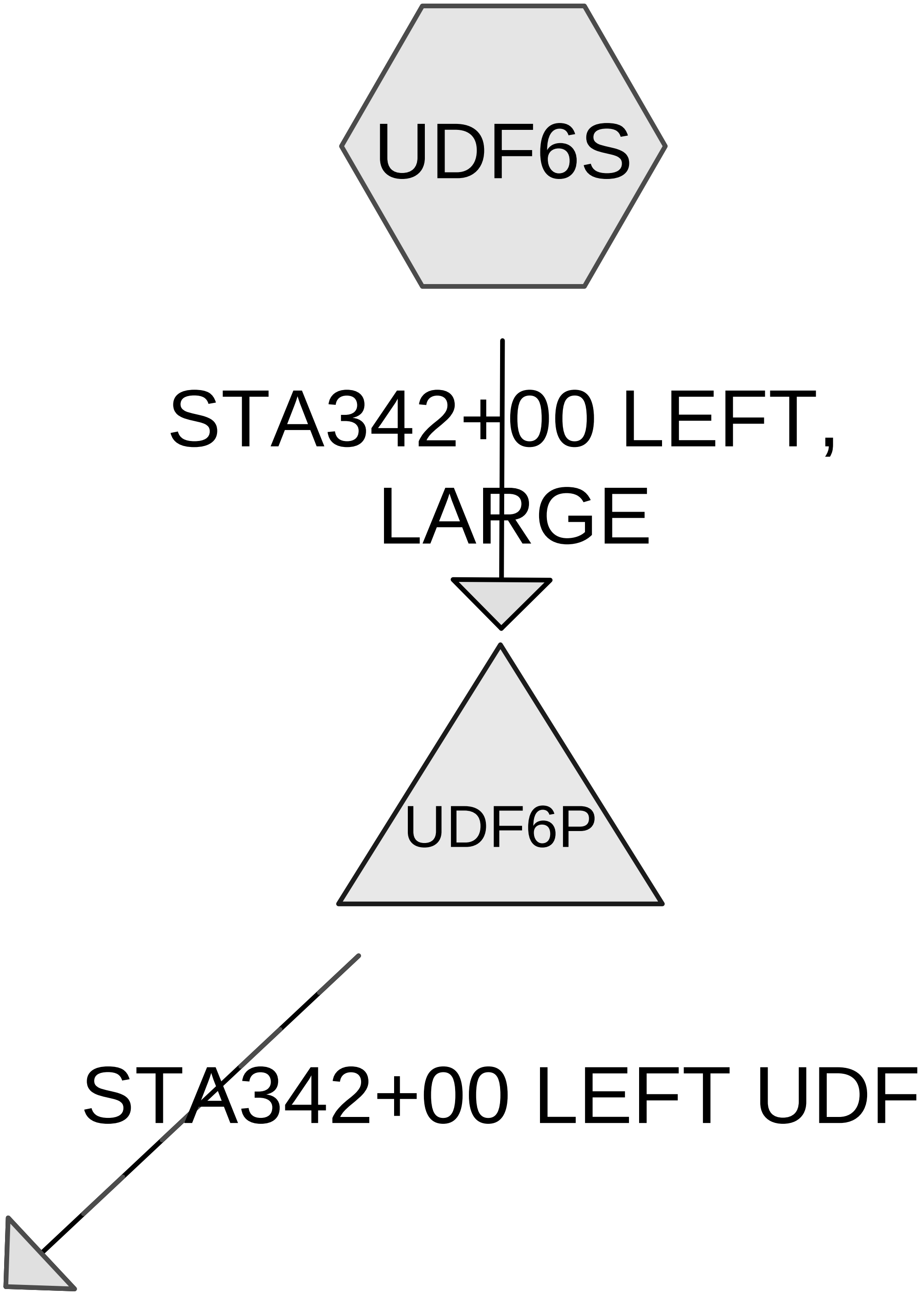
Landscaped Area	74,938.00	SF	Volume	2,497.9				
Impervious Area	28,182.00	SF	Volume	2,348.5				
		CPV Required		4,846.4	CF	0.111	AF	
		Provided CPV		5,048.0	CF	(Elevation 161.00 to 162.40)		104.16%

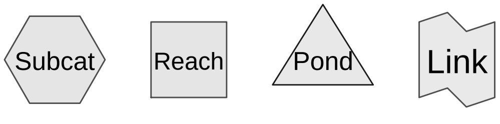
Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	28,182.00	SF					
Sediment Volume	32	CF					
Provided	205	CF	6	Inch Deep Forebay	with area of	409	sf





Routing Diagram for 14181_8.8POST_STA300-STA350 _10-14-16
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.720	80	>75% Grass cover, Good, HSG D (UDF6S)
0.647	98	MTA CORRIDOR (UDF6S)
2.367	**85**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment UDF6S: STA342+00 LEFT, LARGE Runoff Area=103,120 sf 27.33% Impervious Runoff Depth=0.56"
Tc=6.0 min CN=85 Runoff=1.49 cfs 0.111 af

Pond UDF6P: STA342+00 LEFT UDF Peak Elev=161.80' Storage=2,700 cf Inflow=1.49 cfs 0.111 af
Primary=0.07 cfs 0.111 af Secondary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.111 af

Total Runoff Area = 2.367 ac Runoff Volume = 0.111 af Average Runoff Depth = 0.56"
72.67% Pervious = 1.720 ac 27.33% Impervious = 0.647 ac

Summary for Subcatchment UDF6S: STA342+00 LEFT, LARGE

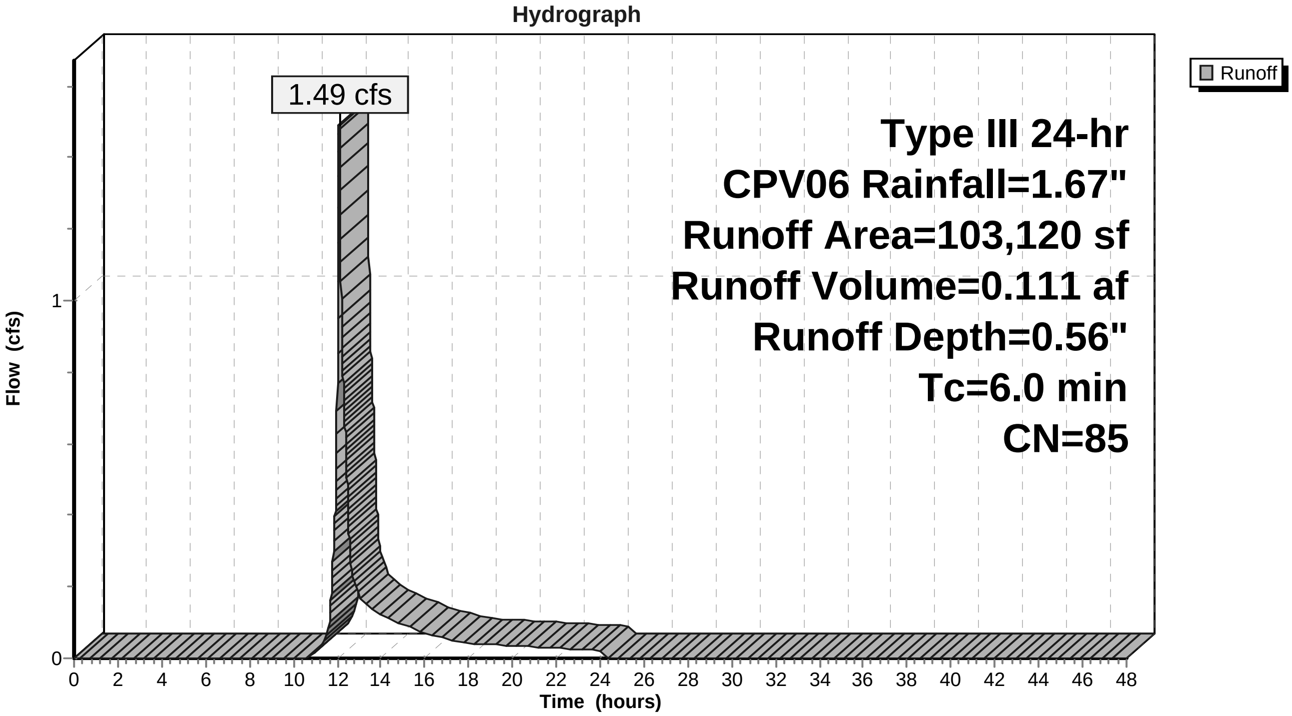
Runoff = 1.49 cfs @ 12.10 hrs, Volume= 0.111 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV06 Rainfall=1.67"

	Area (sf)	CN	Description
	74,938	80	>75% Grass cover, Good, HSG D
*	28,182	98	MTA CORRIDOR
	103,120	85	Weighted Average
	74,938		72.67% Pervious Area
	28,182		27.33% Impervious Area

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

Subcatchment UDF6S: STA342+00 LEFT, LARGE



Summary for Pond UDF6P: STA342+00 LEFT UDF

Inflow Area = 2.367 ac, 27.33% Impervious, Inflow Depth = 0.56" for CPV06 event
Inflow = 1.49 cfs @ 12.10 hrs, Volume= 0.111 af
Outflow = 0.07 cfs @ 16.04 hrs, Volume= 0.111 af, Atten= 96%, Lag= 236.5 min
Primary = 0.07 cfs @ 16.04 hrs, Volume= 0.111 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 161.80' @ 16.04 hrs Surf.Area= 3,676 sf Storage= 2,700 cf

Plug-Flow detention time= 453.2 min calculated for 0.111 af (100% of inflow)
Center-of-Mass det. time= 453.2 min (1,312.9 - 859.7)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	18,832 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

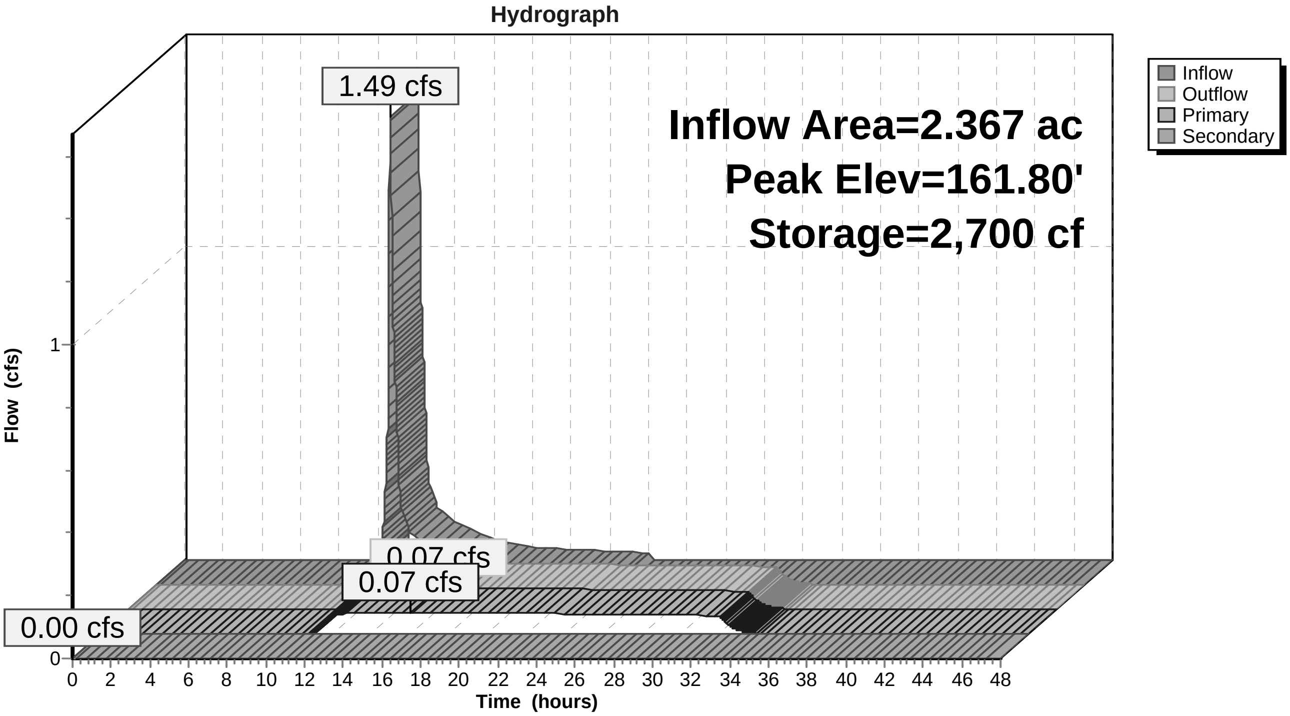
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.00	3,067	0	0
162.00	3,828	3,448	3,448
163.00	4,689	4,259	7,706
164.00	5,549	5,119	12,825
165.00	6,465	6,007	18,832

Device	Routing	Invert	Outlet Devices
#1	Primary	158.15'	**12.0" Round Outlet Pipe** L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.15' / 157.99' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	158.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	158.65'	**1.2" Vert. Orifice at OCS** C= 0.600
#4	Device 1	163.00'	**1.2" x 1.2" Horiz. Catch Basin Grate** X 49 rows C= 0.600 Limited to weir flow at low heads
#5	Secondary	164.50'	**12.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.07 cfs @ 16.04 hrs HW=161.80' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.07 cfs of 6.71 cfs potential flow)
  ├─**2=Header Pipe** (Passes 0.07 cfs of 2.82 cfs potential flow)
  │ └─**3=Orifice at OCS** (Orifice Controls 0.07 cfs @ 8.48 fps)
  └─**4=Catch Basin Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UDF6P: STA342+00 LEFT UDF



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CALCULATED BY	GJH	DATE	2/10/2016
FILE NAME	14181 WQV CALCS_10-14-16.xlsx	PRNT DATE	10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter UDF#7, STA342+50, SMALL ADMIN

Landscaped Area	9,891.00	SF		0.227	ac
Impervious Area	18,376.00	SF	342.00	0.422	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	9,891.00	SF	Area	197.8	SF
Total Impervious Area	18,376.00	SF	Area	918.8	SF

Required Minimum Surface Area 1,116.6 SF

Provided Surface Area 1,266.0 SF 113.38%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	9,891.00	SF	Volume	329.7
Impervious Area	18,376.00	SF	Volume	1,531.3

CPV Required 1,861.0 CF 0.043 AF

Provided CPV 1,898.0 CF (Elevation 162.00 to 163.10) 101.99%

Sediment Pre-Treatment

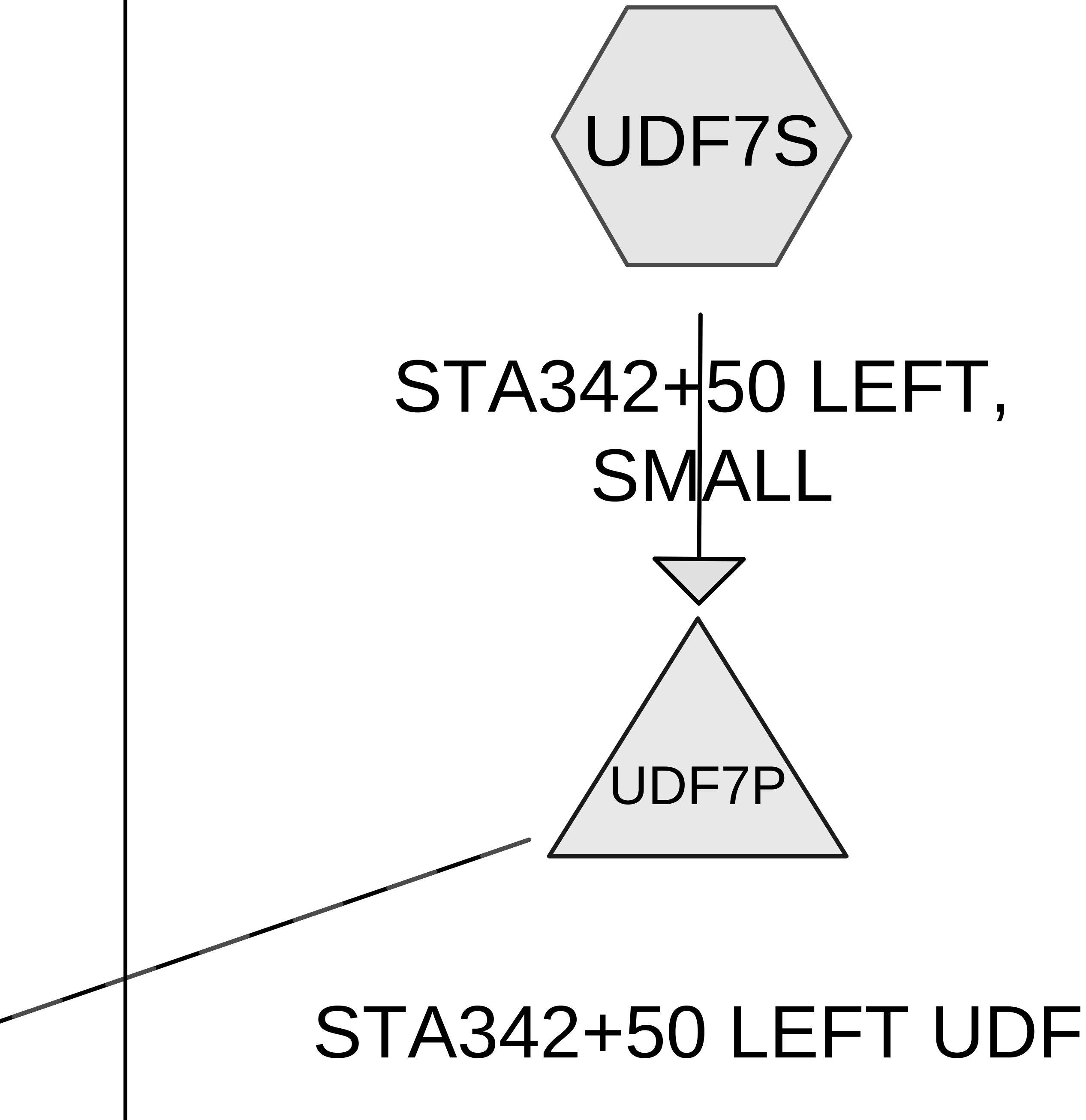
Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

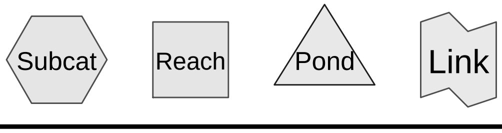
Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded: 18,376.00 SF

Sediment Volume 21 CF

Provided 205 CF 6 Inch Deep Forebay with area of 409 sf





Routing Diagram for 14181_8.8POST_STA300-STA350 _10-14-16
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.227	80	>75% Grass cover, Good, HSG D (UDF7S)
0.422	98	MTA CORRIDOR (UDF7S)
0.649	**92**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment UDF7S: STA342+50 LEFT, SMALL Runoff Area=28,267 sf 65.01% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=92 Runoff=0.61 cfs 0.043 af

Pond UDF7P: STA342+50 LEFT UDF Peak Elev=162.75' Storage=1,095 cf Inflow=0.61 cfs 0.043 af
Primary=0.02 cfs 0.043 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.043 af

Total Runoff Area = 0.649 ac Runoff Volume = 0.043 af Average Runoff Depth = 0.80"
34.99% Pervious = 0.227 ac 65.01% Impervious = 0.422 ac

Summary for Subcatchment UDF7S: STA342+50 LEFT, SMALL

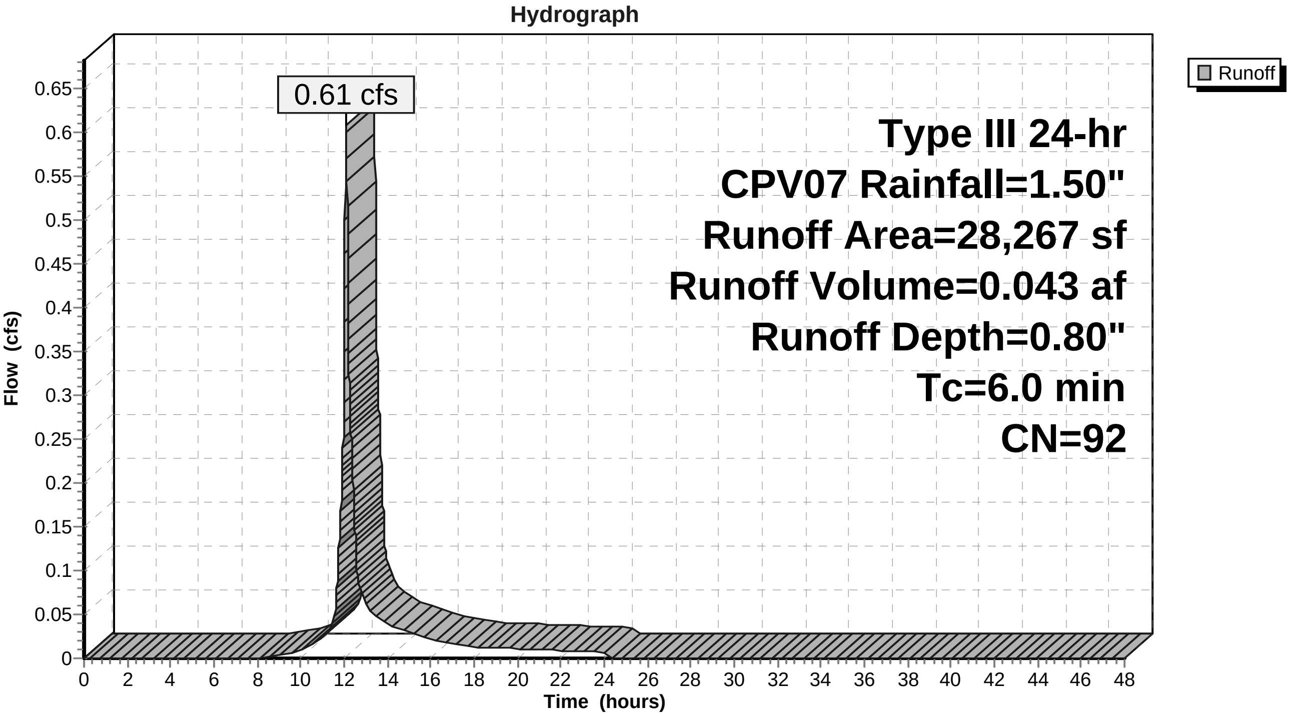
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 0.043 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr CPV07 Rainfall=1.50"

	Area (sf)	CN	Description
	9,891	80	>75% Grass cover, Good, HSG D
*	18,376	98	MTA CORRIDOR
	28,267	92	Weighted Average
	9,891		34.99% Pervious Area
	18,376		65.01% Impervious Area

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

Subcatchment UDF7S: STA342+50 LEFT, SMALL



Summary for Pond UDF7P: STA342+50 LEFT UDF

```
Inflow Area =      0.649 ac,  65.01% Impervious,  Inflow Depth =   0.80"   for  CPV07 event
Inflow      =      0.61 cfs @   12.09 hrs,  Volume=          0.043 af
Outflow     =      0.02 cfs @   15.90 hrs,  Volume=          0.043 af,  Atten= 96%,  Lag= 228.5 min
Primary     =      0.02 cfs @   15.90 hrs,  Volume=          0.043 af
Secondary =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 162.75' @ 15.90 hrs   Surf.Area= 1,636 sf   Storage= 1,095 cf

Plug-Flow detention time= 506.1 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 506.0 min ( 1,334.4 - 828.3 )

Volume       Invert     Avail.Storage   Storage Description
   #1        162.00'         3,705 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation       Surf.Area       Inc.Store       Cum.Store
    (feet)          (sq-ft)    (cubic-feet)    (cubic-feet)
    162.00           1,266               0               0
    163.00           1,756           1,511           1,511
    164.00           2,632           2,194           3,705

Device   Routing        Invert   Outlet Devices
   #1    Primary       159.15'   12.0"  Round Outlet Pipe   L= 15.0'   RCP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 159.15' / 159.00'   S= 0.0100 '/'   Cc= 0.900
                                 n= 0.013,  Flow Area= 0.79 sf
   #2    Device 1      159.65'   8.0" Vert. Header Pipe    C= 0.600
   #3    Device 2      159.65'   0.7" Vert. Orifice at OCS    C= 0.600
   #4    Device 1      163.25'   1.2" x 1.2" Horiz. Catch Basin Grate X 49.00    C= 0.600   Limited to weir flow at low heads
   #5    Secondary     163.75'   12.0' long  x 12.0' 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)  2.57  2.62  2.70  2.67  2.66  2.67  2.66  2.64

Primary OutFlow  Max=0.02 cfs @ 15.90 hrs  HW=162.75'   (Free Discharge)
└─1=Outlet Pipe  (Passes 0.02 cfs of 6.66 cfs potential flow)
  ├─2=Header Pipe  (Passes 0.02 cfs of 2.80 cfs potential flow)
  │ └─3=Orifice at OCS  (Orifice Controls 0.02 cfs @ 8.44 fps)
  └─4=Catch Basin Grate  ( Controls 0.00 cfs)

Secondary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=162.00'   (Free Discharge)
└─5=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
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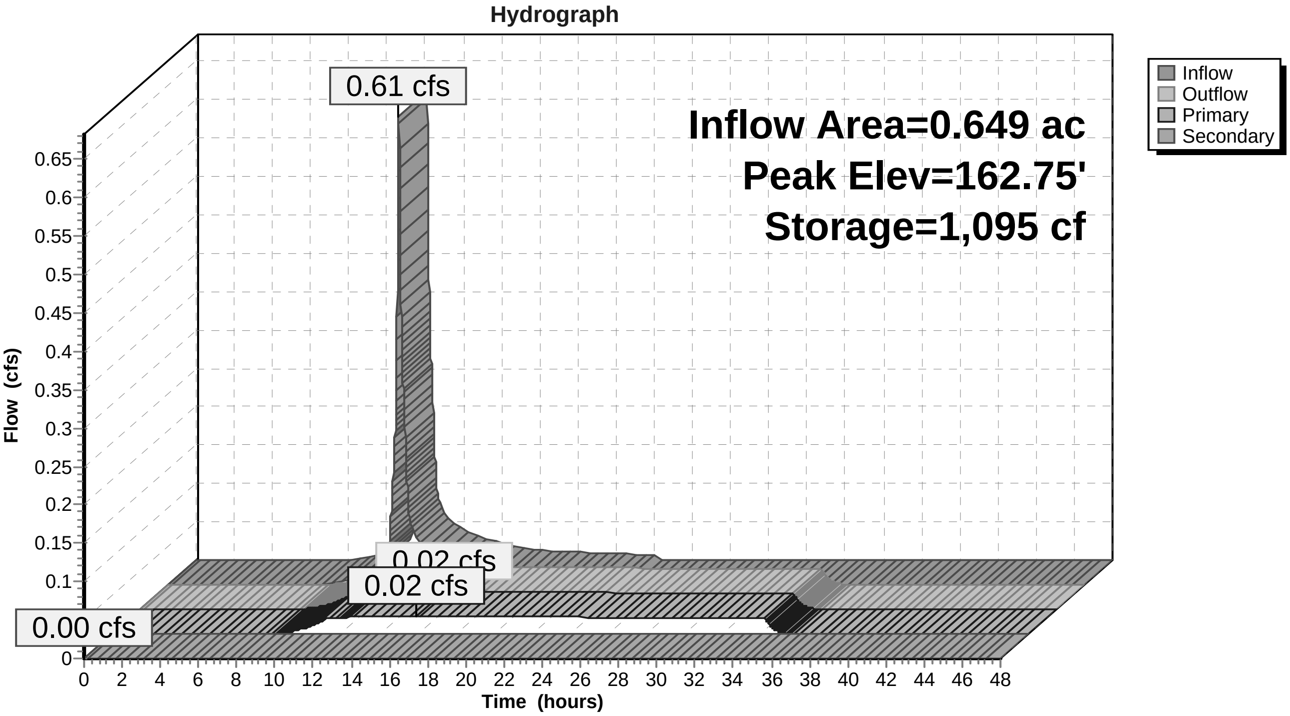
Pond UDF7P: STA342+50 LEFT UDF



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FILE NAME	14181 WQV CALCS_10-14-16.xlsx	PRNT DATE	10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References 1. Maine DEP Chapter 500, Section 4.B.(2)(b)
a. "must detain a runoff volume equal to 1.0 inch times
the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"

2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter UDF#8, STA 353+50, RIGHT

Landscaped Area	13,250.00	SF		0.304	ac
Impervious Area	73,650.00	SF		1.691	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	13,250.00	SF	Area	265.0	SF	
Total Impervious Area	73,650.00	SF	Area	3,682.5	SF	
Required Minimum Surface Area				3,947.5	SF	
Provided Surface Area				2,523.0	SF	63.91%

Channel Protection Volume (CPV) 2,258.0 45160 1.036731

Required (0.4" X Landscaped + 1.0" X Impervious)

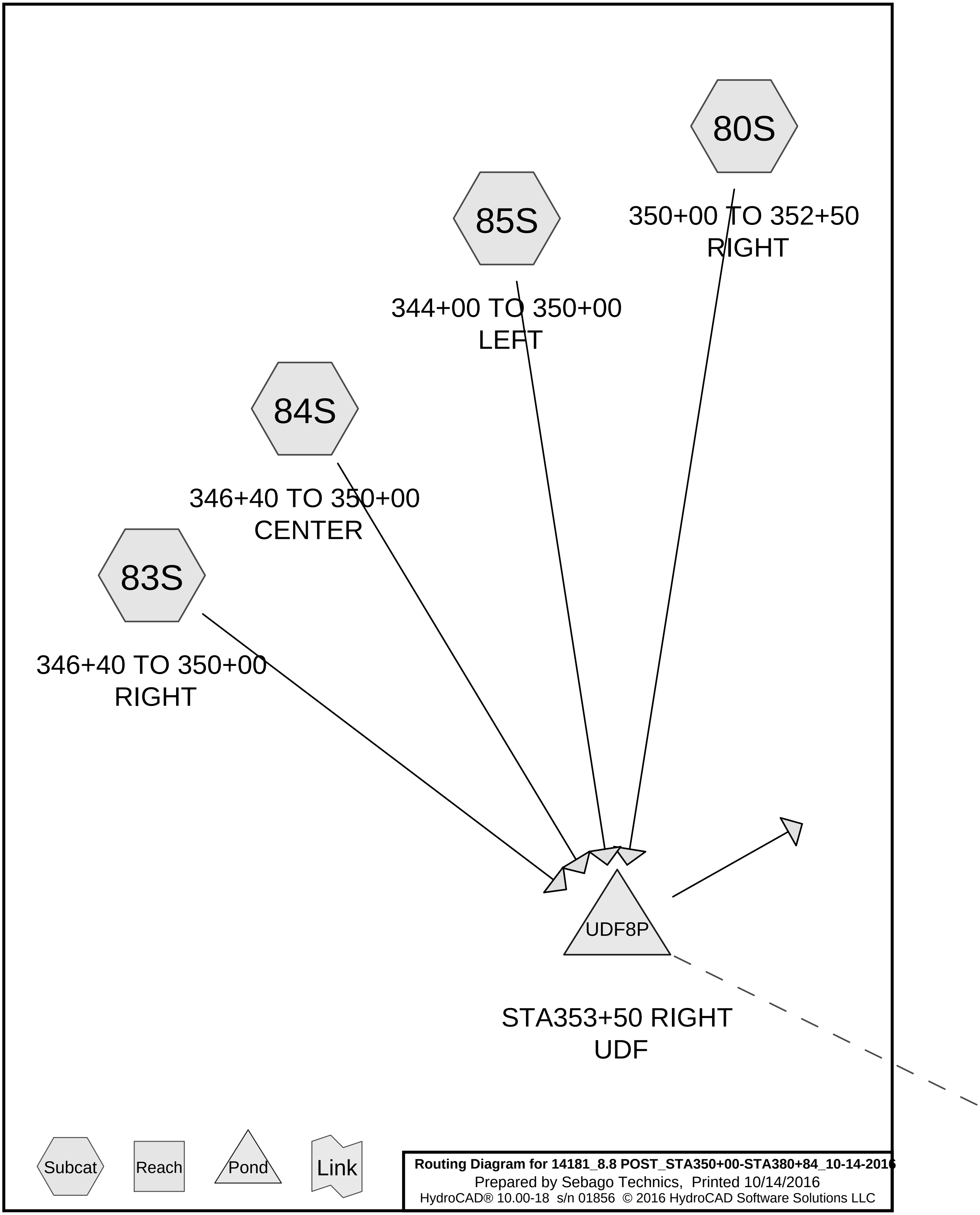
Landscaped Area	13,250.00	SF	Volume	441.7			
Impervious Area	73,650.00	SF	Volume	6,137.5			
		CPV Required		6,579.2	CF	0.151 AF	
		Provided CPV		4,393.0	CF	(Elevation 145.00 to 146.50)	66.77%

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	73,650.00	SF					
Sediment Volume	85	CF					
Provided	52	CF	6	Inch Deep Forebay	with area of	104	sf



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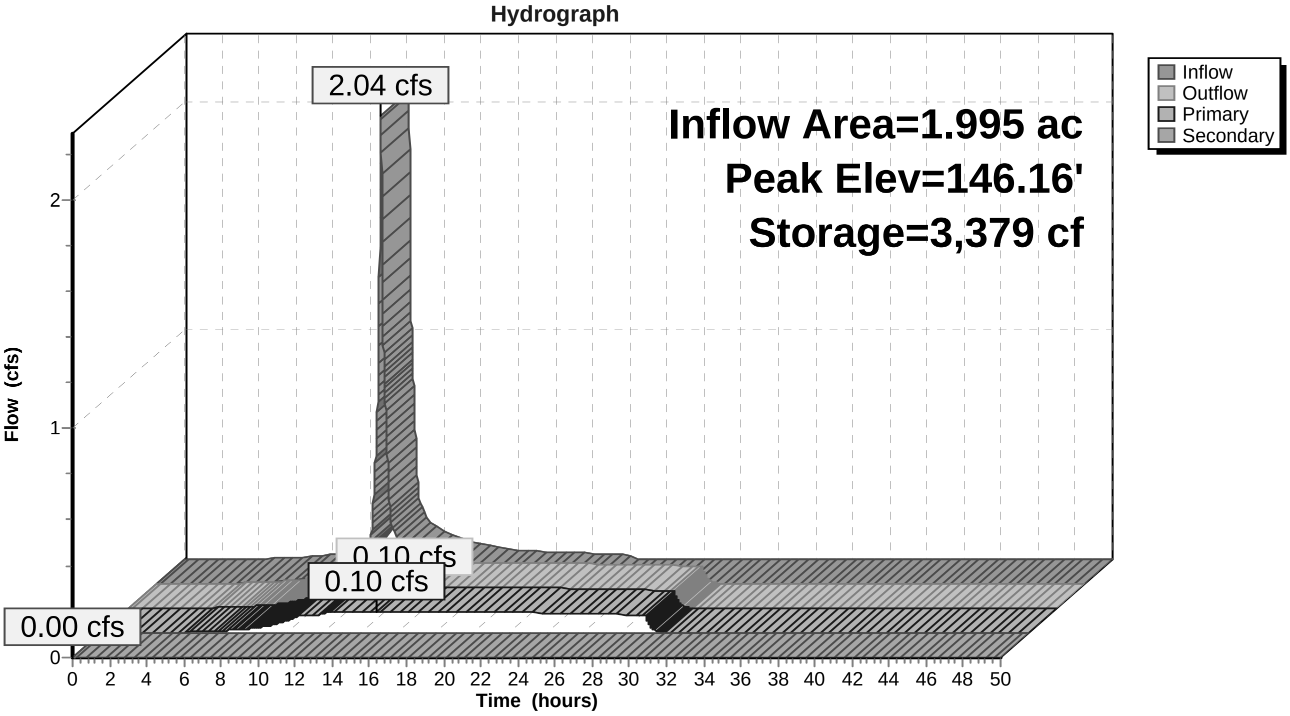
Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.304	80	>75% Grass cover, Good, HSG D (83S)
1.179	98	Paved 346+50 - 350+00 (83S, 84S, 85S)
0.240	98	Paved 350+00 - 3352+50 (80S)
0.272	98	paved (83S)
1.995	**95**	**TOTAL AREA**

Pond UDF8P: STA353+50 RIGHT UDF



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FILE NAME	14181 WQV CALCS_10-14-16.xlsx	PRNT DATE	10/14/2016

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References 1. Maine DEP Chapter 500, Section 4.B.(2)(b)
a. "must detain a runoff volume equal to 1.0 inch times
the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"

2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter UDF#9, STA 355+00

Landscaped Area	5,900.00	SF	0.135	ac
Impervious Area	48,000.00	SF	1.102	ac

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	5,900.00	SF	Area	118.0	SF	
Total Impervious Area	48,000.00	SF	Area	2,400.0	SF	
			Required Minimum Surface Area	2,518.0	SF	
			Provided Surface Area	2,621.0	SF	104.09%

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

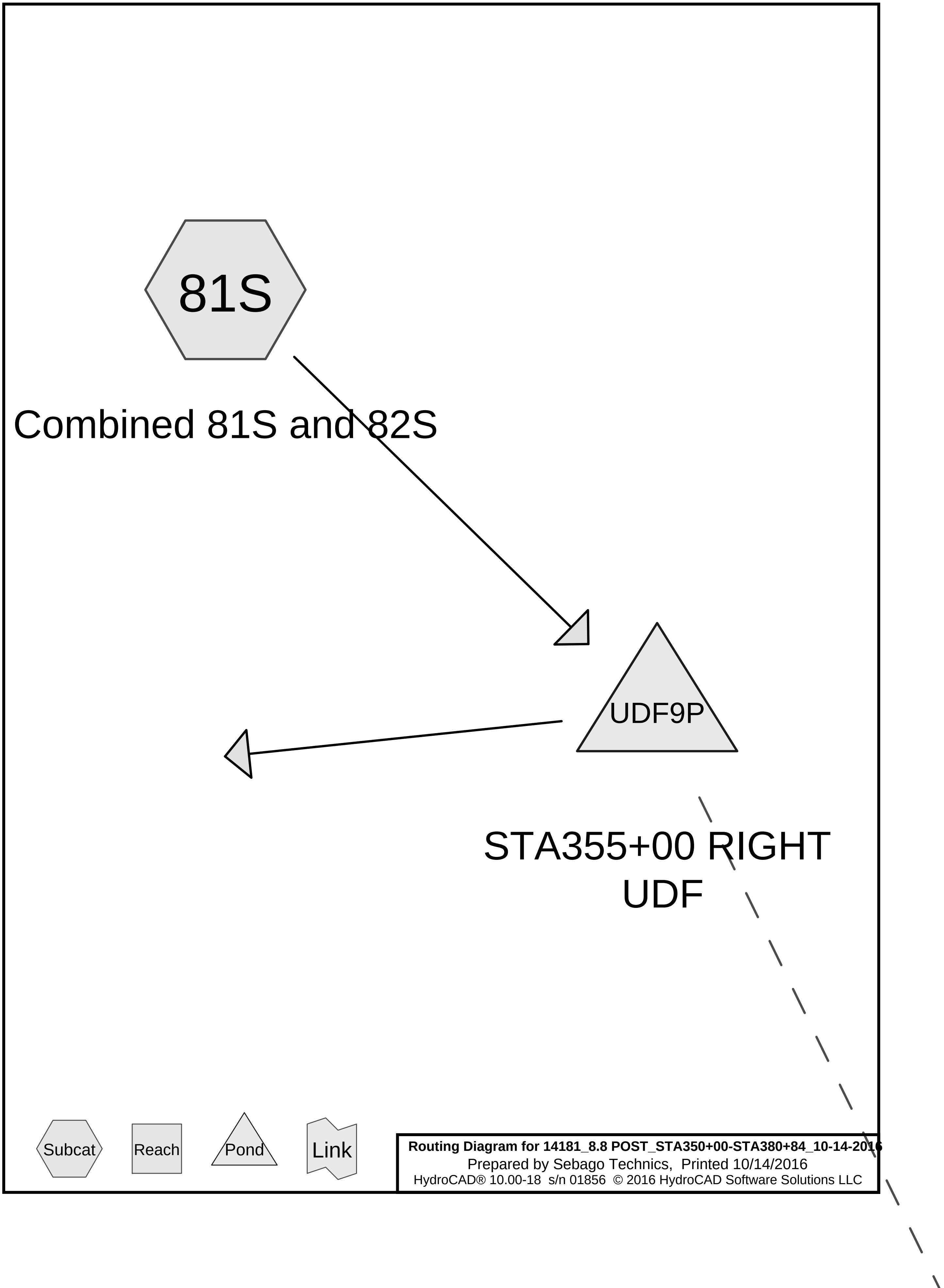
Landscaped Area	5,900.00	SF	Volume	196.7				
Impervious Area	48,000.00	SF	Volume	4,000.0				
			CPV Required	4,196.7	CF	0.096	AF	
			Provided CPV	4,333.0	CF	(Elevation 145.00 to 146.50)		103.25%

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	48,000.00	SF					
Sediment Volume	55	CF					
Provided	52	CF	6	Inch Deep Forebay	with area of	104	sf



Routing Diagram for 14181_8.8 POST_STA350+00-STA380+84_10-14-2016
Prepared by Sebago Technics, Printed 10/14/2016

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.135	80	>75% Grass cover, Good, HSG D (81S)
0.646	98	PAVED (81S)
0.468	98	PAVED- 82S (81S)
1.249	**96**	**TOTAL AREA**

Summary for Pond UDF9P: STA355+00 RIGHT UDF

Inflow Area = 1.249 ac, 89.15% Impervious, Inflow Depth = 0.94" for CPV08 event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 0.05 cfs @ 15.73 hrs, Volume= 0.098 af, Atten= 97%, Lag= 218.3 min
Primary = 0.05 cfs @ 15.73 hrs, Volume= 0.098 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 145.91' @ 15.73 hrs Surf.Area= 2,925 sf Storage= 2,519 cf

Plug-Flow detention time= 536.6 min calculated for 0.098 af (100% of inflow)
Center-of-Mass det. time= 536.7 min (1,339.4 - 802.7)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	10,439 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

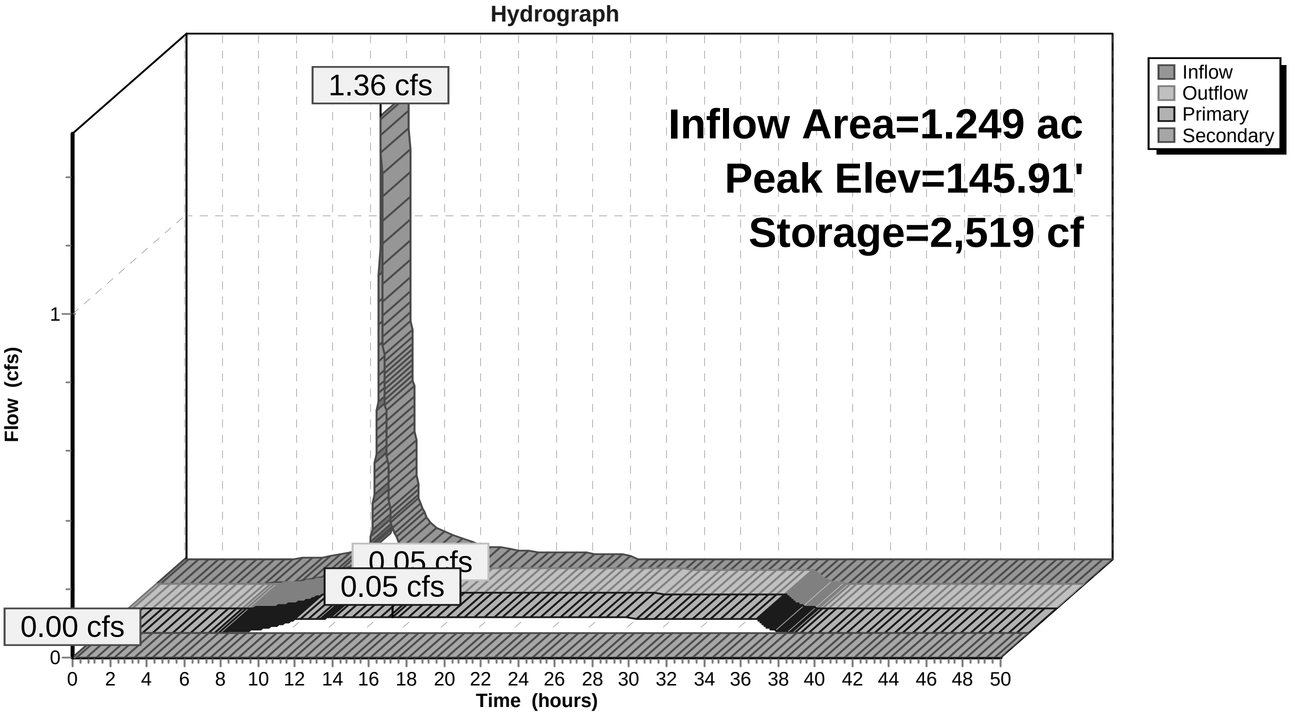
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	2,621	0	0
146.00	2,956	2,789	2,789
147.00	3,486	3,221	6,010
148.00	5,373	4,430	10,439

Device	Routing	Invert	Outlet Devices
#1	Primary	141.43'	**18.0" Round Outlet Pipe** L= 17.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 141.43' / 141.00' S= 0.0253 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	142.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	142.65'	**1.0" Vert. Orifice at OCS** C= 0.600
#4	Device 1	146.00'	**1.2" W x 1.2" H Vert. Catch Basin Grate X 49.00** C= 0.600
#5	Secondary	146.75'	**20.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.05 cfs @ 15.73 hrs HW=145.91' (Free Discharge)
↑**1=Outlet Pipe** (Passes 0.05 cfs of 16.43 cfs potential flow)
  ↑**2=Header Pipe** (Passes 0.05 cfs of 2.87 cfs potential flow)
    ↑**3=Orifice at OCS** (Orifice Controls 0.05 cfs @ 8.64 fps)
  4=Catch Basin Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)
↑**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UDF9P: STA355+00 RIGHT UDF

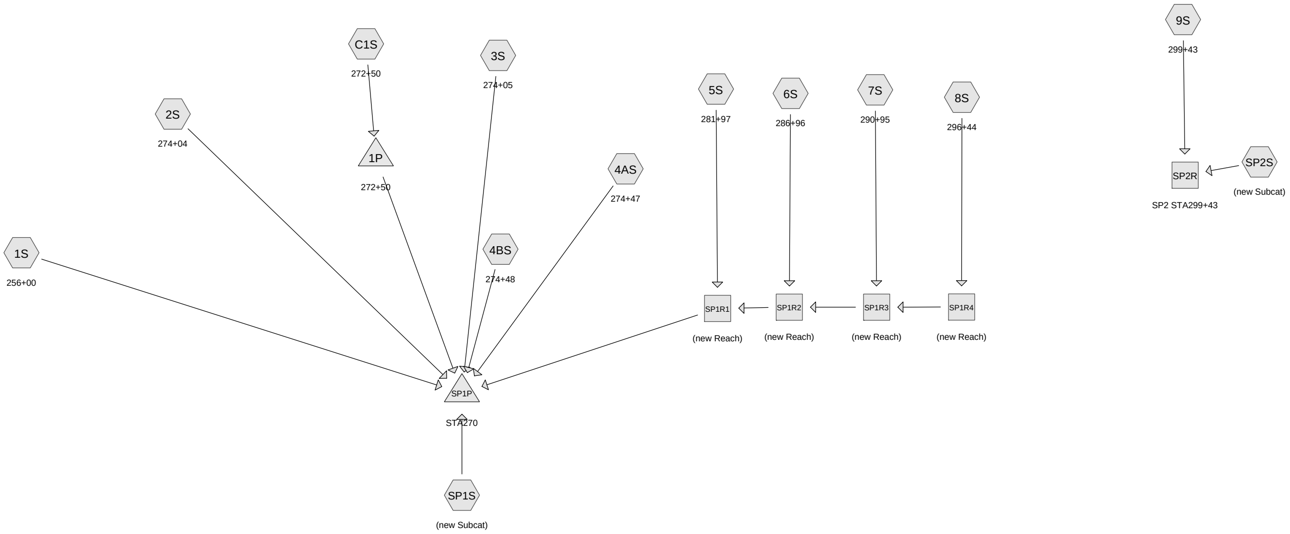


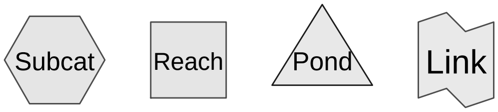
Appendix 3

HydroCAD Output
Pre-Development and
Post-Development Models

PREDEVELOPMENT

Mile 7.3





Routing Diagram for 14181_7.3 PRE revised_10-14-16
Prepared by Sebago Technics, Printed 10/14/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
32.545	98	(1S, 2S, 3S, 4AS, 4BS, 5S, 6S, 7S, 8S, 9S, C1S, SP1S, SP2S)
0.976	80	>75% Grass cover, Good, HSG D (2S, 4AS, 5S, 6S, 7S, 8S, 9S)
3.010	30	Brush, Good, HSG A (C1S)
6.913	48	Brush, Good, HSG B (SP1S)
6.515	65	Brush, Good, HSG C (C1S, SP1S, SP2S)
46.283	73	Brush, Good, HSG D (C1S, SP1S, SP2S)
6.610	30	Woods, Good, HSG A (C1S)
2.903	55	Woods, Good, HSG B (SP1S)
11.055	70	Woods, Good, HSG C (C1S, SP1S, SP2S)
240.656	77	Woods, Good, HSG D (C1S, SP1S, SP2S)
357.466	**76**	**TOTAL AREA**

Notes Listing (all nodes)

Line#	Node Number	Notes
1	SP1P	The outlet culvert is modeled as a 9-ft by 9-ft box. These dimensions have not been field verified.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 256+00	Runoff Area=20,700 sf 100.00% Impervious Runoff Depth=3.07" Tc=5.0 min CN=98 Runoff=1.58 cfs 0.121 af
Subcatchment 2S: 274+04	Runoff Area=7,769 sf 92.64% Impervious Runoff Depth=2.96" Tc=5.0 min CN=97 Runoff=0.58 cfs 0.044 af
Subcatchment 3S: 274+05	Runoff Area=1,056 sf 100.00% Impervious Runoff Depth=3.07" Tc=5.0 min CN=98 Runoff=0.08 cfs 0.006 af
Subcatchment 4AS: 274+47	Runoff Area=37,371 sf 72.03% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=2.56 cfs 0.182 af
Subcatchment 4BS: 274+48	Runoff Area=2,194 sf 100.00% Impervious Runoff Depth=3.07" Tc=5.0 min CN=98 Runoff=0.17 cfs 0.013 af
Subcatchment 5S: 281+97	Runoff Area=24,741 sf 69.54% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=1.69 cfs 0.120 af
Subcatchment 6S: 286+96	Runoff Area=19,949 sf 70.40% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=1.37 cfs 0.097 af
Subcatchment 7S: 290+95	Runoff Area=27,615 sf 71.11% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=1.89 cfs 0.134 af
Subcatchment 8S: 296+44	Runoff Area=15,034 sf 70.51% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=1.03 cfs 0.073 af
Subcatchment 9S: 299+43	Runoff Area=19,736 sf 71.47% Impervious Runoff Depth=2.54" Tc=5.0 min CN=93 Runoff=1.35 cfs 0.096 af
Subcatchment C1S: 272+50	Runoff Area=215.830 ac 7.66% Impervious Runoff Depth=1.22" Flow Length=3,413' Tc=62.6 min CN=76 Runoff=114.39 cfs 21.981 af
Subcatchment SP1S: (new Subcat)	Runoff Area=135.414 ac 9.12% Impervious Runoff Depth=1.22" Flow Length=1,660' Tc=16.2 min CN=76 Runoff=137.25 cfs 13.791 af
Subcatchment SP2S: (new Subcat)	Runoff Area=94,863 sf 26.77% Impervious Runoff Depth=1.22" Tc=5.0 min CN=76 Runoff=3.14 cfs 0.222 af
Reach SP1R1: (new Reach)	Avg. Flow Depth=0.42' Max Vel=2.22 fps Inflow=3.60 cfs 0.425 af n=0.035 L=394.0' S=0.0152 '/' Capacity=122.04 cfs Outflow=3.58 cfs 0.425 af
Reach SP1R2: (new Reach)	Avg. Flow Depth=0.32' Max Vel=2.60 fps Inflow=2.91 cfs 0.304 af n=0.035 L=461.0' S=0.0282 '/' Capacity=167.34 cfs Outflow=2.86 cfs 0.304 af
Reach SP1R3: (new Reach)	Avg. Flow Depth=0.17' Max Vel=1.75 fps Inflow=2.41 cfs 0.207 af n=0.035 L=440.0' S=0.0273 '/' Capacity=528.57 cfs Outflow=2.21 cfs 0.207 af

Reach SP1R4: (new Reach) Avg. Flow Depth=0.17' Max Vel=2.48 fps Inflow=1.03 cfs 0.073 af
n=0.035 L=611.0' S=0.0556 '/' Capacity=620.85 cfs Outflow=0.91 cfs 0.073 af

Reach SP2R: SP2 STA299+43 Avg. Flow Depth=0.14' Max Vel=2.23 fps Inflow=4.49 cfs 0.318 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=4.46 cfs 0.318 af

Pond 1P: 272+50 Peak Elev=39.14' Storage=107,610 cf Inflow=114.39 cfs 21.981 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=79.23 cfs 21.981 af

Pond SP1P: STA270 Peak Elev=38.20' Storage=588,093 cf Inflow=168.60 cfs 36.563 af
Primary=63.12 cfs 35.630 af Secondary=0.00 cfs 0.000 af Outflow=63.12 cfs 35.630 af

Total Runoff Area = 357.466 ac Runoff Volume = 36.881 af Average Runoff Depth = 1.24"
90.90% Pervious = 324.921 ac 9.10% Impervious = 32.545 ac

Summary for Subcatchment 1S: 256+00

Runoff = 1.58 cfs @ 12.07 hrs, Volume= 0.121 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	20,700	98	
	20,700		100.00% Impervious Area

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

Summary for Subcatchment 2S: 274+04

Runoff = 0.58 cfs @ 12.07 hrs, Volume= 0.044 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	7,197	98	
	572	80	>75% Grass cover, Good, HSG D
	7,769	97	Weighted Average
	572		7.36% Pervious Area
	7,197		92.64% Impervious Area

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

Summary for Subcatchment 3S: 274+05

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,056	98	
	1,056		100.00% Impervious Area

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

Summary for Subcatchment 4AS: 274+47

Runoff = 2.56 cfs @ 12.07 hrs, Volume= 0.182 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,920	98	
	10,451	80	>75% Grass cover, Good, HSG D
	37,371	93	Weighted Average
	10,451		27.97% Pervious Area
	26,920		72.03% Impervious Area

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

Summary for Subcatchment 4BS: 274+48

Runoff = 0.17 cfs @ 12.07 hrs, Volume= 0.013 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	2,194	98	
	2,194		100.00% Impervious Area

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

Summary for Subcatchment 5S: 281+97

Runoff = 1.69 cfs @ 12.07 hrs, Volume= 0.120 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	17,204	98	
	7,537	80	>75% Grass cover, Good, HSG D
	24,741	93	Weighted Average
	7,537		30.46% Pervious Area
	17,204		69.54% Impervious Area

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

Summary for Subcatchment 6S: 286+96

Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.097 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,044	98	
	5,905	80	>75% Grass cover, Good, HSG D
	19,949	93	Weighted Average
	5,905		29.60% Pervious Area
	14,044		70.40% Impervious Area

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

Summary for Subcatchment 7S: 290+95

Runoff = 1.89 cfs @ 12.07 hrs, Volume= 0.134 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	19,638	98	
	7,977	80	>75% Grass cover, Good, HSG D
	27,615	93	Weighted Average
	7,977		28.89% Pervious Area
	19,638		71.11% Impervious Area

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

Summary for Subcatchment 8S: 296+44

Runoff = 1.03 cfs @ 12.07 hrs, Volume= 0.073 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	10,600	98	
	4,434	80	>75% Grass cover, Good, HSG D
	15,034	93	Weighted Average
	4,434		29.49% Pervious Area
	10,600		70.51% Impervious Area

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

Summary for Subcatchment 9S: 299+43

Runoff = 1.35 cfs @ 12.07 hrs, Volume= 0.096 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,105	98	
	5,631	80	>75% Grass cover, Good, HSG D
	19,736	93	Weighted Average
	5,631		28.53% Pervious Area
	14,105		71.47% Impervious Area

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

Summary for Subcatchment C1S: 272+50

Runoff = 114.39 cfs @ 12.87 hrs, Volume= 21.981 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (ac)	CN	Description
16.540	98	
6.610	30	Woods, Good, HSG A
3.010	30	Brush, Good, HSG A
1.060	70	Woods, Good, HSG C
1.960	65	Brush, Good, HSG C
156.870	77	Woods, Good, HSG D
29.780	73	Brush, Good, HSG D
215.830	76	Weighted Average
199.290		92.34% Pervious Area
16.540		7.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	95	0.1111	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
6.5	583	0.0900	1.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	65	0.0600	1.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	316	0.0820	33.41	17,640.39	**Channel Flow, D-E** Area= 528.0 sf Perim= 24.0' r= 22.00' n= 0.100 Heavy timber, flow below branches
4.4	190	0.0210	0.72		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.9	259	0.0230	2.27		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
8.0	275	0.0130	0.57		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
16.2	1,219	0.0070	1.25		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
14.0	296	0.0050	0.35		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.6	115	0.0090	2.96	29.60	**Channel Flow, J-K** Area= 10.0 sf Perim= 20.0' r= 0.50' n= 0.030 Short grass
62.6	3,413	Total			

Summary for Subcatchment SP1S: (new Subcat)

Runoff = 137.25 cfs @ 12.23 hrs, Volume= 13.791 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	12.354	98	
	83.604	77	Woods, Good, HSG D
	9.530	70	Woods, Good, HSG C
	2.903	55	Woods, Good, HSG B
	16.352	73	Brush, Good, HSG D
	3.758	65	Brush, Good, HSG C
	6.913	48	Brush, Good, HSG B
	135.414	76	Weighted Average
	123.060		90.88% Pervious Area
	12.354		9.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	52	0.0860	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	74	0.0950	1.54		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	118	0.0170	0.65		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.7	86	0.0930	2.13		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0150	1.84		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
0.2	33	0.0050	3.21	2.52	**Pipe Channel, CMP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.5	249	0.0440	9.20	551.98	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=3.00' D=2.00' Z= 15.0 & 12.0 '/' Top.W=57.00' n= 0.035 Earth, dense weeds
1.7	343	0.0150	3.41	260.91	**Trap/Vee/Rect Channel Flow, H-I** Bot.W=9.00' D=1.00' Z= 75.0 & 60.0 '/' Top.W=144.00' n= 0.035 Earth, dense weeds
1.7	640	0.0210	6.40	179.30	**Trap/Vee/Rect Channel Flow, I-J** Bot.W=2.00' D=2.00' Z= 8.0 & 4.0 '/' Top.W=26.00' n= 0.035 Earth, dense weeds
16.2	1,660	Total			

Summary for Subcatchment SP2S: (new Subcat)

Runoff = 3.14 cfs @ 12.08 hrs, Volume= 0.222 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,391	98	
	6,568	73	Brush, Good, HSG D
	34,718	65	Brush, Good, HSG C
	7,912	77	Woods, Good, HSG D
	20,274	70	Woods, Good, HSG C
	94,863	76	Weighted Average
	69,472		73.23% Pervious Area
	25,391		26.77% Impervious Area

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

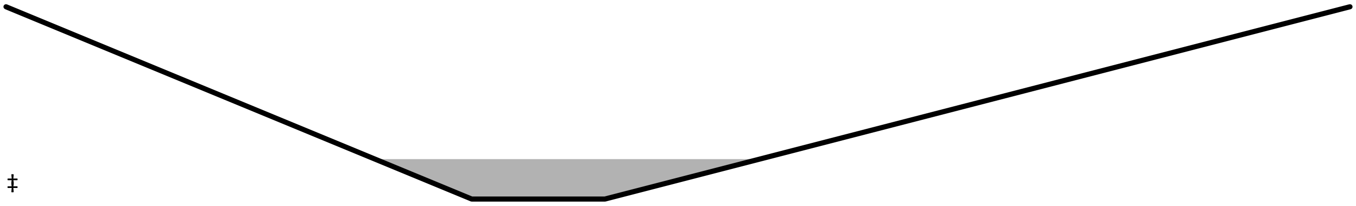
Summary for Reach SP1R1: (new Reach)

```
Inflow Area =       2.005 ac, 70.40% Impervious, Inflow Depth =   2.54"    for 02-YR event
Inflow      =       3.60 cfs @  12.23 hrs, Volume=          0.425 af
Outflow     =       3.58 cfs @  12.30 hrs, Volume=          0.425 af, Atten= 0%, Lag= 4.4 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 8.5 min

Peak Storage= 637 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 2.00' Flow Area= 22.2 sf, Capacity= 122.04 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.5 5.6 '/' Top Width= 20.20'
Length= 394.0' Slope= 0.0152 '/'
Inlet Invert= 48.00', Outlet Invert= 42.00'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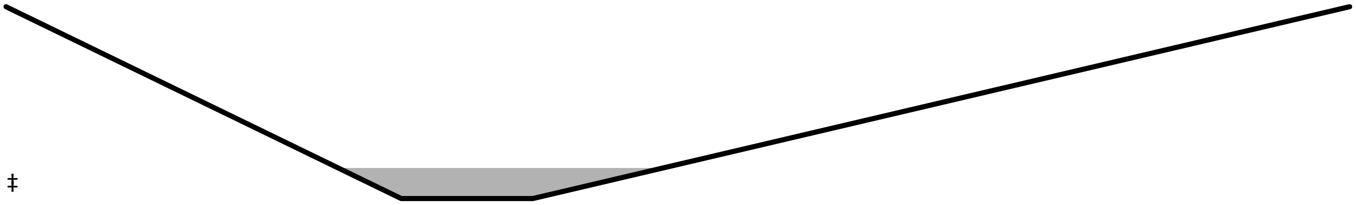
Summary for Reach SP1R2: (new Reach)

```
Inflow Area =       1.437 ac, 70.74% Impervious, Inflow Depth =   2.54"    for 02-YR event
Inflow      =       2.91 cfs @  12.18 hrs, Volume=          0.304 af
Outflow     =       2.86 cfs @  12.26 hrs, Volume=          0.304 af, Atten= 2%, Lag= 4.9 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.60 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 8.7 min

Peak Storage= 508 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 2.00' Flow Area= 22.4 sf, Capacity= 167.34 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 6.2 '/' Top Width= 20.40'
Length= 461.0' Slope= 0.0282 '/'
Inlet Invert= 61.00', Outlet Invert= 48.00'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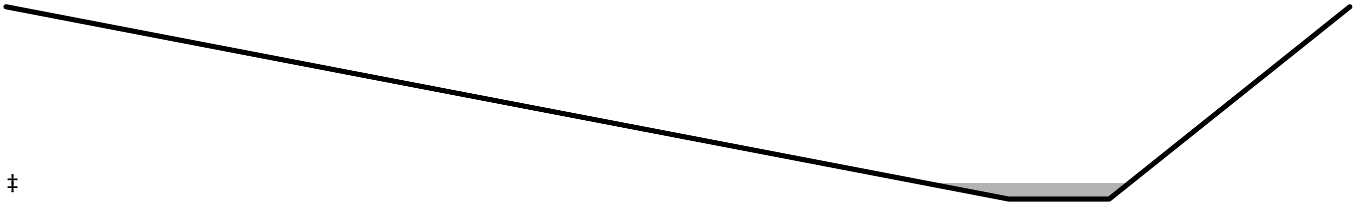
Summary for Reach SP1R3: (new Reach)

Inflow Area = 0.979 ac, 70.90% Impervious, Inflow Depth = 2.54" for 02-YR event
Inflow = 2.41 cfs @ 12.09 hrs, Volume= 0.207 af
Outflow = 2.21 cfs @ 12.21 hrs, Volume= 0.207 af, Atten= 8%, Lag= 7.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 12.0 min

Peak Storage= 556 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 72.0 sf, Capacity= 528.57 cfs

5.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 25.0 6.0 '/' Top Width= 67.00'
Length= 440.0' Slope= 0.0273 '/'
Inlet Invert= 73.00', Outlet Invert= 61.00'



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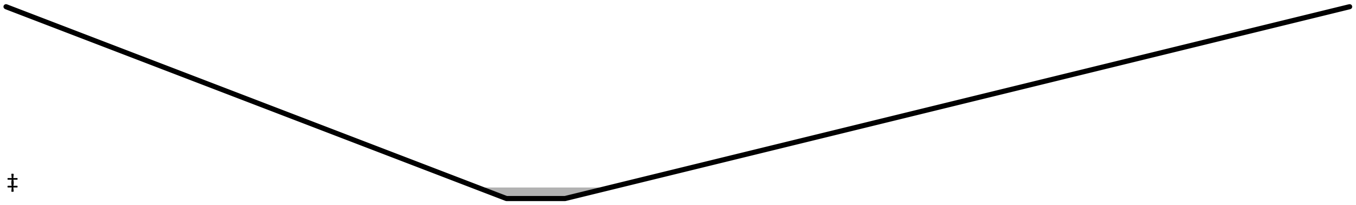
Summary for Reach SP1R4: (new Reach)

Inflow Area = 0.345 ac, 70.51% Impervious, Inflow Depth = 2.54" for 02-YR event
Inflow = 1.03 cfs @ 12.07 hrs, Volume= 0.073 af
Outflow = 0.91 cfs @ 12.18 hrs, Volume= 0.073 af, Atten= 12%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.48 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 10.3 min

Peak Storage= 223 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 3.00' Flow Area= 46.6 sf, Capacity= 620.85 cfs

1.30' x 3.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.7 5.8 '/' Top Width= 29.80'
Length= 611.0' Slope= 0.0556 '/'
Inlet Invert= 107.00', Outlet Invert= 73.00'



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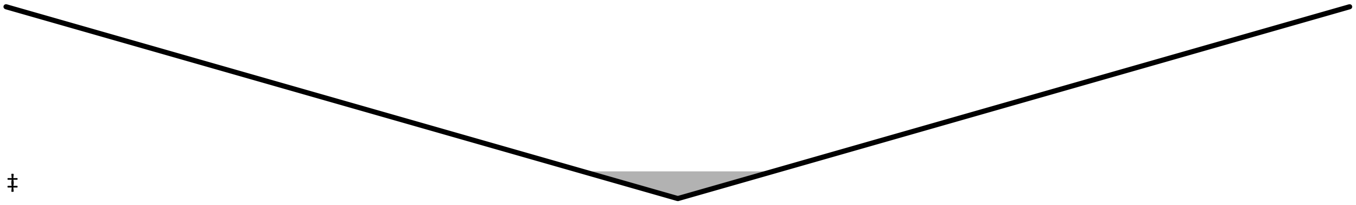
Summary for Reach SP2R: SP2 STA299+43

Inflow Area = 2.631 ac, 34.46% Impervious, Inflow Depth = 1.45" for 02-YR event
Inflow = 4.49 cfs @ 12.08 hrs, Volume= 0.318 af
Outflow = 4.46 cfs @ 12.09 hrs, Volume= 0.318 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 1.5 min

Peak Storage= 154 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 100.0 sf, Capacity= 820.11 cfs

0.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 100.0 '/' Top Width= 200.00'
Length= 77.0' Slope= 0.0940 '/'
Inlet Invert= 114.24', Outlet Invert= 107.00'



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Summary for Pond 1P: 272+50

Inflow Area = 215.830 ac, 7.66% Impervious, Inflow Depth = 1.22" for 02-YR event
Inflow = 114.39 cfs @ 12.87 hrs, Volume= 21.981 af
Outflow = 79.23 cfs @ 13.36 hrs, Volume= 21.981 af, Atten= 31%, Lag= 29.2 min
Primary = 79.23 cfs @ 13.36 hrs, Volume= 21.981 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 39.14' @ 13.36 hrs Surf.Area= 163,251 sf Storage= 107,610 cf

Plug-Flow detention time= 8.9 min calculated for 21.976 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (915.2 - 906.3)

Volume	Invert	Avail.Storage	Storage Description
#1	37.00'	1,813,588 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
37.00	2,863	918.2	0	0	2,863
38.00	26,586	2,276.7	12,724	12,724	348,255
39.00	134,675	3,072.1	73,699	86,424	686,822
40.00	393,337	4,851.0	252,723	339,147	1,808,426
41.00	742,346	5,944.1	558,682	897,829	2,747,466
42.00	1,100,908	6,521.2	915,758	1,813,588	3,319,958

Device	Routing	Invert	Outlet Devices
#1	Primary	34.89'	**54.0" Round Culvert** L= 185.9' Ke= 0.500 Inlet / Outlet Invert= 34.89' / 34.59' S= 0.0016 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 15.90 sf

Primary OutFlow Max=79.23 cfs @ 13.36 hrs HW=39.14' (Free Discharge)
↑**1=Culvert** (Barrel Controls 79.23 cfs @ 6.57 fps)

Summary for Pond SP1P: STA270

Inflow Area = 354.835 ac, 8.92% Impervious, Inflow Depth = 1.24" for 02-YR event
Inflow = 168.60 cfs @ 12.25 hrs, Volume= 36.563 af
Outflow = 63.12 cfs @ 14.52 hrs, Volume= 35.630 af, Atten= 63%, Lag= 136.5 min
Primary = 63.12 cfs @ 14.52 hrs, Volume= 35.630 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 38.20' @ 14.52 hrs Surf.Area= 538,648 sf Storage= 588,093 cf

Plug-Flow detention time= 156.7 min calculated for 35.623 af (97% of inflow)
Center-of-Mass det. time= 142.6 min (1,035.6 - 893.0)

Volume	Invert	Avail.Storage	Storage Description
#1	34.00'	7,139,730 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
34.00	25	20.0	0	0	25
35.00	25	20.0	25	25	45
36.00	63,877	2,213.0	21,722	21,747	389,735
37.00	234,622	3,974.0	140,307	162,054	1,256,762
38.00	436,029	4,766.0	330,166	492,220	1,807,620
39.00	1,068,655	9,433.0	729,100	1,221,320	7,080,964
40.00	1,853,982	9,172.0	1,443,404	2,664,724	7,467,497
41.00	2,208,027	10,197.0	2,028,428	4,693,152	9,047,396
42.00	2,693,152	10,069.0	2,446,578	7,139,730	9,254,072

Device	Routing	Invert	Outlet Devices
#1	Primary	36.23'	**108.0" W x 108.0" H Box Culvert** L= 37.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 36.23' / 36.14' S= 0.0024 '/' Cc= 0.900 n= 0.013, Flow Area= 81.00 sf
#2	Secondary	40.00'	**300.0' long x 22.0' 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

Primary OutFlow Max=63.10 cfs @ 14.52 hrs HW=38.20' (Free Discharge)
↑**1=Culvert** (Barrel Controls 63.10 cfs @ 4.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
32.545	98	(1S, 2S, 3S, 4AS, 4BS, 5S, 6S, 7S, 8S, 9S, C1S, SP1S, SP2S)
0.976	80	>75% Grass cover, Good, HSG D (2S, 4AS, 5S, 6S, 7S, 8S, 9S)
3.010	30	Brush, Good, HSG A (C1S)
6.913	48	Brush, Good, HSG B (SP1S)
6.515	65	Brush, Good, HSG C (C1S, SP1S, SP2S)
46.283	73	Brush, Good, HSG D (C1S, SP1S, SP2S)
6.610	30	Woods, Good, HSG A (C1S)
2.903	55	Woods, Good, HSG B (SP1S)
11.055	70	Woods, Good, HSG C (C1S, SP1S, SP2S)
240.656	77	Woods, Good, HSG D (C1S, SP1S, SP2S)
357.466	**76**	**TOTAL AREA**

Notes Listing (all nodes)

Line#	Node Number	Notes
1	SP1P	The outlet culvert is modeled as a 9-ft by 9-ft box. These dimensions have not been field verified.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 256+00 Runoff Area=20,700 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=2.36 cfs 0.185 af

Subcatchment 2S: 274+04 Runoff Area=7,769 sf 92.64% Impervious Runoff Depth=4.55"
Tc=5.0 min CN=97 Runoff=0.88 cfs 0.068 af

Subcatchment 3S: 274+05 Runoff Area=1,056 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.12 cfs 0.009 af

Subcatchment 4AS: 274+47 Runoff Area=37,371 sf 72.03% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=4.02 cfs 0.293 af

Subcatchment 4BS: 274+48 Runoff Area=2,194 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.25 cfs 0.020 af

Subcatchment 5S: 281+97 Runoff Area=24,741 sf 69.54% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.66 cfs 0.194 af

Subcatchment 6S: 286+96 Runoff Area=19,949 sf 70.40% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.15 cfs 0.156 af

Subcatchment 7S: 290+95 Runoff Area=27,615 sf 71.11% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.97 cfs 0.217 af

Subcatchment 8S: 296+44 Runoff Area=15,034 sf 70.51% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=1.62 cfs 0.118 af

Subcatchment 9S: 299+43 Runoff Area=19,736 sf 71.47% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.12 cfs 0.155 af

Subcatchment C1S: 272+50 Runoff Area=215.830 ac 7.66% Impervious Runoff Depth=2.45"
Flow Length=3,413' Tc=62.6 min CN=76 Runoff=237.79 cfs 44.126 af

Subcatchment SP1S: (new Subcat) Runoff Area=135.414 ac 9.12% Impervious Runoff Depth=2.45"
Flow Length=1,660' Tc=16.2 min CN=76 Runoff=285.34 cfs 27.685 af

Subcatchment SP2S: (new Subcat) Runoff Area=94,863 sf 26.77% Impervious Runoff Depth=2.45"
Tc=5.0 min CN=76 Runoff=6.48 cfs 0.445 af

Reach SP1R1: (new Reach) Avg. Flow Depth=0.53' Max Vel=2.54 fps Inflow=6.02 cfs 0.685 af
n=0.035 L=394.0' S=0.0152 '/' Capacity=122.04 cfs Outflow=5.96 cfs 0.685 af

Reach SP1R2: (new Reach) Avg. Flow Depth=0.41' Max Vel=2.98 fps Inflow=4.81 cfs 0.491 af
n=0.035 L=461.0' S=0.0282 '/' Capacity=167.34 cfs Outflow=4.73 cfs 0.491 af

Reach SP1R3: (new Reach) Avg. Flow Depth=0.22' Max Vel=2.01 fps Inflow=3.88 cfs 0.335 af
n=0.035 L=440.0' S=0.0273 '/' Capacity=528.57 cfs Outflow=3.61 cfs 0.335 af

Reach SP1R4: (new Reach) Avg. Flow Depth=0.22' Max Vel=2.83 fps Inflow=1.62 cfs 0.118 af
n=0.035 L=611.0' S=0.0556 '/' Capacity=620.85 cfs Outflow=1.45 cfs 0.118 af

Reach SP2R: SP2 STA299+43 Avg. Flow Depth=0.18' Max Vel=2.62 fps Inflow=8.61 cfs 0.600 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=8.56 cfs 0.600 af

Pond 1P: 272+50 Peak Elev=40.24' Storage=441,654 cf Inflow=237.79 cfs 44.126 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=107.97 cfs 44.126 af

Pond SP1P: STA270 Peak Elev=38.93' Storage=1,146,519 cf Inflow=340.87 cfs 73.070 af
Primary=100.49 cfs 72.135 af Secondary=0.00 cfs 0.000 af Outflow=100.49 cfs 72.135 af

Total Runoff Area = 357.466 ac Runoff Volume = 73.670 af Average Runoff Depth = 2.47"
90.90% Pervious = 324.921 ac 9.10% Impervious = 32.545 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 256+00 Runoff Area=20,700 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=2.99 cfs 0.236 af

Subcatchment 2S: 274+04 Runoff Area=7,769 sf 92.64% Impervious Runoff Depth=5.84"
Tc=5.0 min CN=97 Runoff=1.12 cfs 0.087 af

Subcatchment 3S: 274+05 Runoff Area=1,056 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.15 cfs 0.012 af

Subcatchment 4AS: 274+47 Runoff Area=37,371 sf 72.03% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=5.20 cfs 0.385 af

Subcatchment 4BS: 274+48 Runoff Area=2,194 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.32 cfs 0.025 af

Subcatchment 5S: 281+97 Runoff Area=24,741 sf 69.54% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=3.44 cfs 0.255 af

Subcatchment 6S: 286+96 Runoff Area=19,949 sf 70.40% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=2.77 cfs 0.205 af

Subcatchment 7S: 290+95 Runoff Area=27,615 sf 71.11% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=3.84 cfs 0.284 af

Subcatchment 8S: 296+44 Runoff Area=15,034 sf 70.51% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=2.09 cfs 0.155 af

Subcatchment 9S: 299+43 Runoff Area=19,736 sf 71.47% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=2.74 cfs 0.203 af

Subcatchment C1S: 272+50 Runoff Area=215.830 ac 7.66% Impervious Runoff Depth=3.55"
Flow Length=3,413' Tc=62.6 min CN=76 Runoff=345.96 cfs 63.909 af

Subcatchment SP1S: (new Subcat) Runoff Area=135.414 ac 9.12% Impervious Runoff Depth=3.55"
Flow Length=1,660' Tc=16.2 min CN=76 Runoff=415.00 cfs 40.097 af

Subcatchment SP2S: (new Subcat) Runoff Area=94,863 sf 26.77% Impervious Runoff Depth=3.55"
Tc=5.0 min CN=76 Runoff=9.41 cfs 0.645 af

Reach SP1R1: (new Reach) Avg. Flow Depth=0.61' Max Vel=2.74 fps Inflow=8.03 cfs 0.899 af
n=0.035 L=394.0' S=0.0152 '/' Capacity=122.04 cfs Outflow=7.96 cfs 0.899 af

Reach SP1R2: (new Reach) Avg. Flow Depth=0.47' Max Vel=3.22 fps Inflow=6.38 cfs 0.644 af
n=0.035 L=461.0' S=0.0282 '/' Capacity=167.34 cfs Outflow=6.28 cfs 0.644 af

Reach SP1R3: (new Reach) Avg. Flow Depth=0.25' Max Vel=2.17 fps Inflow=5.08 cfs 0.439 af
n=0.035 L=440.0' S=0.0273 '/' Capacity=528.57 cfs Outflow=4.76 cfs 0.439 af

Reach SP1R4: (new Reach) Avg. Flow Depth=0.25' Max Vel=3.04 fps Inflow=2.09 cfs 0.155 af
n=0.035 L=611.0' S=0.0556 '/' Capacity=620.85 cfs Outflow=1.89 cfs 0.155 af

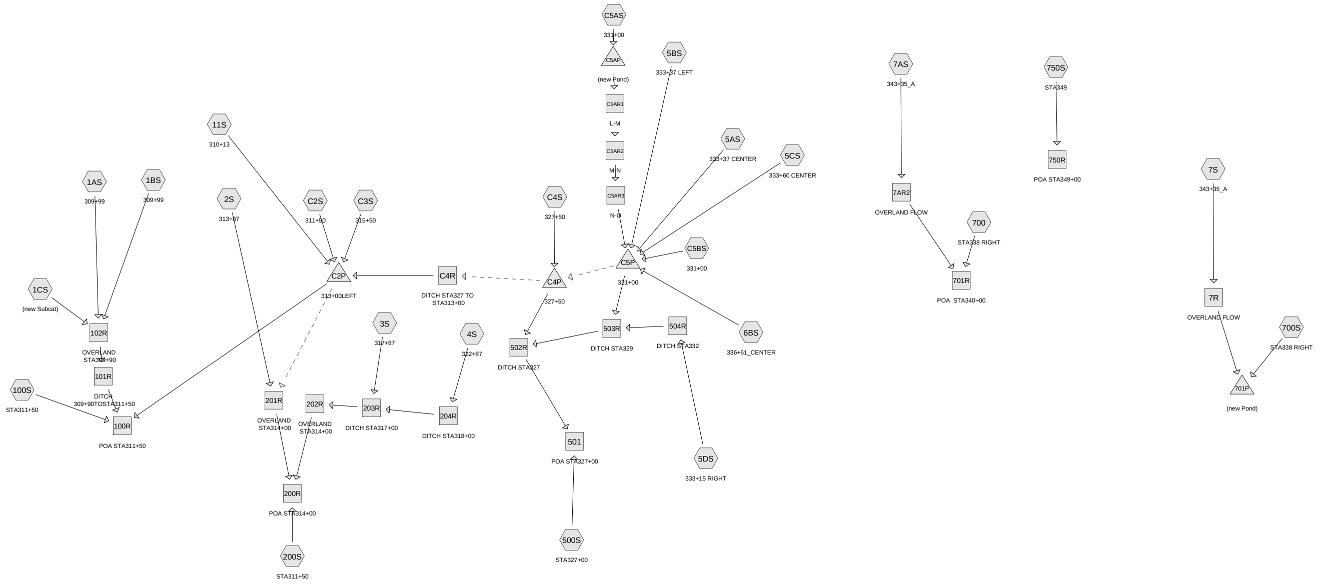
Reach SP2R: SP2 STA299+43 Avg. Flow Depth=0.21' Max Vel=2.86 fps Inflow=12.15 cfs 0.848 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=12.09 cfs 0.848 af

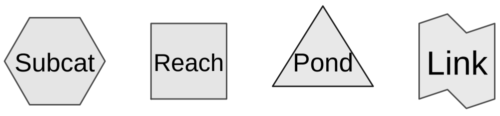
Pond 1P: 272+50 Peak Elev=40.91' Storage=830,895 cf Inflow=345.96 cfs 63.909 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=117.04 cfs 63.909 af

Pond SP1P: STA270 Peak Elev=39.30' Storage=1,577,210 cf Inflow=487.13 cfs 105.650 af
Primary=121.76 cfs 104.713 af Secondary=0.00 cfs 0.000 af Outflow=121.76 cfs 104.713 af

Total Runoff Area = 357.466 ac Runoff Volume = 106.498 af Average Runoff Depth = 3.58"
90.90% Pervious = 324.921 ac 9.10% Impervious = 32.545 ac

Mile 8.8, STA300+00 to STA350+00





Routing Diagram for 14181_8.8PRE_STA300-STA350 _10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
HydroCAD® 10.00-18 s/n 01856

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.144	98	(1CS, 2S, 3S, 4S, 5AS, 5BS, 5CS, 5DS, 6BS, 7AS, 7S, C2S, C4S, C5AS, C5BS)
1.584	80	>75% Grass cover, Good, HSG D (1AS, 1BS, 2S, 3S, 4S, 5AS, 5CS, 6BS, 7AS, 7S)
1.650	30	Brush, Good, HSG A (C2S)
25.164	73	Brush, Good, HSG D (100S, 200S, 500S, 700, 700S, 750S, C2S, C5AS, C5BS)
0.940	98	Impervious (C3S)
0.026	98	Paved (11S)
0.560	98	Paved 303+50-311+00 (1AS)
0.315	98	Paved 311+00-313+75 (1BS)
3.969	98	Pavement (100S, 500S, 700, 700S, 750S)
2.880	30	Woods, Good, HSG A (C2S)
201.410	77	Woods, Good, HSG D (100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS, C5BS)
1.330	98	pavement (200S)
253.972	**78**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1AS: 309+99 Runoff Area=34,148 sf 71.43% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=2.34 cfs 0.166 af

Subcatchment 1BS: 309+99 Runoff Area=19,128 sf 71.72% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=1.31 cfs 0.093 af

Subcatchment 1CS: (new Subcat) Runoff Area=3,895 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.30 cfs 0.023 af

Subcatchment 2S: 313+87 Runoff Area=19,851 sf 70.45% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=1.36 cfs 0.097 af

Subcatchment 3S: 317+87 Runoff Area=24,474 sf 70.25% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=1.68 cfs 0.119 af

Subcatchment 4S: 322+87 Runoff Area=27,080 sf 70.16% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=1.86 cfs 0.132 af

Subcatchment 5AS: 333+37 CENTER Runoff Area=25,898 sf 70.54% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=1.77 cfs 0.126 af

Subcatchment 5BS: 333+37 LEFT Runoff Area=1,340 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment 5CS: 333+60 CENTER Runoff Area=11,537 sf 60.61% Impervious Runoff Depth=2.35"
Tc=5.0 min CN=91 Runoff=0.74 cfs 0.052 af

Subcatchment 5DS: 333+15 RIGHT Runoff Area=1,431 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment 6BS: 336+61_CENTER Runoff Area=20,644 sf 63.34% Impervious Runoff Depth=2.35"
Tc=5.0 min CN=91 Runoff=1.33 cfs 0.093 af

Subcatchment 7AS: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=2.17"
Tc=5.0 min CN=89 Runoff=0.80 cfs 0.056 af

Subcatchment 7S: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=2.17"
Tc=5.0 min CN=89 Runoff=0.80 cfs 0.056 af

Subcatchment 11S: 310+13 Runoff Area=1,152 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment 100S: STA311+50 Runoff Area=2.060 ac 26.21% Impervious Runoff Depth=1.55"
Tc=5.0 min CN=81 Runoff=3.86 cfs 0.266 af

Subcatchment 200S: STA311+50 Runoff Area=3.670 ac 36.24% Impervious Runoff Depth=1.69"
Flow Length=640' Tc=5.0 min CN=83 Runoff=7.54 cfs 0.517 af

Subcatchment 500S: STA327+00	Runoff Area=5.830 ac 22.30% Impervious Runoff Depth=1.48" Flow Length=925' Tc=16.4 min CN=80 Runoff=7.31 cfs 0.719 af
Subcatchment 700: STA338 RIGHT	Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=1.41" Flow Length=575' Tc=22.4 min CN=79 Runoff=6.75 cfs 0.757 af
Subcatchment 700S: STA338 RIGHT	Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=1.41" Flow Length=575' Tc=22.4 min CN=79 Runoff=6.75 cfs 0.757 af
Subcatchment 750S: STA349	Runoff Area=1.503 ac 19.10% Impervious Runoff Depth=1.48" Flow Length=80' Tc=3.1 min CN=80 Runoff=2.87 cfs 0.185 af
Subcatchment C2S: 311+50	Runoff Area=144.070 ac 4.95% Impervious Runoff Depth=1.22" Flow Length=2,483' Tc=35.1 min CN=76 Runoff=105.01 cfs 14.673 af
Subcatchment C3S: 315+50	Runoff Area=3.010 ac 31.23% Impervious Runoff Depth=1.77" Flow Length=731' Tc=15.0 min CN=84 Runoff=4.71 cfs 0.443 af
Subcatchment C4S: 327+50	Runoff Area=8.040 ac 3.11% Impervious Runoff Depth=1.35" Flow Length=869' Tc=20.2 min CN=78 Runoff=8.34 cfs 0.903 af
Subcatchment C5AS: 331+00	Runoff Area=21.260 ac 5.03% Impervious Runoff Depth=1.35" Flow Length=423' Tc=10.2 min CN=78 Runoff=28.53 cfs 2.387 af
Subcatchment C5BS: 331+00	Runoff Area=46.670 ac 6.84% Impervious Runoff Depth=1.35" Flow Length=1,929' Tc=64.4 min CN=78 Runoff=27.01 cfs 5.239 af
Reach 7AR2: OVERLAND FLOW	Avg. Flow Depth=0.03' Max Vel=1.15 fps Inflow=0.80 cfs 0.056 af n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=0.75 cfs 0.056 af
Reach 7R: OVERLAND FLOW	Avg. Flow Depth=0.03' Max Vel=1.15 fps Inflow=0.80 cfs 0.056 af n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=0.75 cfs 0.056 af
Reach 100R: POA STA311+50	Inflow=53.44 cfs 16.221 af Outflow=53.44 cfs 16.221 af
Reach 101R: DITCH 309+90TOSTA311+50	Avg. Flow Depth=0.18' Max Vel=1.78 fps Inflow=3.93 cfs 0.282 af n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=3.82 cfs 0.282 af
Reach 102R: OVERLAND STA309+90	Avg. Flow Depth=0.07' Max Vel=2.54 fps Inflow=3.95 cfs 0.282 af n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=3.93 cfs 0.282 af
Reach 200R: POA STA314+00	Inflow=10.39 cfs 0.865 af Outflow=10.39 cfs 0.865 af
Reach 201R: OVERLAND STA314+00	Inflow=1.36 cfs 0.097 af Outflow=1.36 cfs 0.097 af
Reach 202R: OVERLAND STA314+00	Avg. Flow Depth=0.07' Max Vel=1.88 fps Inflow=2.80 cfs 0.251 af n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=2.72 cfs 0.251 af

Reach 203R: DITCH STA317+00
Avg. Flow Depth=0.25' Max Vel=2.37 fps Inflow=2.81 cfs 0.251 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=2.80 cfs 0.251 af

Reach 204R: DITCH STA318+00
Avg. Flow Depth=0.19' Max Vel=2.12 fps Inflow=1.86 cfs 0.132 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=1.66 cfs 0.132 af

Reach 501: POA STA327+00
Inflow=21.01 cfs 8.930 af
Outflow=21.01 cfs 8.930 af

Reach 502R: DITCH STA327
Avg. Flow Depth=0.79' Max Vel=2.83 fps Inflow=20.07 cfs 8.212 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=20.07 cfs 8.212 af

Reach 503R: DITCH STA329
Avg. Flow Depth=0.77' Max Vel=2.88 fps Inflow=19.58 cfs 7.860 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=19.57 cfs 7.860 af

Reach 504R: DITCH STA332
Avg. Flow Depth=0.04' Max Vel=0.38 fps Inflow=0.11 cfs 0.008 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=0.07 cfs 0.008 af

Reach 701R: POA STA340+00
Inflow=7.12 cfs 0.813 af
Outflow=7.12 cfs 0.813 af

Reach 750R: POA STA349+00
Inflow=2.87 cfs 0.185 af
Outflow=2.87 cfs 0.185 af

Reach C4R: DITCH STA327 TO STA313+00
Avg. Flow Depth=0.38' Max Vel=3.19 fps Inflow=5.09 cfs 0.551 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=4.81 cfs 0.551 af

Reach C5AR1: L-M
Avg. Flow Depth=0.15' Max Vel=0.17 fps Inflow=6.18 cfs 2.348 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=4.65 cfs 2.335 af

Reach C5AR2: M-N
Avg. Flow Depth=0.23' Max Vel=1.45 fps Inflow=4.65 cfs 2.335 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=4.65 cfs 2.335 af

Reach C5AR3: N-O
Avg. Flow Depth=0.45' Max Vel=7.59 fps Inflow=4.65 cfs 2.335 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=4.65 cfs 2.335 af

Pond 701P: (new Pond)
Peak Elev=143.58' Storage=304 cf Inflow=7.12 cfs 0.813 af
Primary=7.08 cfs 0.812 af Secondary=0.00 cfs 0.000 af Outflow=7.08 cfs 0.812 af

Pond C2P: 313+00LEFT
Peak Elev=112.08' Storage=170,900 cf Inflow=111.95 cfs 15.673 af
Primary=52.70 cfs 15.673 af Secondary=0.00 cfs 0.000 af Outflow=52.70 cfs 15.673 af

Pond C4P: 327+50
Peak Elev=146.01' Storage=0 cf Inflow=8.34 cfs 0.903 af
Primary=3.25 cfs 0.352 af Secondary=5.09 cfs 0.551 af Outflow=8.34 cfs 0.903 af

Pond C5AP: (new Pond)
Peak Elev=182.92' Storage=37,717 cf Inflow=28.53 cfs 2.387 af
15.0" Round Culvert n=0.025 L=27.0' S=0.0100 '/' Outflow=6.18 cfs 2.348 af

Pond C5P: 331+00
Peak Elev=144.62' Storage=31,782 cf Inflow=27.38 cfs 7.852 af
Primary=19.57 cfs 7.852 af Secondary=0.00 cfs 0.000 af Outflow=19.57 cfs 7.852 af

Total Runoff Area = 253.972 ac Runoff Volume = 27.880 af Average Runoff Depth = 1.32"
91.62% Pervious = 232.688 ac 8.38% Impervious = 21.284 ac

Summary for Subcatchment 1AS: 309+99

Runoff = 2.34 cfs @ 12.07 hrs, Volume= 0.166 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	24,391	98	Paved 303+50-311+00
	9,757	80	>75% Grass cover, Good, HSG D
	34,148	93	Weighted Average
	9,757		28.57% Pervious Area
	24,391		71.43% Impervious Area

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

Summary for Subcatchment 1BS: 309+99

Runoff = 1.31 cfs @ 12.07 hrs, Volume= 0.093 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	13,718	98	Paved 311+00-313+75
	5,410	80	>75% Grass cover, Good, HSG D
	19,128	93	Weighted Average
	5,410		28.28% Pervious Area
	13,718		71.72% Impervious Area

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

Summary for Subcatchment 1CS: (new Subcat)

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	3,895	98	
	3,895		100.00% Impervious Area

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

Summary for Subcatchment 2S: 313+87

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.097 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	13,985	98	
	5,866	80	>75% Grass cover, Good, HSG D
	19,851	93	Weighted Average
	5,866		29.55% Pervious Area
	13,985		70.45% Impervious Area

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

Summary for Subcatchment 3S: 317+87

Runoff = 1.68 cfs @ 12.07 hrs, Volume= 0.119 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	17,193	98	
	7,281	80	>75% Grass cover, Good, HSG D
	24,474	93	Weighted Average
	7,281		29.75% Pervious Area
	17,193		70.25% Impervious Area

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

Summary for Subcatchment 4S: 322+87

Runoff = 1.86 cfs @ 12.07 hrs, Volume= 0.132 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	18,999	98	
	8,081	80	>75% Grass cover, Good, HSG D
	27,080	93	Weighted Average
	8,081		29.84% Pervious Area
	18,999		70.16% Impervious Area

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

Summary for Subcatchment 5AS: 333+37 CENTER

Runoff = 1.77 cfs @ 12.07 hrs, Volume= 0.126 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	18,269	98	
	7,629	80	>75% Grass cover, Good, HSG D
	25,898	93	Weighted Average
	7,629		29.46% Pervious Area
	18,269		70.54% Impervious Area

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

Summary for Subcatchment 5BS: 333+37 LEFT

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,340	98	
	1,340		100.00% Impervious Area

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

Summary for Subcatchment 5CS: 333+60 CENTER

Runoff = 0.74 cfs @ 12.07 hrs, Volume= 0.052 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	6,992	98	
	4,545	80	>75% Grass cover, Good, HSG D
	11,537	91	Weighted Average
	4,545		39.39% Pervious Area
	6,992		60.61% Impervious Area

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

Summary for Subcatchment 5DS: 333+15 RIGHT

Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,431	98	
	1,431		100.00% Impervious Area

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

Summary for Subcatchment 6BS: 336+61_CENTER

Runoff = 1.33 cfs @ 12.07 hrs, Volume= 0.093 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	13,076	98	
	7,568	80	>75% Grass cover, Good, HSG D
	20,644	91	Weighted Average
	7,568		36.66% Pervious Area
	13,076		63.34% Impervious Area

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

Summary for Subcatchment 7AS: 343+35_A

Runoff = 0.80 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	6,943	98	
	6,437	80	>75% Grass cover, Good, HSG D
	13,380	89	Weighted Average
	6,437		48.11% Pervious Area
	6,943		51.89% Impervious Area

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

Summary for Subcatchment 7S: 343+35_A

Runoff = 0.80 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	6,943	98	
	6,437	80	>75% Grass cover, Good, HSG D
	13,380	89	Weighted Average
	6,437		48.11% Pervious Area
	6,943		51.89% Impervious Area

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

Summary for Subcatchment 11S: 310+13

Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,152	98	Paved
	1,152		100.00% Impervious Area

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

Summary for Subcatchment 100S: STA311+50

Runoff = 3.86 cfs @ 12.08 hrs, Volume= 0.266 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.540	98	Pavement
	0.620	73	Brush, Good, HSG D
	0.900	77	Woods, Good, HSG D
	2.060	81	Weighted Average
	1.520		73.79% Pervious Area
	0.540		26.21% Impervious Area

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

Summary for Subcatchment 200S: STA311+50

Runoff = 7.54 cfs @ 12.08 hrs, Volume= 0.517 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.330	98	pavement
	1.180	73	Brush, Good, HSG D
	1.160	77	Woods, Good, HSG D
	3.670	83	Weighted Average
	2.340		63.76% Pervious Area
	1.330		36.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	30	0.1500	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	590	0.0300	13.83	2,455.21	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=5.00' Z= 5.0 & 8.0 '/' Top.W=68.00' n= 0.035 Earth, dense weeds
0.6					**Direct Entry,**
5.0	640	Total			

Summary for Subcatchment 500S: STA327+00

Runoff = 7.31 cfs @ 12.23 hrs, Volume= 0.719 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.300	98	Pavement
	1.950	73	Brush, Good, HSG D
	2.580	77	Woods, Good, HSG D
	5.830	80	Weighted Average
	4.530		77.70% Pervious Area
	1.300		22.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	90	0.0900	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
4.1	360	0.0440	1.47		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.7	475	0.0060	4.66	279.49	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=5.00' D=3.00' Z= 5.0 '/' Top.W=35.00' n= 0.035 Earth, dense weeds
16.4	925	Total			

Summary for Subcatchment 700: STA338 RIGHT

Runoff = 6.75 cfs @ 12.32 hrs, Volume= 0.757 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	4.405	77	Woods, Good, HSG D
	1.109	73	Brush, Good, HSG D
*	0.921	98	Pavement
	6.435	79	Weighted Average
	5.514		85.69% Pervious Area
	0.921		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0250	0.13		**Sheet Flow, A-B**
					Grass: Dense n= 0.240 P2= 3.30"
7.1	300	0.0200	0.71		**Shallow Concentrated Flow, B-C**
					Woodland Kv= 5.0 fps
2.4	175	0.0600	1.22		**Shallow Concentrated Flow, C-D**
					Woodland Kv= 5.0 fps
22.4	575	Total			

Summary for Subcatchment 700S: STA338 RIGHT

Runoff = 6.75 cfs @ 12.32 hrs, Volume= 0.757 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	4.405	77	Woods, Good, HSG D
	1.109	73	Brush, Good, HSG D
*	0.921	98	Pavement
	6.435	79	Weighted Average
	5.514		85.69% Pervious Area
	0.921		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0250	0.13		**Sheet Flow, A-B**
					Grass: Dense n= 0.240 P2= 3.30"
7.1	300	0.0200	0.71		**Shallow Concentrated Flow, B-C**
					Woodland Kv= 5.0 fps
2.4	175	0.0600	1.22		**Shallow Concentrated Flow, C-D**
					Woodland Kv= 5.0 fps
22.4	575	Total			

Summary for Subcatchment 750S: STA349

Runoff = 2.87 cfs @ 12.05 hrs, Volume= 0.185 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	0.810	77	Woods, Good, HSG D
	0.406	73	Brush, Good, HSG D
*	0.287	98	Pavement
	1.503	80	Weighted Average
	1.216		80.90% Pervious Area
	0.287		19.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.1000	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.30"
0.3	50	0.2000	3.13		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
3.1	80	Total			

Summary for Subcatchment C2S: 311+50

Runoff = 105.01 cfs @ 12.52 hrs, Volume= 14.673 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	7.130	98	
	2.880	30	Woods, Good, HSG A
	1.650	30	Brush, Good, HSG A
	120.910	77	Woods, Good, HSG D
	11.500	73	Brush, Good, HSG D
	144.070	76	Weighted Average
	136.940		95.05% Pervious Area
	7.130		4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	29	0.0760	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	60	0.0333	1.28		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.4	115	0.0780	1.40		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
12.9	521	0.0020	0.67		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
0.8	120	0.0250	2.53	48.11	**Channel Flow, E-F** Area= 19.0 sf Perim= 29.0' r= 0.66' n= 0.070 Sluggish weedy reaches w/pools
0.3	113	0.0370	6.49	470.44	**Channel Flow, F-G** Area= 72.5 sf Perim= 129.0' r= 0.56' n= 0.030 Earth, grassed & winding
2.2	124	0.0040	0.95		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
6.1	361	0.0390	0.99		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
0.9	463	0.0713	9.00	413.84	**Channel Flow, I-J** Area= 46.0 sf Perim= 82.0' r= 0.56' n= 0.030 Earth, grassed & winding
3.2	123	0.0160	0.63		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.4	167	0.0540	7.25	65.26	**Channel Flow, K-L** Area= 9.0 sf Perim= 18.0' r= 0.50' n= 0.030 Earth, grassed & winding
1.5	287	0.0105	3.20	30.38	**Channel Flow, L-M** Area= 9.5 sf Perim= 19.0' r= 0.50' n= 0.030 Earth, grassed & winding
35.1	2,483	Total			

Summary for Subcatchment C3S: 315+50

Runoff = 4.71 cfs @ 12.21 hrs, Volume= 0.443 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.940	98	Impervious
	2.070	77	Woods, Good, HSG D
	0.000	73	Brush, Good, HSG D
	3.010	84	Weighted Average
	2.070		68.77% Pervious Area
	0.940		31.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	62	0.4840	0.26		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	101	0.0890	1.49		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	22	0.4090	3.20		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
9.8	546	0.0348	0.93		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
15.0	731	Total			

Summary for Subcatchment C4S: 327+50

Runoff = 8.34 cfs @ 12.28 hrs, Volume= 0.903 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.250	98	
	7.790	77	Woods, Good, HSG D
	8.040	78	Weighted Average
	7.790		96.89% Pervious Area
	0.250		3.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	28	0.0357	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	44	0.0909	1.51		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.4	128	0.0156	0.62		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	51	0.0980	1.57		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	24	0.2083	2.28		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.1	62	0.0323	0.90		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
0.5	62	0.1613	2.01		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.3	28	0.1071	1.64		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
0.5	30	0.0333	0.91		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.1	24	0.2917	2.70		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.3	27	0.1111	1.67		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
0.4	26	0.0385	0.98		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
0.5	68	0.2353	2.43		**Shallow Concentrated Flow, M-N** Woodland Kv= 5.0 fps
0.3	24	0.0833	1.44		**Shallow Concentrated Flow, N-O** Woodland Kv= 5.0 fps
0.4	52	0.1538	1.96		**Shallow Concentrated Flow, O-P** Woodland Kv= 5.0 fps
5.1	191	0.0157	0.63		**Shallow Concentrated Flow, P-Q** Woodland Kv= 5.0 fps
20.2	869	Total			

Summary for Subcatchment C5AS: 331+00

Runoff = 28.53 cfs @ 12.15 hrs, Volume= 2.387 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.070	98	
	17.680	77	Woods, Good, HSG D
	2.510	73	Brush, Good, HSG D
	21.260	78	Weighted Average
	20.190		94.97% Pervious Area
	1.070		5.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0750	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	81	0.9877	4.97		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
4.3	150	0.0133	0.58		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.8	79	0.1013	1.59		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	34	0.2059	2.27		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.6	55	0.1091	1.65		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
10.2	423	Total			

Summary for Subcatchment C5BS: 331+00

Runoff = 27.01 cfs @ 12.89 hrs, Volume= 5.239 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	3.190	98	
	38.700	77	Woods, Good, HSG D
	4.780	73	Brush, Good, HSG D
	46.670	78	Weighted Average
	43.480		93.16% Pervious Area
	3.190		6.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	36	0.0972	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.30"
3.6	166	0.0120	0.77		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.6	56	0.0893	1.49		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	83	0.0120	0.77		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.6	40	0.0250	1.11		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
1.0	95	0.0526	1.61		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
5.0	131	0.0076	0.44		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.6	56	0.1071	1.64		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
3.7	108	0.0093	0.48		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.3	33	0.1515	1.95		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.8	40	0.0250	0.79		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
0.6	63	0.1111	1.67		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
1.4	88	0.0455	1.07		**Shallow Concentrated Flow, M-N** Woodland Kv= 5.0 fps
30.9	444	0.0023	0.24		**Shallow Concentrated Flow, N-O** Woodland Kv= 5.0 fps
2.0	103	0.0291	0.85		**Shallow Concentrated Flow, O-P** Woodland Kv= 5.0 fps
1.0	76	0.0658	1.28		**Shallow Concentrated Flow, P-Q** Woodland Kv= 5.0 fps
6.2	152	0.0066	0.41		**Shallow Concentrated Flow, Q-R** Woodland Kv= 5.0 fps
0.5	50	0.1200	1.73		**Shallow Concentrated Flow, R-S** Woodland Kv= 5.0 fps
0.0	9	1.0000	5.00		**Shallow Concentrated Flow, S-T** Woodland Kv= 5.0 fps
0.1	12	0.2500	3.50		**Shallow Concentrated Flow, T-U** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, U-V** Short Grass Pasture Kv= 7.0 fps
64.4	1,929	Total			

Summary for Reach 7AR2: OVERLAND FLOW

Inflow Area = 0.307 ac, 51.89% Impervious, Inflow Depth = 2.17" for 02-YR event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 0.056 af
Outflow = 0.75 cfs @ 12.15 hrs, Volume= 0.056 af, Atten= 6%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.15 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 6.1 min

Peak Storage= 131 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 354.74 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 200.0' Slope= 0.0750 '/'
Inlet Invert= 160.00', Outlet Invert= 145.00'

Summary for Reach 7R: OVERLAND FLOW

Inflow Area = 0.307 ac, 51.89% Impervious, Inflow Depth = 2.17" for 02-YR event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 0.056 af
Outflow = 0.75 cfs @ 12.15 hrs, Volume= 0.056 af, Atten= 6%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.15 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 6.1 min

Peak Storage= 131 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 354.74 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 200.0' Slope= 0.0750 '/'
Inlet Invert= 160.00', Outlet Invert= 145.00'

Summary for Reach 100R: POA STA311+50

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 150.479 ac, 6.38% Impervious, Inflow Depth = 1.29" for 02-YR event
Inflow = 53.44 cfs @ 13.00 hrs, Volume= 16.221 af
Outflow = 53.44 cfs @ 13.00 hrs, Volume= 16.221 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 101R: DITCH 309+90TOSTA311+50

[62] Hint: Exceeded Reach 102R OUTLET depth by 0.11' @ 12.11 hrs

Inflow Area = 1.312 ac, 73.47% Impervious, Inflow Depth = 2.58" for 02-YR event
Inflow = 3.93 cfs @ 12.08 hrs, Volume= 0.282 af
Outflow = 3.82 cfs @ 12.13 hrs, Volume= 0.282 af, Atten= 3%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.78 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 6.4 min

Peak Storage= 366 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 92.78 cfs

10.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 170.0' Slope= 0.0206 '/'
Inlet Invert= 107.00', Outlet Invert= 103.50'


‡

Summary for Reach 102R: OVERLAND STA309+90

Inflow Area = 1.312 ac, 73.47% Impervious, Inflow Depth = 2.58" for 02-YR event
Inflow = 3.95 cfs @ 12.07 hrs, Volume= 0.282 af
Outflow = 3.93 cfs @ 12.08 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 1.3 min

Peak Storage= 93 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 467.03 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 60.0' Slope= 0.1300 '/'
Inlet Invert= 114.80', Outlet Invert= 107.00'

Summary for Reach 200R: POA STA314+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.309 ac, 46.75% Impervious, Inflow Depth = 1.95" for 02-YR event
Inflow = 10.39 cfs @ 12.08 hrs, Volume= 0.865 af
Outflow = 10.39 cfs @ 12.08 hrs, Volume= 0.865 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 201R: OVERLAND STA314+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.456 ac, 70.45% Impervious, Inflow Depth = 2.54" for 02-YR event
Inflow = 1.36 cfs @ 12.07 hrs, Volume= 0.097 af
Outflow = 1.36 cfs @ 12.07 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 202R: OVERLAND STA314+00

[61] Hint: Exceeded Reach 203R outlet invert by 0.07' @ 12.18 hrs

Inflow Area = 1.184 ac, 70.20% Impervious, Inflow Depth = 2.54" for 02-YR event
Inflow = 2.80 cfs @ 12.15 hrs, Volume= 0.251 af
Outflow = 2.72 cfs @ 12.22 hrs, Volume= 0.251 af, Atten= 3%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 8.7 min

Peak Storage= 471 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 359.26 cfs

20.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 325.0' Slope= 0.0769 '/'
Inlet Invert= 126.00', Outlet Invert= 101.00'

Summary for Reach 203R: DITCH STA317+00

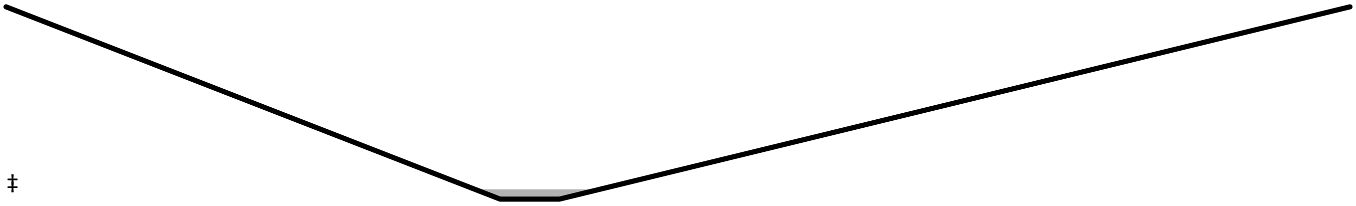
[62] Hint: Exceeded Reach 204R OUTLET depth by 0.08' @ 12.20 hrs

Inflow Area =	1.184 ac, 70.20% Impervious, Inflow Depth = 2.54" for 02-YR event		
Inflow =	2.81 cfs @ 12.12 hrs, Volume=	0.251 af	
Outflow =	2.80 cfs @ 12.15 hrs, Volume=	0.251 af, Atten= 0%, Lag= 1.4 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.37 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 2.0 min

Peak Storage= 142 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 5.00' Flow Area= 177.5 sf, Capacity= 2,420.87 cfs

3.00' x 5.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 8.0 '/' Top Width= 68.00'
Length= 120.0' Slope= 0.0292 '/'
Inlet Invert= 129.50', Outlet Invert= 126.00'



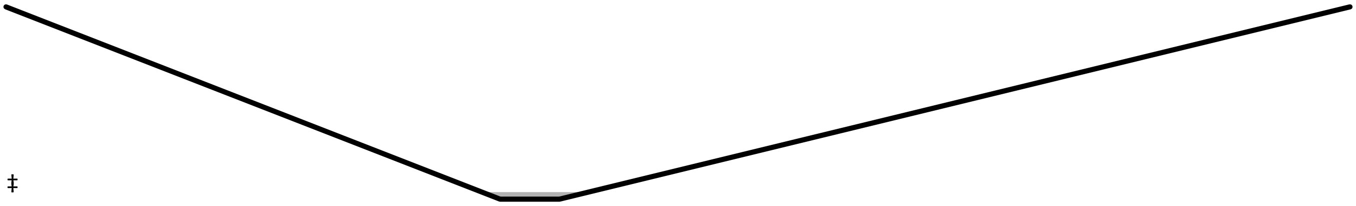
Summary for Reach 204R: DITCH STA318+00

Inflow Area =	0.622 ac, 70.16% Impervious, Inflow Depth = 2.54" for 02-YR event		
Inflow =	1.86 cfs @ 12.07 hrs, Volume=	0.132 af	
Outflow =	1.66 cfs @ 12.17 hrs, Volume=	0.132 af, Atten= 11%, Lag= 6.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 7.8 min

Peak Storage= 372 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 5.00' Flow Area= 177.5 sf, Capacity= 2,560.64 cfs

3.00' x 5.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 8.0 '/' Top Width= 68.00'
Length= 475.0' Slope= 0.0326 '/'
Inlet Invert= 145.00', Outlet Invert= 129.50'



Summary for Reach 501: POA STA327+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 83.197 ac, 8.12% Impervious, Inflow Depth > 1.29" for 02-YR event
Inflow = 21.01 cfs @ 13.39 hrs, Volume= 8.930 af
Outflow = 21.01 cfs @ 13.39 hrs, Volume= 8.930 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 502R: DITCH STA327

[62] Hint: Exceeded Reach 503R OUTLET depth by 0.10' @ 12.27 hrs
[79] Warning: Submerged Pond C4P Primary device # 1 OUTLET by 0.26'

Inflow Area = 77.367 ac, 7.05% Impervious, Inflow Depth > 1.27" for 02-YR event
Inflow = 20.07 cfs @ 13.39 hrs, Volume= 8.212 af
Outflow = 20.07 cfs @ 13.41 hrs, Volume= 8.212 af, Atten= 0%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 2.8 min

Peak Storage= 1,065 cf @ 13.40 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 142.33 cfs

5.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 138.50', Outlet Invert= 137.00'

‡

Summary for Reach 503R: DITCH STA329

[79] Warning: Submerged Pond C5P Primary device # 1 INLET by 0.47'

```
Inflow Area =         69.327 ac,    7.51% Impervious,  Inflow Depth >   1.36"    for  02-YR event
Inflow       =        19.58 cfs @   13.36 hrs,  Volume=            7.860 af
Outflow     =        19.57 cfs @   13.40 hrs,  Volume=            7.860 af,  Atten= 0%,  Lag= 2.7 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 4.9 min

Peak Storage= 1,835 cf @ 13.38 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 147.51 cfs

5.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 270.0' Slope= 0.0107 '/'
Inlet Invert= 141.40', Outlet Invert= 138.50'

‡

Summary for Reach 504R: DITCH STA332

```
Inflow Area =          0.033 ac,100.00% Impervious,  Inflow Depth =   3.07"    for  02-YR event
Inflow       =          0.11 cfs @   12.07 hrs,  Volume=            0.008 af
Outflow     =          0.07 cfs @   12.37 hrs,  Volume=            0.008 af,  Atten= 34%,  Lag= 18.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 13.1 min
Avg. Velocity = 0.25 fps, Avg. Travel Time= 19.7 min

Peak Storage= 57 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 116.22 cfs

5.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 300.0' Slope= 0.0067 '/'
Inlet Invert= 146.00', Outlet Invert= 144.00'

Summary for Reach 701R: POA STA340+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.742 ac, 16.02% Impervious, Inflow Depth = 1.45" for 02-YR event
Inflow = 7.12 cfs @ 12.32 hrs, Volume= 0.813 af
Outflow = 7.12 cfs @ 12.32 hrs, Volume= 0.813 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 750R: POA STA349+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.503 ac, 19.10% Impervious, Inflow Depth = 1.48" for 02-YR event
Inflow = 2.87 cfs @ 12.05 hrs, Volume= 0.185 af
Outflow = 2.87 cfs @ 12.05 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

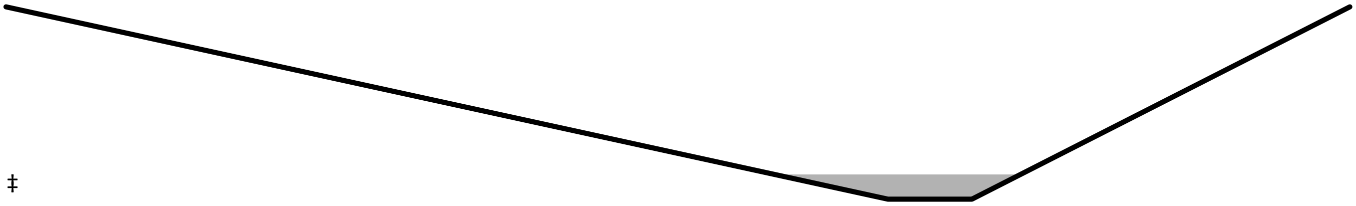
Summary for Reach C4R: DITCH STA327 TO STA313+00

Inflow = 5.09 cfs @ 12.28 hrs, Volume= 0.551 af
Outflow = 4.81 cfs @ 12.45 hrs, Volume= 0.551 af, Atten= 5%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.19 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 13.2 min

Peak Storage= 1,524 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 3.00' Flow Area= 51.0 sf, Capacity= 545.10 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 3.0 '/' Top Width= 32.00'
Length= 1,010.0' Slope= 0.0257 '/'
Inlet Invert= 144.00', Outlet Invert= 118.00'



Summary for Reach C5AR1: L-M

Inflow Area = 21.260 ac, 5.03% Impervious, Inflow Depth > 1.33" for 02-YR event
Inflow = 6.18 cfs @ 12.66 hrs, Volume= 2.348 af
Outflow = 4.65 cfs @ 15.91 hrs, Volume= 2.335 af, Atten= 25%, Lag= 195.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.17 fps, Min. Travel Time= 88.5 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 238.9 min

Peak Storage= 24,704 cf @ 14.44 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00' Flow Area= 182.0 sf, Capacity= 108.51 cfs

175.00' x 1.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 8.0 6.0 '/' Top Width= 189.00'
Length= 922.0' Slope= 0.0011 '/'
Inlet Invert= 178.00', Outlet Invert= 177.00'

Summary for Reach C5AR2: M-N

[62] Hint: Exceeded Reach C5AR1 OUTLET depth by 0.11' @ 17.05 hrs

Inflow Area = 21.260 ac, 5.03% Impervious, Inflow Depth > 1.32" for 02-YR event
Inflow = 4.65 cfs @ 15.91 hrs, Volume= 2.335 af
Outflow = 4.65 cfs @ 15.95 hrs, Volume= 2.335 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 4.0 min

Peak Storage= 440 cf @ 15.93 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 21.0 sf, Capacity= 69.43 cfs

11.70' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 10.6 8.0 '/' Top Width= 30.30'
Length= 137.0' Slope= 0.0073 '/'
Inlet Invert= 177.00', Outlet Invert= 176.00'

‡

Summary for Reach C5AR3: N-O

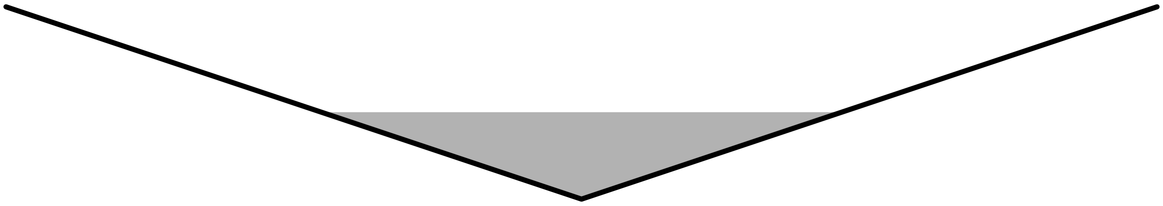
[62] Hint: Exceeded Reach C5AR2 OUTLET depth by 0.22' @ 16.06 hrs

Inflow Area = 21.260 ac, 5.03% Impervious, Inflow Depth > 1.32" for 02-YR event
Inflow = 4.65 cfs @ 15.95 hrs, Volume= 2.335 af
Outflow = 4.65 cfs @ 15.96 hrs, Volume= 2.335 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.59 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.81 fps, Avg. Travel Time= 0.7 min

Peak Storage= 94 cf @ 15.96 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 38.66 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 153.0' Slope= 0.1830 '/'
Inlet Invert= 176.00', Outlet Invert= 148.00'



Summary for Pond 701P: (new Pond)

Inflow Area = 6.742 ac, 16.02% Impervious, Inflow Depth = 1.45" for 02-YR event
Inflow = 7.12 cfs @ 12.32 hrs, Volume= 0.813 af
Outflow = 7.08 cfs @ 12.33 hrs, Volume= 0.812 af, Atten= 1%, Lag= 1.0 min
Primary = 7.08 cfs @ 12.33 hrs, Volume= 0.812 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 143.58' @ 12.33 hrs Surf.Area= 812 sf Storage= 304 cf

Plug-Flow detention time= 1.4 min calculated for 0.812 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (857.5 - 856.6)

Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	52,314 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
142.00	50	10.0	0	0	50
143.00	100	20.0	74	74	78
144.00	1,770	194.0	764	837	3,043
145.00	28,791	939.0	12,567	13,404	70,216
146.00	50,000	2,000.0	38,911	52,314	318,365

Device	Routing	Invert	Outlet Devices
#1	Primary	142.45'	**24.0" Round Culvert** L= 26.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 142.45' / 141.96' S= 0.0188 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Secondary	144.50'	**200.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.08 cfs @ 12.33 hrs HW=143.58' (Free Discharge)
↑**1=Culvert** (Barrel Controls 7.08 cfs @ 5.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=142.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C2P: 313+00LEFT

Inflow Area = 147.106 ac, 5.50% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 111.95 cfs @ 12.52 hrs, Volume= 15.673 af
Outflow = 52.70 cfs @ 13.02 hrs, Volume= 15.673 af, Atten= 53%, Lag= 30.0 min
Primary = 52.70 cfs @ 13.02 hrs, Volume= 15.673 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 112.08' @ 13.02 hrs Surf.Area= 159,777 sf Storage= 170,900 cf

Plug-Flow detention time= 44.6 min calculated for 15.670 af (100% of inflow)
Center-of-Mass det. time= 44.6 min (923.8 - 879.3)

Volume	Invert	Avail.Storage	Storage Description
#1	109.00'	2,272,428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
109.00	19,183	958.9	0	0	19,183
110.00	28,032	1,282.6	23,468	23,468	76,933
111.00	47,773	1,796.1	37,467	60,935	202,748
112.00	157,032	2,961.9	97,139	158,074	644,160
113.00	192,597	3,080.9	174,512	332,586	701,464
114.00	225,197	3,246.6	208,685	541,271	784,958
115.00	262,192	3,905.1	243,460	784,731	1,159,737
116.00	312,689	4,095.9	287,070	1,071,801	1,281,285
117.00	353,942	4,361.6	333,103	1,404,904	1,460,158
118.00	447,427	3,488.1	399,773	1,804,676	2,005,812
119.00	488,375	4,125.0	467,752	2,272,428	2,391,685

Device	Routing	Invert	Outlet Devices
#1	Primary	108.70'	**48.0" Round Culvert** L= 235.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 108.70' / 108.12' S= 0.0025 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Secondary	115.55'	**18.0" Round Culvert** L= 211.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.55' / 109.60' S= 0.0282 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=52.70 cfs @ 13.02 hrs HW=112.08' (Free Discharge)
└─**1=Culvert** (Barrel Controls 52.70 cfs @ 6.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=109.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Summary for Pond C4P: 327+50

Inflow Area = 8.040 ac, 3.11% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 8.34 cfs @ 12.28 hrs, Volume= 0.903 af
Outflow = 8.34 cfs @ 12.28 hrs, Volume= 0.903 af, Atten= 0%, Lag= 0.0 min
Primary = 3.25 cfs @ 12.28 hrs, Volume= 0.352 af
Secondary = 5.09 cfs @ 12.28 hrs, Volume= 0.551 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 146.01' @ 12.28 hrs Surf.Area= 27 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.902 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (860.7 - 860.7)

Volume	Invert	Avail.Storage	Storage Description
#1	146.00'	27,066 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.00	22	27.1	0	0	22
147.00	4,250	726.7	1,526	1,526	41,990
148.00	13,227	840.3	8,325	9,851	56,177
149.00	21,540	863.6	17,215	27,066	59,449

Device	Routing	Invert	Outlet Devices
#1	Primary	143.41'	**18.0" Round Culvert** L= 255.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 143.41' / 139.03' S= 0.0172 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Secondary	145.00'	**6.5' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=11.57 cfs @ 12.28 hrs HW=146.01' (Free Discharge)
↳**1=Culvert** (Inlet Controls 11.57 cfs @ 6.55 fps)

Secondary OutFlow Max=17.64 cfs @ 12.28 hrs HW=146.01' (Free Discharge)
↳**2=Broad-Crested Rectangular Weir** (Weir Controls 17.64 cfs @ 2.69 fps)

Summary for Pond C5AP: (new Pond)

Inflow Area = 21.260 ac, 5.03% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 28.53 cfs @ 12.15 hrs, Volume= 2.387 af
Outflow = 6.18 cfs @ 12.66 hrs, Volume= 2.348 af, Atten= 78%, Lag= 30.6 min
Primary = 6.18 cfs @ 12.66 hrs, Volume= 2.348 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 182.92' @ 12.66 hrs Surf.Area= 24,480 sf Storage= 37,717 cf

Plug-Flow detention time= 94.7 min calculated for 2.348 af (98% of inflow)
Center-of-Mass det. time= 85.4 min (936.8 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	356,034 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	5,233	331.6	0	0	5,233
181.00	9,056	413.5	7,058	7,058	10,103
182.00	15,897	572.6	12,317	19,375	22,598
183.00	25,365	730.2	20,448	39,822	38,950
184.00	134,830	3,722.3	72,892	112,714	1,099,109
185.00	171,754	3,831.3	152,920	265,634	1,164,737
185.50	190,000	3,900.0	90,400	356,034	1,207,048

Device	Routing	Invert	Outlet Devices
#1	Primary	180.27'	**15.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 180.27' / 180.00' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf

Primary OutFlow Max=6.18 cfs @ 12.66 hrs HW=182.92' (Free Discharge)
↳**1=Culvert** (Barrel Controls 6.18 cfs @ 5.04 fps)

Summary for Pond C5P: 331+00

Inflow Area = 69.294 ac, 7.46% Impervious, Inflow Depth > 1.36" for 02-YR event
Inflow = 27.38 cfs @ 12.89 hrs, Volume= 7.852 af
Outflow = 19.57 cfs @ 13.36 hrs, Volume= 7.852 af, Atten= 29%, Lag= 28.3 min
Primary = 19.57 cfs @ 13.36 hrs, Volume= 7.852 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 144.62' @ 13.36 hrs Surf.Area= 31,222 sf Storage= 31,782 cf

Plug-Flow detention time= 15.0 min calculated for 7.850 af (100% of inflow)
Center-of-Mass det. time= 14.9 min (987.4 - 972.5)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	297,542 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	20	15.0	0	0	20
141.70	50	30.0	7	7	74
142.00	1,500	400.0	182	189	12,735
143.00	3,404	858.6	2,388	2,577	58,671
144.00	23,914	1,161.1	12,113	14,691	107,300
145.00	36,142	1,360.8	29,818	44,509	147,397
146.00	50,955	1,644.8	43,337	87,846	215,340
147.00	64,383	1,674.9	57,538	145,384	223,463
148.00	78,650	1,939.5	71,398	216,782	299,590
149.00	82,890	2,150.0	80,761	297,542	368,124

Device	Routing	Invert	Outlet Devices
#1	Primary	141.70'	**30.0" Round Culvert** L= 285.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 141.70' / 141.50' S= 0.0007 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Secondary	147.00'	**50.0' long x 25.0' 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

Primary OutFlow Max=19.57 cfs @ 13.36 hrs HW=144.62' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 19.57 cfs @ 4.29 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.144	98	(1CS, 2S, 3S, 4S, 5AS, 5BS, 5CS, 5DS, 6BS, 7AS, 7S, C2S, C4S, C5AS, C5BS)
1.584	80	>75% Grass cover, Good, HSG D (1AS, 1BS, 2S, 3S, 4S, 5AS, 5CS, 6BS, 7AS, 7S)
1.650	30	Brush, Good, HSG A (C2S)
25.164	73	Brush, Good, HSG D (100S, 200S, 500S, 700, 700S, 750S, C2S, C5AS, C5BS)
0.940	98	Impervious (C3S)
0.026	98	Paved (11S)
0.560	98	Paved 303+50-311+00 (1AS)
0.315	98	Paved 311+00-313+75 (1BS)
3.969	98	Pavement (100S, 500S, 700, 700S, 750S)
2.880	30	Woods, Good, HSG A (C2S)
201.410	77	Woods, Good, HSG D (100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS, C5BS)
1.330	98	pavement (200S)
253.972	**78**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1AS: 309+99 Runoff Area=34,148 sf 71.43% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=3.67 cfs 0.268 af

Subcatchment 1BS: 309+99 Runoff Area=19,128 sf 71.72% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.06 cfs 0.150 af

Subcatchment 1CS: (new Subcat) Runoff Area=3,895 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.44 cfs 0.035 af

Subcatchment 2S: 313+87 Runoff Area=19,851 sf 70.45% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.14 cfs 0.156 af

Subcatchment 3S: 317+87 Runoff Area=24,474 sf 70.25% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.63 cfs 0.192 af

Subcatchment 4S: 322+87 Runoff Area=27,080 sf 70.16% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.91 cfs 0.212 af

Subcatchment 5AS: 333+37 CENTER Runoff Area=25,898 sf 70.54% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=2.79 cfs 0.203 af

Subcatchment 5BS: 333+37 LEFT Runoff Area=1,340 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.15 cfs 0.012 af

Subcatchment 5CS: 333+60 CENTER Runoff Area=11,537 sf 60.61% Impervious Runoff Depth=3.89"
Tc=5.0 min CN=91 Runoff=1.20 cfs 0.086 af

Subcatchment 5DS: 333+15 RIGHT Runoff Area=1,431 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.16 cfs 0.013 af

Subcatchment 6BS: 336+61_CENTER Runoff Area=20,644 sf 63.34% Impervious Runoff Depth=3.89"
Tc=5.0 min CN=91 Runoff=2.14 cfs 0.153 af

Subcatchment 7AS: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=89 Runoff=1.33 cfs 0.094 af

Subcatchment 7S: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=89 Runoff=1.33 cfs 0.094 af

Subcatchment 11S: 310+13 Runoff Area=1,152 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.13 cfs 0.010 af

Subcatchment 100S: STA311+50 Runoff Area=2.060 ac 26.21% Impervious Runoff Depth=2.90"
Tc=5.0 min CN=81 Runoff=7.25 cfs 0.497 af

Subcatchment 200S: STA311+50 Runoff Area=3.670 ac 36.24% Impervious Runoff Depth=3.08"
Flow Length=640' Tc=5.0 min CN=83 Runoff=13.70 cfs 0.943 af

Subcatchment 500S: STA327+00 Runoff Area=5.830 ac 22.30% Impervious Runoff Depth=2.81"
Flow Length=925' Tc=16.4 min CN=80 Runoff=14.03 cfs 1.363 af

Subcatchment 700: STA338 RIGHT Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=2.72"
Flow Length=575' Tc=22.4 min CN=79 Runoff=13.18 cfs 1.456 af

Subcatchment 700S: STA338 RIGHT Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=2.72"
Flow Length=575' Tc=22.4 min CN=79 Runoff=13.18 cfs 1.456 af

Subcatchment 750S: STA349 Runoff Area=1.503 ac 19.10% Impervious Runoff Depth=2.81"
Flow Length=80' Tc=3.1 min CN=80 Runoff=5.49 cfs 0.351 af

Subcatchment C2S: 311+50 Runoff Area=144.070 ac 4.95% Impervious Runoff Depth=2.45"
Flow Length=2,483' Tc=35.1 min CN=76 Runoff=216.75 cfs 29.455 af

Subcatchment C3S: 315+50 Runoff Area=3.010 ac 31.23% Impervious Runoff Depth=3.18"
Flow Length=731' Tc=15.0 min CN=84 Runoff=8.45 cfs 0.797 af

Subcatchment C4S: 327+50 Runoff Area=8.040 ac 3.11% Impervious Runoff Depth=2.63"
Flow Length=869' Tc=20.2 min CN=78 Runoff=16.64 cfs 1.760 af

Subcatchment C5AS: 331+00 Runoff Area=21.260 ac 5.03% Impervious Runoff Depth=2.63"
Flow Length=423' Tc=10.2 min CN=78 Runoff=56.85 cfs 4.654 af

Subcatchment C5BS: 331+00 Runoff Area=46.670 ac 6.84% Impervious Runoff Depth=2.63"
Flow Length=1,929' Tc=64.4 min CN=78 Runoff=53.99 cfs 10.217 af

Reach 7AR2: OVERLAND FLOW Avg. Flow Depth=0.04' Max Vel=1.40 fps Inflow=1.33 cfs 0.094 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=1.27 cfs 0.094 af

Reach 7R: OVERLAND FLOW Avg. Flow Depth=0.04' Max Vel=1.40 fps Inflow=1.33 cfs 0.094 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=1.27 cfs 0.094 af

Reach 100R: POA STA311+50 Inflow=84.76 cfs 32.286 af
Outflow=84.76 cfs 32.286 af

Reach 101R: DITCH 309+90TOSTA311+50 Avg. Flow Depth=0.24' Max Vel=2.07 fps Inflow=6.16 cfs 0.453 af
n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=6.02 cfs 0.453 af

Reach 102R: OVERLAND STA309+90 Avg. Flow Depth=0.09' Max Vel=3.00 fps Inflow=6.18 cfs 0.453 af
n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=6.16 cfs 0.453 af

Reach 200R: POA STA314+00 Inflow=18.49 cfs 1.503 af
Outflow=18.49 cfs 1.503 af

Reach 201R: OVERLAND STA314+00 Inflow=2.14 cfs 0.156 af
Outflow=2.14 cfs 0.156 af

Reach 202R: OVERLAND STA314+00 Avg. Flow Depth=0.09' Max Vel=2.26 fps Inflow=4.58 cfs 0.404 af
n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=4.48 cfs 0.404 af

Reach 203R: DITCH STA317+00 Avg. Flow Depth=0.33' Max Vel=2.73 fps Inflow=4.60 cfs 0.404 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=4.58 cfs 0.404 af

Reach 204R: DITCH STA318+00 Avg. Flow Depth=0.24' Max Vel=2.43 fps Inflow=2.91 cfs 0.212 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=2.65 cfs 0.212 af

Reach 501: POA STA327+00 Inflow=32.76 cfs 17.334 af
Outflow=32.76 cfs 17.334 af

Reach 502R: DITCH STA327 Avg. Flow Depth=0.99' Max Vel=3.19 fps Inflow=31.24 cfs 15.971 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=31.24 cfs 15.971 af

Reach 503R: DITCH STA329 Avg. Flow Depth=0.96' Max Vel=3.25 fps Inflow=30.44 cfs 15.285 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=30.44 cfs 15.284 af

Reach 504R: DITCH STA332 Avg. Flow Depth=0.05' Max Vel=0.46 fps Inflow=0.16 cfs 0.013 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=0.12 cfs 0.013 af

Reach 701R: POA STA340+00 Inflow=13.77 cfs 1.550 af
Outflow=13.77 cfs 1.550 af

Reach 750R: POA STA349+00 Inflow=5.49 cfs 0.351 af
Outflow=5.49 cfs 0.351 af

Reach C4R: DITCH STA327 TO STA313+00 Avg. Flow Depth=0.54' Max Vel=3.85 fps Inflow=10.15 cfs 1.074 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=9.73 cfs 1.074 af

Reach C5AR1: L-M Avg. Flow Depth=0.20' Max Vel=0.21 fps Inflow=7.61 cfs 4.616 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=7.19 cfs 4.602 af

Reach C5AR2: M-N Avg. Flow Depth=0.30' Max Vel=1.67 fps Inflow=7.19 cfs 4.602 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=7.19 cfs 4.601 af

Reach C5AR3: N-O Avg. Flow Depth=0.53' Max Vel=8.46 fps Inflow=7.19 cfs 4.601 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=7.19 cfs 4.601 af

Pond 701P: (new Pond) Peak Elev=144.14' Storage=1,216 cf Inflow=13.77 cfs 1.550 af
Primary=13.30 cfs 1.550 af Secondary=0.00 cfs 0.000 af Outflow=13.30 cfs 1.550 af

Pond C2P: 313+00LEFT Peak Elev=113.46' Storage=424,190 cf Inflow=230.19 cfs 31.336 af
Primary=83.67 cfs 31.336 af Secondary=0.00 cfs 0.000 af Outflow=83.67 cfs 31.336 af

Pond C4P: 327+50 Peak Elev=146.02' Storage=0 cf Inflow=16.64 cfs 1.760 af
Primary=6.49 cfs 0.686 af Secondary=10.15 cfs 1.074 af Outflow=16.64 cfs 1.760 af

Pond C5AP: (new Pond) Peak Elev=183.77' Storage=85,842 cf Inflow=56.85 cfs 4.654 af
15.0" Round Culvert n=0.025 L=27.0' S=0.0100 '/' Outflow=7.61 cfs 4.616 af

Pond C5P: 331+00 Peak Elev=146.24' Storage=100,229 cf Inflow=54.88 cfs 15.273 af
Primary=30.43 cfs 15.272 af Secondary=0.00 cfs 0.000 af Outflow=30.43 cfs 15.272 af

Total Runoff Area = 253.972 ac Runoff Volume = 54.629 af Average Runoff Depth = 2.58"
91.62% Pervious = 232.688 ac 8.38% Impervious = 21.284 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1AS: 309+99 Runoff Area=34,148 sf 71.43% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=4.75 cfs 0.351 af

Subcatchment 1BS: 309+99 Runoff Area=19,128 sf 71.72% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=2.66 cfs 0.197 af

Subcatchment 1CS: (new Subcat) Runoff Area=3,895 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.56 cfs 0.044 af

Subcatchment 2S: 313+87 Runoff Area=19,851 sf 70.45% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=2.76 cfs 0.204 af

Subcatchment 3S: 317+87 Runoff Area=24,474 sf 70.25% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=3.40 cfs 0.252 af

Subcatchment 4S: 322+87 Runoff Area=27,080 sf 70.16% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=3.76 cfs 0.279 af

Subcatchment 5AS: 333+37 CENTER Runoff Area=25,898 sf 70.54% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=93 Runoff=3.60 cfs 0.267 af

Subcatchment 5BS: 333+37 LEFT Runoff Area=1,340 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af

Subcatchment 5CS: 333+60 CENTER Runoff Area=11,537 sf 60.61% Impervious Runoff Depth=5.15"
Tc=5.0 min CN=91 Runoff=1.56 cfs 0.114 af

Subcatchment 5DS: 333+15 RIGHT Runoff Area=1,431 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.21 cfs 0.016 af

Subcatchment 6BS: 336+61_CENTER Runoff Area=20,644 sf 63.34% Impervious Runoff Depth=5.15"
Tc=5.0 min CN=91 Runoff=2.80 cfs 0.204 af

Subcatchment 7AS: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=89 Runoff=1.76 cfs 0.126 af

Subcatchment 7S: 343+35_A Runoff Area=13,380 sf 51.89% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=89 Runoff=1.76 cfs 0.126 af

Subcatchment 11S: 310+13 Runoff Area=1,152 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.17 cfs 0.013 af

Subcatchment 100S: STA311+50 Runoff Area=2.060 ac 26.21% Impervious Runoff Depth=4.07"
Tc=5.0 min CN=81 Runoff=10.11 cfs 0.698 af

Subcatchment 200S: STA311+50 Runoff Area=3.670 ac 36.24% Impervious Runoff Depth=4.28"
Flow Length=640' Tc=5.0 min CN=83 Runoff=18.83 cfs 1.308 af

Subcatchment 500S: STA327+00
Runoff Area=5.830 ac 22.30% Impervious Runoff Depth=3.96"
Flow Length=925' Tc=16.4 min CN=80 Runoff=19.74 cfs 1.925 af

Subcatchment 700: STA338 RIGHT
Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=3.86"
Flow Length=575' Tc=22.4 min CN=79 Runoff=18.68 cfs 2.069 af

Subcatchment 700S: STA338 RIGHT
Runoff Area=6.435 ac 14.31% Impervious Runoff Depth=3.86"
Flow Length=575' Tc=22.4 min CN=79 Runoff=18.68 cfs 2.069 af

Subcatchment 750S: STA349
Runoff Area=1.503 ac 19.10% Impervious Runoff Depth=3.96"
Flow Length=80' Tc=3.1 min CN=80 Runoff=7.72 cfs 0.496 af

Subcatchment C2S: 311+50
Runoff Area=144.070 ac 4.95% Impervious Runoff Depth=3.55"
Flow Length=2,483' Tc=35.1 min CN=76 Runoff=315.03 cfs 42.660 af

Subcatchment C3S: 315+50
Runoff Area=3.010 ac 31.23% Impervious Runoff Depth=4.38"
Flow Length=731' Tc=15.0 min CN=84 Runoff=11.55 cfs 1.100 af

Subcatchment C4S: 327+50
Runoff Area=8.040 ac 3.11% Impervious Runoff Depth=3.76"
Flow Length=869' Tc=20.2 min CN=78 Runoff=23.79 cfs 2.517 af

Subcatchment C5AS: 331+00
Runoff Area=21.260 ac 5.03% Impervious Runoff Depth=3.76"
Flow Length=423' Tc=10.2 min CN=78 Runoff=81.23 cfs 6.655 af

Subcatchment C5BS: 331+00
Runoff Area=46.670 ac 6.84% Impervious Runoff Depth=3.76"
Flow Length=1,929' Tc=64.4 min CN=78 Runoff=77.32 cfs 14.608 af

Reach 7AR2: OVERLAND FLOW
Avg. Flow Depth=0.05' Max Vel=1.56 fps Inflow=1.76 cfs 0.126 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=1.69 cfs 0.126 af

Reach 7R: OVERLAND FLOW
Avg. Flow Depth=0.05' Max Vel=1.56 fps Inflow=1.76 cfs 0.126 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=1.69 cfs 0.126 af

Reach 100R: POA STA311+50
Inflow=102.12 cfs 46.972 af
Outflow=102.12 cfs 46.972 af

Reach 101R: DITCH 309+90TOSTA311+50
Avg. Flow Depth=0.27' Max Vel=2.25 fps Inflow=7.94 cfs 0.593 af
n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=7.80 cfs 0.593 af

Reach 102R: OVERLAND STA309+90
Avg. Flow Depth=0.11' Max Vel=3.28 fps Inflow=7.97 cfs 0.593 af
n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=7.94 cfs 0.593 af

Reach 200R: POA STA314+00
Inflow=25.23 cfs 2.043 af
Outflow=25.23 cfs 2.043 af

Reach 201R: OVERLAND STA314+00
Inflow=2.76 cfs 0.204 af
Outflow=2.76 cfs 0.204 af

Reach 202R: OVERLAND STA314+00
Avg. Flow Depth=0.11' Max Vel=2.50 fps Inflow=6.04 cfs 0.531 af
n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=5.91 cfs 0.531 af

Reach 203R: DITCH STA317+00
Avg. Flow Depth=0.38' Max Vel=2.94 fps Inflow=6.06 cfs 0.531 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=6.04 cfs 0.531 af

Reach 204R: DITCH STA318+00
Avg. Flow Depth=0.27' Max Vel=2.63 fps Inflow=3.76 cfs 0.279 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=3.47 cfs 0.279 af

Reach 501: POA STA327+00
Inflow=45.31 cfs 24.357 af
Outflow=45.31 cfs 24.357 af

Reach 502R: DITCH STA327
Avg. Flow Depth=1.15' Max Vel=3.48 fps Inflow=43.16 cfs 22.432 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=43.16 cfs 22.432 af

Reach 503R: DITCH STA329
Avg. Flow Depth=1.05' Max Vel=3.41 fps Inflow=36.53 cfs 21.213 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=36.53 cfs 21.212 af

Reach 504R: DITCH STA332
Avg. Flow Depth=0.06' Max Vel=0.50 fps Inflow=0.21 cfs 0.016 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=0.15 cfs 0.016 af

Reach 701R: POA STA340+00
Inflow=19.46 cfs 2.195 af
Outflow=19.46 cfs 2.195 af

Reach 750R: POA STA349+00
Inflow=7.72 cfs 0.496 af
Outflow=7.72 cfs 0.496 af

Reach C4R: DITCH STA327 TO STA313+00
Avg. Flow Depth=0.64' Max Vel=4.23 fps Inflow=14.51 cfs 1.908 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=14.00 cfs 1.908 af

Reach C5AR1: L-M
Avg. Flow Depth=0.21' Max Vel=0.21 fps Inflow=8.15 cfs 6.616 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=7.95 cfs 6.601 af

Reach C5AR2: M-N
Avg. Flow Depth=0.31' Max Vel=1.73 fps Inflow=7.95 cfs 6.601 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=7.95 cfs 6.601 af

Reach C5AR3: N-O
Avg. Flow Depth=0.55' Max Vel=8.68 fps Inflow=7.95 cfs 6.601 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=7.95 cfs 6.601 af

Pond 701P: (new Pond)
Peak Elev=144.48' Storage=3,558 cf Inflow=19.46 cfs 2.195 af
Primary=17.11 cfs 2.195 af Secondary=0.00 cfs 0.000 af Outflow=17.11 cfs 2.195 af

Pond C2P: 313+00LEFT
Peak Elev=114.61' Storage=684,397 cf Inflow=333.95 cfs 45.681 af
Primary=100.75 cfs 45.681 af Secondary=0.00 cfs 0.000 af Outflow=100.75 cfs 45.681 af

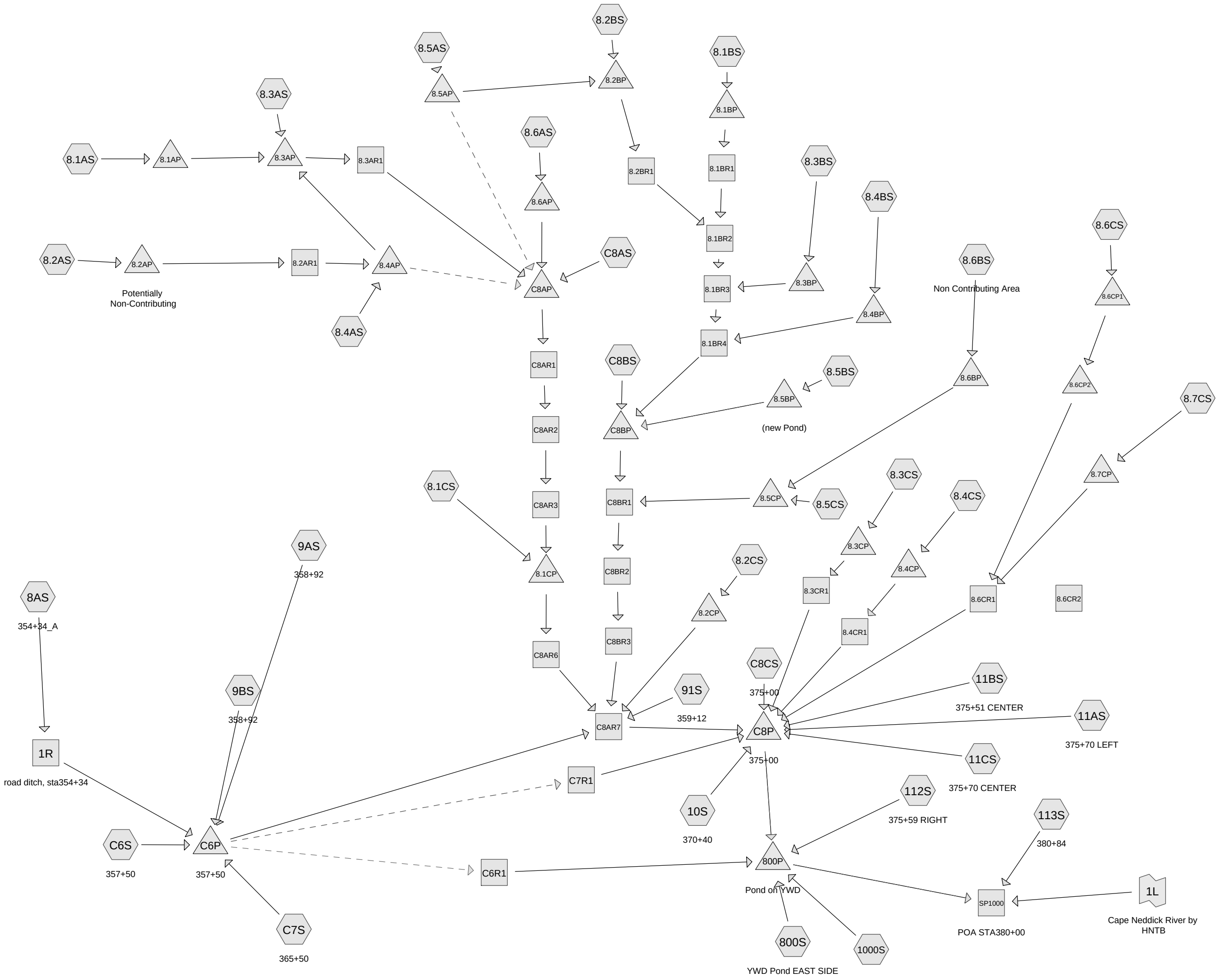
Pond C4P: 327+50
Peak Elev=146.02' Storage=1 cf Inflow=23.79 cfs 3.128 af
Primary=9.28 cfs 1.220 af Secondary=14.51 cfs 1.908 af Outflow=23.79 cfs 3.128 af

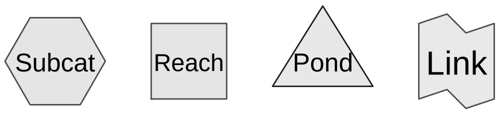
Pond C5AP: (new Pond)
Peak Elev=184.15' Storage=133,237 cf Inflow=81.23 cfs 6.655 af
15.0" Round Culvert n=0.025 L=27.0' S=0.0100 '/' Outflow=8.15 cfs 6.616 af

Pond C5P: 331+00
Peak Elev=147.22' Storage=159,921 cf Inflow=79.37 cfs 21.808 af
Primary=36.52 cfs 21.196 af Secondary=14.02 cfs 0.612 af Outflow=50.53 cfs 21.808 af

Total Runoff Area = 253.972 ac Runoff Volume = 78.314 af Average Runoff Depth = 3.70"
91.62% Pervious = 232.688 ac 8.38% Impervious = 21.284 ac

Mile 8.8, STA350+00 to STA380+00





Routing Diagram for 14181_8.8PRE_STA350-STA380_10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
19.203	98	(8.1AS, 8.1BS, 8.1CS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8AS, 9AS, 9BS, 10S, 11AS, 11BS, 11CS, 91S, 112S, 113S, 1000S, C6S, C7S, C8AS, C8BS, C8CS)
1.111	89	<50% Grass cover, Poor, HSG D (8AS, 9AS, 10S, 11BS, 11CS)
7.569	77	Brush, Fair, HSG D (8.1CS, C8AS)
32.327	73	Brush, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C6S, C7S, C8BS, C8CS)
1.407	98	Pavement (800S)
48.653	79	Woods, Fair, HSG D (8.1CS, C8AS)
183.311	77	Woods, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C6S, C7S, C8BS, C8CS)
293.581	**78**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=1.55"
Flow Length=430' Tc=28.4 min CN=81 Runoff=2.92 cfs 0.360 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=1.28"
Flow Length=265' Tc=35.1 min CN=77 Runoff=1.28 cfs 0.177 af

Subcatchment 8.1CS: Runoff Area=1,067,628 sf 2.41% Impervious Runoff Depth=1.41"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=20.75 cfs 2.884 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=1.35"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=1.15 cfs 0.145 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=1.28"
Flow Length=372' Tc=28.8 min CN=77 Runoff=1.82 cfs 0.231 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=1.35"
Flow Length=475' Tc=37.1 min CN=78 Runoff=1.85 cfs 0.263 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=1.48"
Flow Length=420' Tc=26.1 min CN=80 Runoff=2.21 cfs 0.264 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=1.35"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=0.83 cfs 0.131 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=1.28"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=2.07 cfs 0.476 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=1.48"
Flow Length=260' Tc=13.2 min CN=80 Runoff=2.23 cfs 0.201 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=1.28"
Flow Length=506' Tc=43.8 min CN=77 Runoff=1.36 cfs 0.211 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=1.28"
Flow Length=365' Tc=40.2 min CN=77 Runoff=1.98 cfs 0.295 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=1.28"
Flow Length=150' Tc=17.5 min CN=77 Runoff=3.10 cfs 0.319 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=1.35"
Flow Length=717' Tc=47.8 min CN=78 Runoff=1.98 cfs 0.321 af

Subcatchment 8.5CS: Runoff Area=115,586 sf 14.02% Impervious Runoff Depth=1.41"
Flow Length=285' Tc=35.7 min CN=79 Runoff=2.26 cfs 0.312 af

Subcatchment 8.6AS: Runoff Area=63,890 sf 15.73% Impervious Runoff Depth=1.48"
Flow Length=445' Tc=27.3 min CN=80 Runoff=1.48 cfs 0.181 af

Subcatchment 8.6BS: Non Contributing Area
Runoff Area=307,280 sf 17.19% Impervious Runoff Depth=1.48"
Flow Length=450' Tc=41.5 min CN=80 Runoff=5.86 cfs 0.870 af

Subcatchment 8.6CS:
Runoff Area=420,023 sf 1.26% Impervious Runoff Depth=1.28"
Flow Length=875' Tc=59.5 min CN=77 Runoff=5.55 cfs 1.032 af

Subcatchment 8.7CS:
Runoff Area=33,655 sf 0.00% Impervious Runoff Depth=1.22"
Flow Length=135' Slope=0.1030 '/' Tc=24.3 min CN=76 Runoff=0.66 cfs 0.079 af

Subcatchment 8AS: 354+34_A
Runoff Area=22,267 sf 56.30% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=94 Runoff=1.57 cfs 0.113 af

Subcatchment 9AS: 358+92
Runoff Area=46,654 sf 67.98% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=95 Runoff=3.37 cfs 0.245 af

Subcatchment 9BS: 358+92
Runoff Area=6,166 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.47 cfs 0.036 af

Subcatchment 10S: 370+40
Runoff Area=29,978 sf 70.94% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=95 Runoff=2.16 cfs 0.157 af

Subcatchment 11AS: 375+70 LEFT
Runoff Area=2,361 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.18 cfs 0.014 af

Subcatchment 11BS: 375+51 CENTER
Runoff Area=22,154 sf 66.93% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=95 Runoff=1.60 cfs 0.116 af

Subcatchment 11CS: 375+70 CENTER
Runoff Area=22,485 sf 65.79% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=95 Runoff=1.62 cfs 0.118 af

Subcatchment 91S: 359+12
Runoff Area=1,008 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment 112S: 375+59 RIGHT
Runoff Area=797 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment 113S: 380+84
Runoff Area=18,128 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=1.38 cfs 0.106 af

Subcatchment 800S: YWD Pond EAST SIDE
Runoff Area=1,262,903 sf 4.85% Impervious Runoff Depth=1.35"
Flow Length=1,350' Tc=47.7 min CN=78 Runoff=20.14 cfs 3.255 af

Subcatchment 1000S:
Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=1.35"
Flow Length=862' Tc=24.7 min CN=78 Runoff=8.52 cfs 1.005 af

Subcatchment C6S: 357+50
Runoff Area=30.640 ac 5.81% Impervious Runoff Depth=1.35"
Flow Length=1,098' Tc=21.4 min CN=78 Runoff=31.01 cfs 3.440 af

Subcatchment C7S: 365+50
Runoff Area=5.750 ac 5.91% Impervious Runoff Depth=1.35"
Flow Length=489' Tc=6.0 min CN=78 Runoff=8.93 cfs 0.645 af

Subcatchment C8AS: Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=1.48"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=25.67 cfs 4.231 af

Subcatchment C8BS: Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=1.35"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=21.51 cfs 3.511 af

Subcatchment C8CS: 375+00 Runoff Area=3,197,116 sf 6.20% Impervious Runoff Depth=1.35"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=53.79 cfs 8.239 af

Reach 1R: road ditch, sta354+34 Avg. Flow Depth=0.10' Max Vel=2.86 fps Inflow=1.57 cfs 0.113 af
n=0.035 L=70.0' S=0.1071 '/' Capacity=96.67 cfs Outflow=1.56 cfs 0.113 af

Reach 8.1BR1: Avg. Flow Depth=0.06' Max Vel=0.40 fps Inflow=0.15 cfs 0.059 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=0.15 cfs 0.059 af

Reach 8.1BR2: Avg. Flow Depth=0.12' Max Vel=0.24 fps Inflow=0.59 cfs 0.220 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=0.45 cfs 0.220 af

Reach 8.1BR3: Avg. Flow Depth=0.21' Max Vel=1.51 fps Inflow=0.83 cfs 0.351 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=0.82 cfs 0.351 af

Reach 8.1BR4: Avg. Flow Depth=0.27' Max Vel=1.63 fps Inflow=2.14 cfs 0.556 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=2.14 cfs 0.556 af

Reach 8.2AR1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.00 cfs 0.000 af

Reach 8.2BR1: Avg. Flow Depth=0.16' Max Vel=0.82 fps Inflow=0.59 cfs 0.161 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=18.57 cfs Outflow=0.59 cfs 0.161 af

Reach 8.3AR1: Avg. Flow Depth=0.27' Max Vel=0.91 fps Inflow=1.48 cfs 0.165 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=1.24 cfs 0.165 af

Reach 8.3CR1: Avg. Flow Depth=0.06' Max Vel=0.40 fps Inflow=0.48 cfs 0.178 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=0.46 cfs 0.178 af

Reach 8.4CR1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.120 L=1,440.0' S=0.0178 '/' Capacity=48.74 cfs Outflow=0.00 cfs 0.000 af

Reach 8.6CR1: Avg. Flow Depth=0.18' Max Vel=1.30 fps Inflow=1.36 cfs 0.544 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=1.36 cfs 0.544 af

Reach 8.6CR2: Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.120 L=865.0' S=0.0079 '/' Capacity=34.51 cfs Outflow=0.00 cfs 0.000 af

Reach C6R1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=0.00 cfs 0.000 af

Reach C7R1: Avg. Flow Depth=0.09' Max Vel=1.61 fps Inflow=0.81 cfs 0.028 af
n=0.030 L=190.0' S=0.0316 '/' Capacity=1,060.34 cfs Outflow=0.80 cfs 0.028 af

Reach C8AR1: Avg. Flow Depth=0.12' Max Vel=1.10 fps Inflow=4.57 cfs 4.555 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=4.57 cfs 4.555 af

Reach C8AR2: Avg. Flow Depth=0.42' Max Vel=0.94 fps Inflow=4.57 cfs 4.555 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=566.71 cfs Outflow=4.56 cfs 4.555 af

Reach C8AR3: Avg. Flow Depth=0.53' Max Vel=2.54 fps Inflow=4.56 cfs 4.555 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=4.56 cfs 4.555 af

Reach C8AR6: Avg. Flow Depth=0.47' Max Vel=1.52 fps Inflow=4.73 cfs 3.395 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=4.73 cfs 3.395 af

Reach C8AR7: Avg. Flow Depth=0.88' Max Vel=0.89 fps Inflow=27.12 cfs 12.005 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=25.96 cfs 12.004 af

Reach C8BR1: Avg. Flow Depth=0.16' Max Vel=2.77 fps Inflow=7.14 cfs 4.154 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=7.14 cfs 4.154 af

Reach C8BR2: Avg. Flow Depth=0.14' Max Vel=4.78 fps Inflow=7.14 cfs 4.154 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=7.14 cfs 4.154 af

Reach C8BR3: Avg. Flow Depth=0.05' Max Vel=1.46 fps Inflow=7.14 cfs 4.154 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=7.13 cfs 4.153 af

Reach SP1000: POA STA380+00 Inflow=131.04 cfs 202.565 af
Outflow=131.04 cfs 202.565 af

Pond 8.1AP: Peak Elev=207.72' Storage=15,668 cf Inflow=2.92 cfs 0.360 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.03' Storage=5,284 cf Inflow=1.28 cfs 0.177 af
Outflow=0.15 cfs 0.059 af

Pond 8.1CP: Peak Elev=158.11' Storage=190,623 cf Inflow=22.20 cfs 7.439 af
Outflow=4.73 cfs 3.395 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.31' Storage=6,319 cf Inflow=1.15 cfs 0.145 af
Outflow=0.00 cfs 0.000 af

Pond 8.2BP: Peak Elev=199.62' Storage=4,309 cf Inflow=1.82 cfs 0.234 af
Outflow=0.59 cfs 0.161 af

Pond 8.2CP: Peak Elev=182.20' Storage=11,450 cf Inflow=1.85 cfs 0.263 af
Outflow=0.00 cfs 0.000 af

Pond 8.3AP: Peak Elev=200.54' Storage=4,500 cf Inflow=2.21 cfs 0.264 af
Outflow=1.48 cfs 0.165 af

Pond 8.3BP: Peak Elev=201.61' Storage=72 cf Inflow=0.83 cfs 0.131 af
Outflow=0.83 cfs 0.131 af

Pond 8.3CP: Peak Elev=155.02' Storage=13,410 cf Inflow=2.07 cfs 0.476 af
Outflow=0.48 cfs 0.178 af

Pond 8.4AP: Peak Elev=207.46' Storage=8,776 cf Inflow=2.23 cfs 0.201 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.39' Storage=356 cf Inflow=1.36 cfs 0.211 af
Outflow=1.36 cfs 0.206 af

Pond 8.4CP: Peak Elev=161.45' Storage=12,860 cf Inflow=1.98 cfs 0.295 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.5AP: Peak Elev=205.80' Storage=13,744 cf Inflow=3.10 cfs 0.319 af
Primary=0.04 cfs 0.004 af Secondary=0.02 cfs 0.002 af Outflow=0.05 cfs 0.005 af

Pond 8.5BP: (new Pond) Peak Elev=167.95' Storage=10,451 cf Inflow=1.98 cfs 0.321 af
Primary=0.13 cfs 0.141 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.141 af

Pond 8.5CP: Peak Elev=159.52' Storage=13,603 cf Inflow=2.26 cfs 0.312 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.56' Storage=1,180 cf Inflow=1.48 cfs 0.181 af
Outflow=1.48 cfs 0.157 af

Pond 8.6BP: Peak Elev=156.74' Storage=37,874 cf Inflow=5.86 cfs 0.870 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.77' Storage=18,980 cf Inflow=5.55 cfs 1.032 af
Outflow=2.61 cfs 0.671 af

Pond 8.6CP2: Peak Elev=158.22' Storage=8,409 cf Inflow=2.61 cfs 0.671 af
Outflow=1.36 cfs 0.544 af

Pond 8.7CP: Peak Elev=157.49' Storage=3,427 cf Inflow=0.66 cfs 0.079 af
Outflow=0.00 cfs 0.000 af

Pond 800P: Pond on YWD Peak Elev=119.57' Storage=21,290 cf Inflow=58.05 cfs 25.663 af
Outflow=57.81 cfs 25.663 af

Pond C6P: 357+50 Peak Elev=139.62' Storage=21,895 cf Inflow=37.29 cfs 4.479 af
Primary=25.58 cfs 4.451 af Secondary=0.81 cfs 0.028 af Tertiary=0.00 cfs 0.000 af Outflow=26.39 cfs 4.479 af

Pond C8AP: Peak Elev=182.55' Storage=93,380 cf Inflow=27.34 cfs 4.555 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=4.57 cfs 4.555 af

Pond C8BP: Peak Elev=163.38' Storage=61,688 cf Inflow=23.63 cfs 4.208 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=7.14 cfs 4.154 af

Pond C8P: 375+00 Peak Elev=122.51' Storage=3.113 af Inflow=74.44 cfs 21.399 af
Primary=42.12 cfs 21.398 af Secondary=0.00 cfs 0.000 af Outflow=42.12 cfs 21.398 af

Link 1L: Cape 02-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=88.26 cfs 176.796 af
Area= 2,130.640 ac 7.98% Imperv. Primary=88.26 cfs 176.796 af

Total Runoff Area = 293.581 ac Runoff Volume = 33.994 af Average Runoff Depth = 1.39"
92.98% Pervious = 272.972 ac 7.02% Impervious = 20.610 ac

Summary for Subcatchment 8.1AS:

Runoff = 2.92 cfs @ 12.40 hrs, Volume= 0.360 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,882	98	
	61,847	77	Woods, Good, HSG D
	32,725	73	Brush, Good, HSG D
	121,454	81	Weighted Average
	94,572		77.87% Pervious Area
	26,882		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	85	0.0120	0.06		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
3.8	170	0.0220	0.74		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.5	130	0.0080	1.44		**Shallow Concentrated Flow, C to D** Unpaved Kv= 16.1 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
28.4	430	Total			

Summary for Subcatchment 8.1BS:

Runoff = 1.28 cfs @ 12.52 hrs, Volume= 0.177 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,205	98	
	63,793	77	Woods, Good, HSG D
	7,195	73	Brush, Good, HSG D
	72,193	77	Weighted Average
	70,988		98.33% Pervious Area
	1,205		1.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	145	0.0140	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.6	60	0.0160	0.63		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
35.1	265	Total			

Summary for Subcatchment 8.1CS:

Runoff = 20.75 cfs @ 12.52 hrs, Volume= 2.884 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,685	98	
	929,966	79	Woods, Fair, HSG D
	111,977	77	Brush, Fair, HSG D
	1,067,628	79	Weighted Average
	1,041,943		97.59% Pervious Area
	25,685		2.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.7	125	0.0560	0.12		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	125	0.1440	1.90		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
14.3	899	0.0100	1.05	6.30	**Trap/Vee/Rect Channel Flow, C to D (reach 8AR2)** Bot.W=10.00' D=0.50' Z= 4.0 '/' Top.W=14.00' n= 0.080
3.8	647	0.0150	2.80	1,497.17	**Trap/Vee/Rect Channel Flow, D to E (Reach 8AR4)** Bot.W=255.00' D=2.00' Z= 4.8 & 7.3 '/' Top.W=279.20' n= 0.100
35.9	1,796	Total			

Summary for Subcatchment 8.2AS:

Runoff = 1.15 cfs @ 12.43 hrs, Volume= 0.145 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	5,384	98	
	30,146	77	Woods, Good, HSG D
	20,761	73	Brush, Good, HSG D
	56,291	78	Weighted Average
	50,907		90.44% Pervious Area
	5,384		9.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0200	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"

Summary for Subcatchment 8.2BS:

Runoff = 1.82 cfs @ 12.42 hrs, Volume= 0.231 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	4	98	
	91,507	77	Woods, Good, HSG D
	2,378	73	Brush, Good, HSG D
	93,889	77	Weighted Average
	93,885		100.00% Pervious Area
	4		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	112	0.0270	0.09		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.2	95	0.0740	1.36		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
7.1	165	0.0060	0.39		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
28.8	372	Total			

Summary for Subcatchment 8.2CS:

Runoff = 1.85 cfs @ 12.53 hrs, Volume= 0.263 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	12,392	98	
	59,368	77	Woods, Good, HSG D
	30,241	73	Brush, Good, HSG D
	102,001	78	Weighted Average
	89,609		87.85% Pervious Area
	12,392		12.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	90	0.0700	0.07		**Sheet Flow, A t oB** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.8	105	0.0380	0.97		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
14.8	280	0.0040	0.32		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
37.1	475	Total			

Summary for Subcatchment 8.3AS:

Runoff = 2.21 cfs @ 12.38 hrs, Volume= 0.264 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	15,142	98	
	58,308	77	Woods, Good, HSG D
	19,987	73	Brush, Good, HSG D
	93,437	80	Weighted Average
	78,295		83.79% Pervious Area
	15,142		16.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	150	0.0400	0.11		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
3.9	270	0.0520	1.14		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
26.1	420	Total			

Summary for Subcatchment 8.3BS:

Runoff = 0.83 cfs @ 12.67 hrs, Volume= 0.131 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	3,710	98	
	41,240	77	Woods, Good, HSG D
	5,720	73	Brush, Good, HSG D
	50,670	78	Weighted Average
	46,960		92.68% Pervious Area
	3,710		7.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.1	135	0.0220	0.05		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"

Summary for Subcatchment 8.3CS:

Runoff = 2.07 cfs @ 13.15 hrs, Volume= 0.476 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	0	98	
	169,677	77	Woods, Good, HSG D
	24,095	73	Brush, Good, HSG D
	193,772	77	Weighted Average
	193,772		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.9	150	0.0700	0.08		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.4	35	0.1100	1.66		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.4	70	0.0280	0.84		**Shallow Concentrated Flow, C t oD** Woodland Kv= 5.0 fps
0.4	35	0.1100	1.66		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
5.7	90	0.0110	0.26		**Shallow Concentrated Flow, E to F** Forest w/Heavy Litter Kv= 2.5 fps
1.1	85	0.0700	1.32		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
26.4	250	0.0040	0.16		**Shallow Concentrated Flow, G to H** Forest w/Heavy Litter Kv= 2.5 fps
6.0	133	0.0220	0.37		**Shallow Concentrated Flow, H to I** Forest w/Heavy Litter Kv= 2.5 fps
11.6	191	0.0030	0.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
83.9	1,039	Total			

Summary for Subcatchment 8.4AS:

Runoff = 2.23 cfs @ 12.19 hrs, Volume= 0.201 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,400	98	
	35,974	77	Woods, Good, HSG D
	20,821	73	Brush, Good, HSG D
	71,195	80	Weighted Average
	56,795		79.77% Pervious Area
	14,400		20.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	56	0.0540	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
0.7	94	0.0200	2.12		**Shallow Concentrated Flow, C to D** Grassed Waterway Kv= 15.0 fps
0.2	30	0.2700	2.60		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
2.2	30	0.0020	0.22		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
13.2	260	Total			

Summary for Subcatchment 8.4BS:

Runoff = 1.36 cfs @ 12.61 hrs, Volume= 0.211 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	642	98	
	84,672	77	Woods, Good, HSG D
	658	73	Brush, Good, HSG D
	85,972	77	Weighted Average
	85,330		99.25% Pervious Area
	642		0.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.8	60	0.0160	0.04		**Sheet Flow, A to B**
					Woods: Dense underbrush n= 0.800 P2= 3.30"
2.8	106	0.0660	0.64		**Shallow Concentrated Flow, B to C**
					Forest w/Heavy Litter Kv= 2.5 fps
6.7	170	0.0290	0.43		**Shallow Concentrated Flow, C to D**
					Forest w/Heavy Litter Kv= 2.5 fps
7.5	170	0.0230	0.38		**Shallow Concentrated Flow, D to E**
					Forest w/Heavy Litter Kv= 2.5 fps
43.8	506	Total			

Summary for Subcatchment 8.4CS:

Runoff = 1.98 cfs @ 12.59 hrs, Volume= 0.295 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	9,964	98	
	61,261	77	Woods, Good, HSG D
	48,988	73	Brush, Good, HSG D
	120,213	77	Weighted Average
	110,249		91.71% Pervious Area
	9,964		8.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.8	95	0.0100	0.06		**Sheet Flow, A to B**
					Woods: Light underbrush n= 0.400 P2= 3.30"
4.1	145	0.0140	0.59		**Shallow Concentrated Flow, B to C**
					Woodland Kv= 5.0 fps
9.3	125	0.0020	0.22		**Shallow Concentrated Flow, C to D**
					Woodland Kv= 5.0 fps
40.2	365	Total			

Summary for Subcatchment 8.5AS:

Runoff = 3.10 cfs @ 12.25 hrs, Volume= 0.319 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	7,422	98	
	95,282	77	Woods, Good, HSG D
	27,137	73	Brush, Good, HSG D
	129,841	77	Weighted Average
	122,419		94.28% Pervious Area
	7,422		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	80	0.0250	0.08		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	150	Total			

Summary for Subcatchment 8.5BS:

Runoff = 1.98 cfs @ 12.69 hrs, Volume= 0.321 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	4,759	98	
	111,701	77	Woods, Good, HSG D
	8,211	73	Brush, Good, HSG D
	124,671	78	Weighted Average
	119,912		96.18% Pervious Area
	4,759		3.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	65	0.0150	0.04		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
3.7	115	0.0430	0.52		**Shallow Concentrated Flow, B to C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	95	0.1360	0.92		**Shallow Concentrated Flow, C to D** Forest w/Heavy Litter Kv= 2.5 fps
9.4	240	0.0290	0.43		**Shallow Concentrated Flow, D t oE** Forest w/Heavy Litter Kv= 2.5 fps
1.1	80	0.0625	1.25		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
2.6	122	0.0240	0.77		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
47.8	717	Total			

Summary for Subcatchment 8.5CS:

Runoff = 2.26 cfs @ 12.50 hrs, Volume= 0.312 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	16,201	98	
	68,051	77	Woods, Good, HSG D
	31,334	73	Brush, Good, HSG D
	115,586	79	Weighted Average
	99,385		85.98% Pervious Area
	16,201		14.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	35	0.0140	0.03		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.8	30	0.0600	0.61		**Shallow Concentrated Flow, B to C** Forest w/Heavy Litter Kv= 2.5 fps
1.4	70	0.0290	0.85		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
4.8	80	0.0125	0.28		**Shallow Concentrated Flow, C to D** Forest w/Heavy Litter Kv= 2.5 fps
10.4	70	0.0020	0.11		**Shallow Concentrated Flow, D to E** Forest w/Heavy Litter Kv= 2.5 fps
35.7	285	Total			

Summary for Subcatchment 8.6AS:

Runoff = 1.48 cfs @ 12.40 hrs, Volume= 0.181 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	10,048	98	
	49,320	77	Woods, Good, HSG D
	4,522	73	Brush, Good, HSG D
	63,890	80	Weighted Average
	53,842		84.27% Pervious Area
	10,048		15.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0100	0.05		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
2.7	140	0.0290	0.85		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
7.7	180	0.0060	0.39		**Shallow Concentrated Flow, C tO d** Woodland Kv= 5.0 fps
0.9	75	0.0800	1.41		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
27.3	445	Total			

Summary for Subcatchment 8.6BS: Non Contributing Area

Runoff = 5.86 cfs @ 12.59 hrs, Volume= 0.870 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	52,822	98	
	189,735	77	Woods, Good, HSG D
	64,723	73	Brush, Good, HSG D
	307,280	80	Weighted Average
	254,458		82.81% Pervious Area
	52,822		17.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.8	60	0.0125	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.7	95	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	90	0.0550	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.3	155	0.0060	0.19		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.5	450	Total			

Summary for Subcatchment 8.6CS:

Runoff = 5.55 cfs @ 12.83 hrs, Volume= 1.032 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	5,284	98	
	402,314	77	Woods, Good, HSG D
	12,425	73	Brush, Good, HSG D
	420,023	77	Weighted Average
	414,739		98.74% Pervious Area
	5,284		1.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.4	105	0.0190	0.08		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	60	0.0330	0.91		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
0.3	45	0.2900	2.69		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
9.0	195	0.0210	0.36		**Shallow Concentrated Flow, D to E** Forest w/Heavy Litter Kv= 2.5 fps
12.4	235	0.0040	0.32		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
14.3	235	0.0030	0.27		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
59.5	875	Total			

Summary for Subcatchment 8.7CS:

Runoff = 0.66 cfs @ 12.36 hrs, Volume= 0.079 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	0	98	
	21,110	77	Woods, Good, HSG D
	12,545	73	Brush, Good, HSG D
	33,655	76	Weighted Average
	33,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	135	0.1030	0.09		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"

Summary for Subcatchment 8AS: 354+34_A

Runoff = 1.57 cfs @ 12.07 hrs, Volume= 0.113 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	12,537	98	
	9,730	89	<50% Grass cover, Poor, HSG D
	22,267	94	Weighted Average
	9,730		43.70% Pervious Area
	12,537		56.30% Impervious Area

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

Summary for Subcatchment 9AS: 358+92

Runoff = 3.37 cfs @ 12.07 hrs, Volume= 0.245 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	31,716	98	
	14,938	89	<50% Grass cover, Poor, HSG D
	46,654	95	Weighted Average
	14,938		32.02% Pervious Area
	31,716		67.98% Impervious Area

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

Summary for Subcatchment 9BS: 358+92

Runoff = 0.47 cfs @ 12.07 hrs, Volume= 0.036 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	6,166	98	
	6,166		100.00% Impervious Area

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

Summary for Subcatchment 10S: 370+40

Runoff = 2.16 cfs @ 12.07 hrs, Volume= 0.157 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	21,265	98	
	8,713	89	<50% Grass cover, Poor, HSG D
	29,978	95	Weighted Average
	8,713		29.06% Pervious Area
	21,265		70.94% Impervious Area

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

Summary for Subcatchment 11AS: 375+70 LEFT

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	2,361	98	
	2,361		100.00% Impervious Area

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

Summary for Subcatchment 11BS: 375+51 CENTER

Runoff = 1.60 cfs @ 12.07 hrs, Volume= 0.116 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,827	98	
	7,327	89	<50% Grass cover, Poor, HSG D
	22,154	95	Weighted Average
	7,327		33.07% Pervious Area
	14,827		66.93% Impervious Area

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

Summary for Subcatchment 11CS: 375+70 CENTER

Runoff = 1.62 cfs @ 12.07 hrs, Volume= 0.118 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,794	98	
	7,691	89	<50% Grass cover, Poor, HSG D
	22,485	95	Weighted Average
	7,691		34.21% Pervious Area
	14,794		65.79% Impervious Area

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

Summary for Subcatchment 91S: 359+12

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,008	98	
	1,008		100.00% Impervious Area

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

Summary for Subcatchment 112S: 375+59 RIGHT

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.005 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	797	98	
	797		100.00% Impervious Area

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

Summary for Subcatchment 113S: 380+84

Runoff = 1.38 cfs @ 12.07 hrs, Volume= 0.106 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	18,128	98	
	18,128		100.00% Impervious Area

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

Summary for Subcatchment 800S: YWD Pond EAST SIDE

Runoff = 20.14 cfs @ 12.67 hrs, Volume= 3.255 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	61,279	98	Pavement
	79,827	73	Brush, Good, HSG D
	1,121,797	77	Woods, Good, HSG D
	1,262,903	78	Weighted Average
	1,201,624		95.15% Pervious Area
	61,279		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	300	0.0900	0.18		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
4.3	91	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.9	328	0.0640	6.39	44.70	**Channel Flow, C-D** Area= 7.0 sf Perim= 12.5' r= 0.56' n= 0.040 Winding stream, pools & shoals
4.9	168		0.57		**Lake or Reservoir, D-E** Mean Depth= 0.01'
0.4	28	0.0200	1.08		**Sheet Flow, E-F** Smooth surfaces n= 0.011 P2= 3.30"
7.2	244		0.57		**Lake or Reservoir, F-G** Mean Depth= 0.01'
2.1	191	0.0050	1.52	33.43	**Channel Flow, G-H** Area= 22.0 sf Perim= 50.0' r= 0.44' n= 0.040 Winding stream, pools & shoals
47.7	1,350	Total			

Summary for Subcatchment 1000S:

Runoff = 8.52 cfs @ 12.36 hrs, Volume= 1.005 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,097	98	
	36,572	73	Brush, Good, HSG D
	327,251	77	Woods, Good, HSG D
	389,920	78	Weighted Average
	363,823		93.31% Pervious Area
	26,097		6.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	244	0.1350	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	100	0.2700	2.60		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	144	0.2010	2.24		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.4	42	0.1480	1.92		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.4	61	0.0050	2.30	82.73	**Channel Flow, E-F** Area= 36.0 sf Perim= 44.0' r= 0.82' n= 0.040 Winding stream, pools & shoals
2.1	271	0.0050	2.15	25.77	**Channel Flow, F-G** Area= 12.0 sf Perim= 25.0' r= 0.48' n= 0.030 Stream, clean & straight

24.7 862 Total

Summary for Subcatchment C6S: 357+50

Runoff = 31.01 cfs @ 12.30 hrs, Volume= 3.440 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.780	98	
	24.830	77	Woods, Good, HSG D
	4.030	73	Brush, Good, HSG D
	30.640	78	Weighted Average
	28.860		94.19% Pervious Area
	1.780		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	31	0.0483	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	94	0.1277	1.79		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	31	0.1935	2.20		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.8	94	0.0851	2.04		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.0	63	0.0476	1.09		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.6	177	0.1412	1.88		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
1.1	129	0.0155	2.00		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
9.9	429	0.0023	0.72		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
0.1	50	0.0200	7.29	12.87	**Pipe Channel, I-J** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
21.4	1,098	Total			

Summary for Subcatchment C7S: 365+50

Runoff = 8.93 cfs @ 12.09 hrs, Volume= 0.645 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.340	98	
	4.610	77	Woods, Good, HSG D
	0.800	73	Brush, Good, HSG D
	5.750	78	Weighted Average
	5.410		94.09% Pervious Area
	0.340		5.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1190	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	26	0.2692	2.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.3	60	0.4000	3.16		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	15	0.1333	1.83		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.5	35	0.0571	1.19		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.2	58	0.0862	4.73		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
1.2	113	0.0088	1.51		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
0.5	161	0.0932	4.92		**Shallow Concentrated Flow, H-I** Unpaved Kv= 16.1 fps
6.0	489	Total			

Summary for Subcatchment C8AS:

Runoff = 25.67 cfs @ 12.69 hrs, Volume= 4.231 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	88,039	98	
	1,189,371	79	Woods, Fair, HSG D
	217,732	77	Brush, Fair, HSG D
	1,495,142	80	Weighted Average
	1,407,103		94.11% Pervious Area
	88,039		5.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.1	167	0.0120	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	31	0.0968	1.56		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	250	0.0240	3.63	18.13	**Channel Flow, C-D** Area= 5.0 sf Perim= 10.0' r= 0.50' n= 0.040 Mountain streams
0.3	133	0.0977	7.25	29.02	**Channel Flow, D-E** Area= 4.0 sf Perim= 8.1' r= 0.49' n= 0.040 Mountain streams
0.0	40	0.0500	59.66	8,948.44	**Channel Flow, E-F** Area= 150.0 sf Perim= 12.0' r= 12.50' n= 0.030 Earth, grassed & winding
9.5	1,025		1.79		**Lake or Reservoir, F-G** Mean Depth= 0.10'
50.3	1,646	Total			

Summary for Subcatchment C8BS:

Runoff = 21.51 cfs @ 12.71 hrs, Volume= 3.511 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	96,194	98	
	1,023,625	77	Woods, Good, HSG D
	242,692	73	Brush, Good, HSG D
	1,362,511	78	Weighted Average
	1,266,317		92.94% Pervious Area
	96,194		7.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	90	0.0220	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
2.9	211	0.0569	1.19		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.7	293	0.0034	0.29		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
6.3	153	0.0065	0.40		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.1	31	0.0050	3.64	6.44	**Pipe Channel, H-I** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.4	144	0.0347	5.81	58.13	**Channel Flow, I-J** Area= 10.0 sf Perim= 20.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	24	0.0050	3.64	6.44	**Pipe Channel, J-K** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.1	63	0.0635	7.86	39.32	**Channel Flow, K-L** Area= 5.0 sf Perim= 10.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	23	0.0050	3.64	6.44	**Pipe Channel, L-M** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.7	180	0.0194	4.35	23.90	**Channel Flow, M-N** Area= 5.5 sf Perim= 11.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	41	0.0300	8.92	15.77	**Pipe Channel, N-O** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
1.4	115	0.0087	1.40		**Shallow Concentrated Flow, O-P** Grassed Waterway Kv= 15.0 fps
0.2	65	0.0154	6.39	11.30	**Pipe Channel, P-Q** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.5	171	0.0292	5.33	16.00	**Channel Flow, Q-R** Area= 3.0 sf Perim= 6.0' r= 0.50' n= 0.030 Earth, grassed & winding
48.3	1,604	Total			

Summary for Subcatchment C8CS: 375+00

Runoff = 53.79 cfs @ 12.60 hrs, Volume= 8.239 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	198,255	98	
	2,534,660	77	Woods, Good, HSG D
	464,201	73	Brush, Good, HSG D
	3,197,116	78	Weighted Average
	2,998,861		93.80% Pervious Area
	198,255		6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	75	0.0450	0.15		**Sheet Flow, A to B** Grass: Dense n= 0.240 P2= 3.30"
5.3	313	0.0383	0.98		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
2.3	133	0.0376	0.97		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
5.2	538	0.0130	1.71		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
1.6	182	0.0166	1.93		**Shallow Concentrated Flow, I-J** Grassed Waterway Kv= 15.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
1.8	136	0.0662	1.29		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
4.3	197	0.0228	0.75		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
12.3	929	0.0070	1.25		**Shallow Concentrated Flow, M-N** Grassed Waterway Kv= 15.0 fps
43.1	2,622	Total			

Summary for Reach 1R: road ditch, sta354+34

Inflow Area = 0.511 ac, 56.30% Impervious, Inflow Depth = 2.64" for 02-YR event
Inflow = 1.57 cfs @ 12.07 hrs, Volume= 0.113 af
Outflow = 1.56 cfs @ 12.08 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 1.5 min

Peak Storage= 38 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 96.67 cfs

5.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 70.0' Slope= 0.1071 '/'
Inlet Invert= 150.00', Outlet Invert= 142.50'

Summary for Reach 8.1BR1:

Inflow Area = 1.657 ac, 1.67% Impervious, Inflow Depth = 0.43" for 02-YR event
Inflow = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af
Outflow = 0.15 cfs @ 15.70 hrs, Volume= 0.059 af, Atten= 2%, Lag= 24.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.27 fps, Avg. Travel Time= 17.7 min

Peak Storage= 103 cf @ 15.50 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 100.71 cfs

6.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 5.0 '/' Top Width= 26.00'
Length= 286.0' Slope= 0.0500 '/'
Inlet Invert= 202.45', Outlet Invert= 188.16'

Summary for Reach 8.1BR2:

Inflow Area = 6.793 ac, 2.92% Impervious, Inflow Depth = 0.39" for 02-YR event
Inflow = 0.59 cfs @ 13.16 hrs, Volume= 0.220 af
Outflow = 0.45 cfs @ 14.22 hrs, Volume= 0.220 af, Atten= 24%, Lag= 63.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 31.3 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 70.1 min

Peak Storage= 839 cf @ 13.70 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.50' Flow Area= 33.8 sf, Capacity= 36.13 cfs

15.00' x 1.50' deep channel, n= 0.100
Side Slope Z-value= 5.0 '/' Top Width= 30.00'
Length= 445.0' Slope= 0.0045 '/'
Inlet Invert= 187.00', Outlet Invert= 185.00'

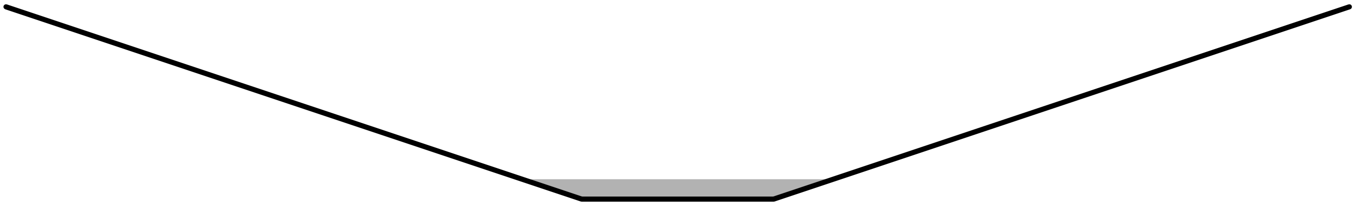
Summary for Reach 8.1BR3:

Inflow Area = 7.957 ac, 3.56% Impervious, Inflow Depth = 0.53" for 02-YR event
Inflow = 0.83 cfs @ 12.68 hrs, Volume= 0.351 af
Outflow = 0.82 cfs @ 12.79 hrs, Volume= 0.351 af, Atten= 1%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 9.2 min

Peak Storage= 203 cf @ 12.72 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 85.66 cfs

2.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 374.0' Slope= 0.0289 '/'
Inlet Invert= 183.79', Outlet Invert= 173.00'



Summary for Reach 8.1BR4:

Inflow Area = 9.930 ac, 3.00% Impervious, Inflow Depth = 0.67" for 02-YR event
Inflow = 2.14 cfs @ 12.71 hrs, Volume= 0.556 af
Outflow = 2.14 cfs @ 12.76 hrs, Volume= 0.556 af, Atten= 0%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.63 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 5.2 min

Peak Storage= 225 cf @ 12.73 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.50' Flow Area= 12.8 sf, Capacity= 53.25 cfs

4.00' x 1.50' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 171.0' Slope= 0.0213 '/'
Inlet Invert= 171.64', Outlet Invert= 168.00'

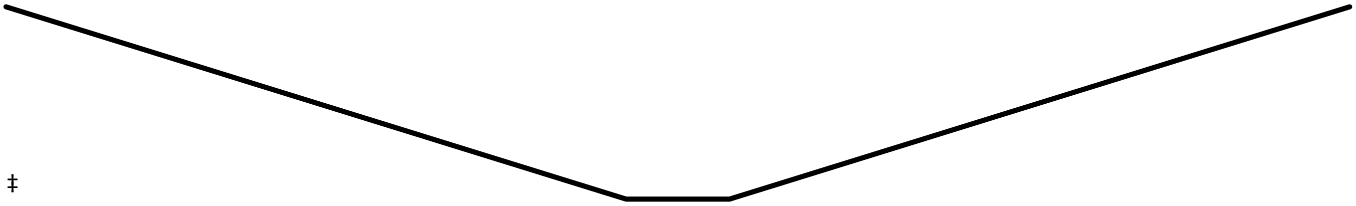
Summary for Reach 8.2AR1:

Inflow Area = 1.292 ac, 9.56% Impervious, Inflow Depth = 0.00" for 02-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 42.0 sf, Capacity= 82.07 cfs

2.00' x 3.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 330.0' Slope= 0.0061 '/'
Inlet Invert= 212.50', Outlet Invert= 210.50'



Summary for Reach 8.2BR1:

Inflow Area = 5.136 ac, 3.32% Impervious, Inflow Depth = 0.38" for 02-YR event
Inflow = 0.59 cfs @ 13.06 hrs, Volume= 0.161 af
Outflow = 0.59 cfs @ 13.16 hrs, Volume= 0.161 af, Atten= 0%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.82 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 8.2 min

Peak Storage= 120 cf @ 13.11 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 18.57 cfs

4.00' x 1.00' deep channel, n= 0.120
Side Slope Z-value= 4.0 '/' Top Width= 12.00'
Length= 166.0' Slope= 0.0620 '/'
Inlet Invert= 198.45', Outlet Invert= 188.16'

‡

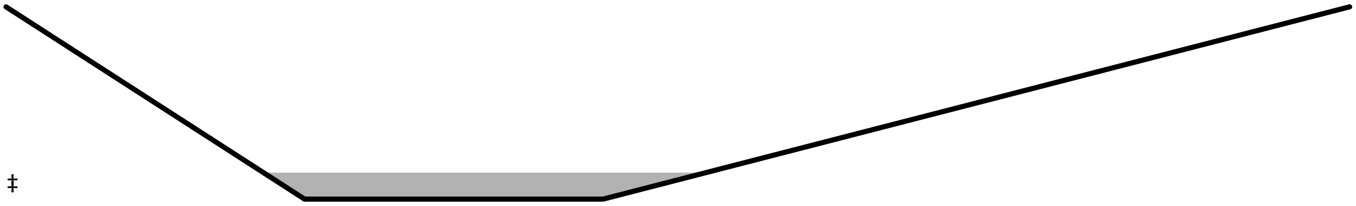
Summary for Reach 8.3AR1:

Inflow Area = 7.860 ac, 18.05% Impervious, Inflow Depth = 0.25" for 02-YR event
Inflow = 1.48 cfs @ 12.66 hrs, Volume= 0.165 af
Outflow = 1.24 cfs @ 12.82 hrs, Volume= 0.165 af, Atten= 16%, Lag= 9.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.91 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 10.3 min

Peak Storage= 314 cf @ 12.75 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 60.12 cfs

4.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 2.0 5.0 '/' Top Width= 18.00'
Length= 230.0' Slope= 0.0391 '/'
Inlet Invert= 194.00', Outlet Invert= 185.00'



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Summary for Reach 8.3CR1:

Inflow Area = 4.448 ac, 0.00% Impervious, Inflow Depth = 0.48" for 02-YR event
Inflow = 0.48 cfs @ 15.61 hrs, Volume= 0.178 af
Outflow = 0.46 cfs @ 16.19 hrs, Volume= 0.178 af, Atten= 5%, Lag= 34.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 16.1 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 29.6 min

Peak Storage= 443 cf @ 15.92 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 68.10 cfs

20.00' x 1.00' deep channel, n= 0.120
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 384.0' Slope= 0.0495 '/'
Inlet Invert= 154.00', Outlet Invert= 135.00'

‡

Summary for Reach 8.4CR1:

```
Inflow Area =      2.760 ac,   8.29% Impervious,  Inflow Depth =   0.00"   for  02-YR event
Inflow      =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af
Outflow     =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 48.74 cfs

5.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 4.0 '/' Top Width= 21.00'
Length= 1,440.0' Slope= 0.0178 '/'
Inlet Invert= 160.60', Outlet Invert= 135.00'

‡

Summary for Reach 8.6CR1:

```
Inflow Area =     10.415 ac,   1.16% Impervious,  Inflow Depth =   0.63"   for  02-YR event
Inflow      =       1.36 cfs @   14.80 hrs,  Volume=          0.544 af
Outflow     =       1.36 cfs @   14.98 hrs,  Volume=          0.544 af,  Atten= 0%,  Lag= 10.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 15.3 min

Peak Storage= 504 cf @ 14.87 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 30.58 cfs

5.00' x 1.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 482.0' Slope= 0.0560 '/'
Inlet Invert= 156.00', Outlet Invert= 129.00'

Summary for Reach 8.6CR2:

[43] Hint: Has no inflow (Outflow=Zero)

Bank-Full Depth= 1.00' Flow Area= 34.0 sf, Capacity= 34.51 cfs

30.00' x 1.00' deep channel, n= 0.120
Side Slope Z-value= 4.0 '/' Top Width= 38.00'
Length= 865.0' Slope= 0.0079 '/'
Inlet Invert= 127.80', Outlet Invert= 121.00'

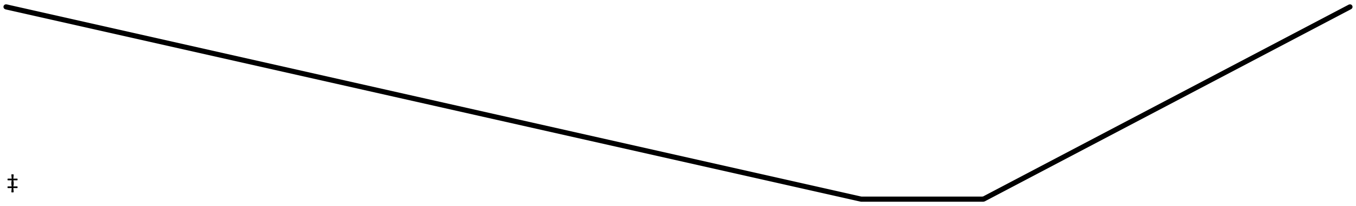
Summary for Reach C6R1:

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 189.62 cfs

2.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 7.0 3.0 '/' Top Width= 22.00'
Length= 338.0' Slope= 0.0414 '/'
Inlet Invert= 139.00', Outlet Invert= 125.00'



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Summary for Reach C7R1:

Inflow = 0.81 cfs @ 12.51 hrs, Volume= 0.028 af
Outflow = 0.80 cfs @ 12.57 hrs, Volume= 0.028 af, Atten= 1%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 2.9 min

Peak Storage= 95 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 3.00' Flow Area= 87.0 sf, Capacity= 1,060.34 cfs

5.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 10.0 6.0 '/' Top Width= 53.00'
Length= 190.0' Slope= 0.0316 '/'
Inlet Invert= 135.00', Outlet Invert= 129.00'

‡

Summary for Reach C8AR1:

Inflow Area = 43.650 ac, 8.41% Impervious, Inflow Depth = 1.25" for 02-YR event
Inflow = 4.57 cfs @ 14.80 hrs, Volume= 4.555 af
Outflow = 4.57 cfs @ 14.85 hrs, Volume= 4.555 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.10 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 1.9 min

Peak Storage= 447 cf @ 14.82 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 10.00' Flow Area= 680.0 sf, Capacity= 9,842.09 cfs

33.00' x 10.00' deep channel, n= 0.100
Side Slope Z-value= 3.0 4.0 '/' Top Width= 103.00'
Length= 107.5' Slope= 0.0794 '/'
Inlet Invert= 179.54', Outlet Invert= 171.00'

Summary for Reach C8AR2:

Inflow Area = 43.650 ac, 8.41% Impervious, Inflow Depth = 1.25" for 02-YR event
Inflow = 4.57 cfs @ 14.85 hrs, Volume= 4.555 af
Outflow = 4.56 cfs @ 15.26 hrs, Volume= 4.555 af, Atten= 0%, Lag= 24.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 26.6 min

Peak Storage= 3,938 cf @ 15.02 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 5.00' Flow Area= 150.0 sf, Capacity= 566.71 cfs

10.00' x 5.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 50.00'
Length= 810.0' Slope= 0.0099 '/'
Inlet Invert= 170.00', Outlet Invert= 162.00'

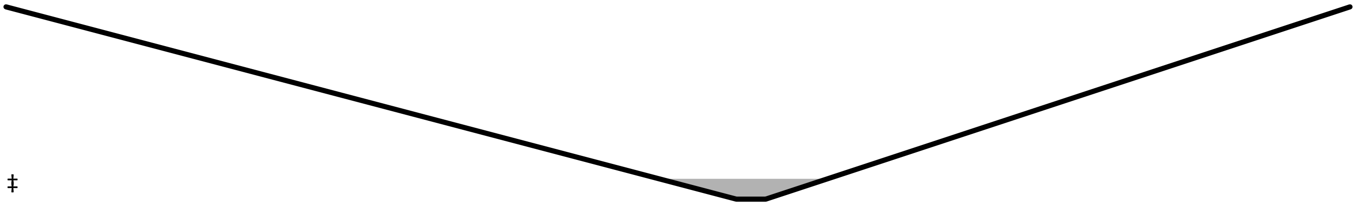
Summary for Reach C8AR3:

Inflow Area = 43.650 ac, 8.41% Impervious, Inflow Depth = 1.25" for 02-YR event
Inflow = 4.56 cfs @ 15.26 hrs, Volume= 4.555 af
Outflow = 4.56 cfs @ 15.27 hrs, Volume= 4.555 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 0.2 min

Peak Storage= 40 cf @ 15.26 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 5.00' Flow Area= 117.5 sf, Capacity= 1,210.27 cfs

1.00' x 5.00' deep channel, n= 0.080
Side Slope Z-value= 5.0 4.0 '/' Top Width= 46.00'
Length= 22.0' Slope= 0.0909 '/'
Inlet Invert= 161.00', Outlet Invert= 159.00'



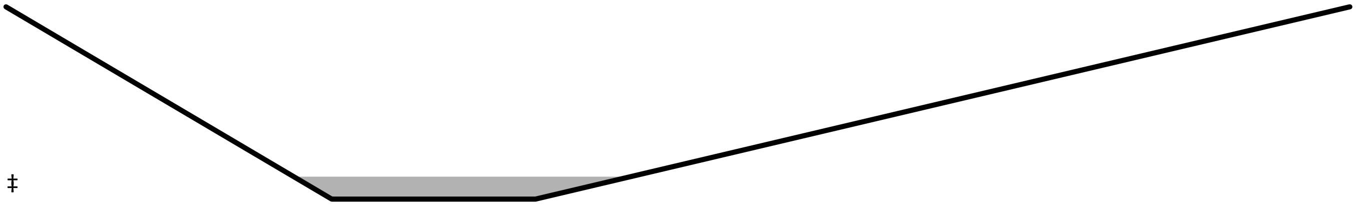
Summary for Reach C8AR6:

Inflow Area = 68.160 ac, 6.25% Impervious, Inflow Depth > 0.60" for 02-YR event
Inflow = 4.73 cfs @ 19.46 hrs, Volume= 3.395 af
Outflow = 4.73 cfs @ 19.72 hrs, Volume= 3.395 af, Atten= 0%, Lag= 16.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 17.9 min

Peak Storage= 2,552 cf @ 19.57 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 4.00' Flow Area= 76.0 sf, Capacity= 382.10 cfs

5.00' x 4.00' deep channel, n= 0.080
Side Slope Z-value= 2.0 5.0 '/' Top Width= 33.00'
Length= 822.0' Slope= 0.0254 '/'
Inlet Invert= 155.88', Outlet Invert= 135.00'



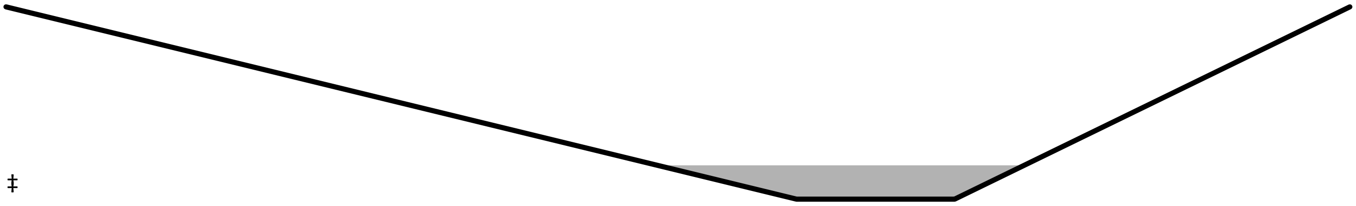
Summary for Reach C8AR7:

Inflow Area = 162.417 ac, 7.42% Impervious, Inflow Depth > 0.89" for 02-YR event
Inflow = 27.12 cfs @ 12.63 hrs, Volume= 12.005 af
Outflow = 25.96 cfs @ 13.10 hrs, Volume= 12.004 af, Atten= 4%, Lag= 28.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 15.6 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 40.8 min

Peak Storage= 24,344 cf @ 12.84 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 5.00' Flow Area= 475.0 sf, Capacity= 1,134.27 cfs

20.00' x 5.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 20.0 10.0 '/' Top Width= 170.00'
Length= 831.0' Slope= 0.0042 '/'
Inlet Invert= 132.50', Outlet Invert= 129.00'



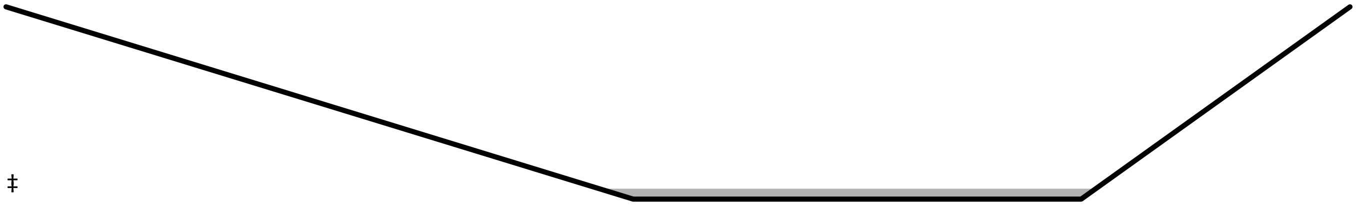
Summary for Reach C8BR1:

Inflow Area =	53.779 ac,	7.81% Impervious, Inflow Depth > 0.93"	for 02-YR event
Inflow =	7.14 cfs @	13.73 hrs, Volume=	4.154 af
Outflow =	7.14 cfs @	13.76 hrs, Volume=	4.154 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.77 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 2.0 min

Peak Storage= 412 cf @ 13.74 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 3.00' Flow Area= 90.0 sf, Capacity= 1,356.35 cfs

15.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 3.0 '/' Top Width= 45.00'
Length= 160.0' Slope= 0.0375 '/'
Inlet Invert= 160.00', Outlet Invert= 154.00'



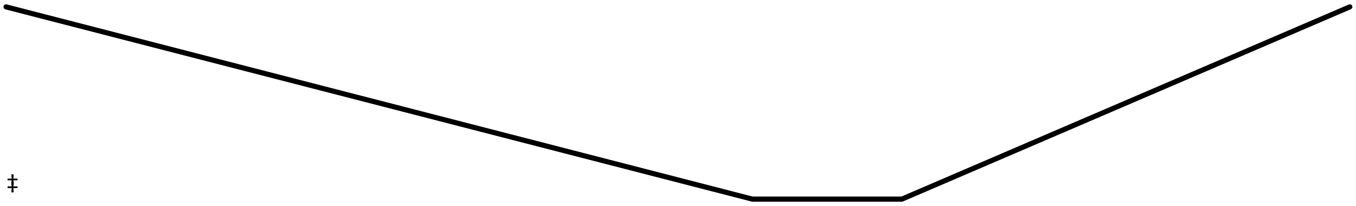
Summary for Reach C8BR2:

Inflow Area =	53.779 ac,	7.81% Impervious, Inflow Depth > 0.93"	for 02-YR event
Inflow =	7.14 cfs @	13.76 hrs, Volume=	4.154 af
Outflow =	7.14 cfs @	13.76 hrs, Volume=	4.154 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.78 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.75 fps, Avg. Travel Time= 0.1 min

Peak Storage= 46 cf @ 13.76 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 10.00' Flow Area= 500.0 sf, Capacity= 26,509.48 cfs

10.00' x 10.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 3.0 '/' Top Width= 90.00'
Length= 31.0' Slope= 0.1210 '/'
Inlet Invert= 153.75', Outlet Invert= 150.00'



‡

Summary for Reach C8BR3:

Inflow Area = 53.779 ac, 7.81% Impervious, Inflow Depth > 0.93" for 02-YR event
Inflow = 7.14 cfs @ 13.76 hrs, Volume= 4.154 af
Outflow = 7.13 cfs @ 14.11 hrs, Volume= 4.153 af, Atten= 0%, Lag= 20.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.46 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 9.0 min

Peak Storage= 3,846 cf @ 13.96 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 10.00' Flow Area= 1,650.0 sf, Capacity= 41,604.45 cfs

100.00' x 10.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 6.0 '/' Top Width= 230.00'
Length= 788.0' Slope= 0.0189 '/'
Inlet Invert= 149.89', Outlet Invert= 135.00'

‡

Summary for Reach SP1000: POA STA380+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,424.221 ac, 7.86% Impervious, Inflow Depth > 1.00" for 02-YR event
Inflow = 131.04 cfs @ 12.61 hrs, Volume= 202.565 af
Outflow = 131.04 cfs @ 12.61 hrs, Volume= 202.565 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 8.1AP:

Inflow Area = 2.788 ac, 22.13% Impervious, Inflow Depth = 1.55" for 02-YR event
Inflow = 2.92 cfs @ 12.40 hrs, Volume= 0.360 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 207.72' @ 25.63 hrs Surf.Area= 11,025 sf Storage= 15,668 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	206.00'	64,483 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.00	7,624	339.0	0	0	7,624
207.00	9,226	361.0	8,412	8,412	8,898
208.00	11,778	413.0	10,476	18,888	12,125
209.00	14,330	449.0	13,033	31,922	14,631
210.00	16,588	464.0	15,445	47,367	15,813
211.00	17,650	499.0	17,116	64,483	18,538

Device	Routing	Invert	Outlet Devices
#1	Primary	210.00'	**22.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.1BP:

Inflow Area = 1.657 ac, 1.67% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 1.28 cfs @ 12.52 hrs, Volume= 0.177 af
Outflow = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af, Atten= 88%, Lag= 166.5 min
Primary = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 203.03' @ 15.29 hrs Surf.Area= 5,186 sf Storage= 5,284 cf

Plug-Flow detention time= 372.5 min calculated for 0.059 af (34% of inflow)
Center-of-Mass det. time= 234.5 min (1,112.2 - 877.6)

Volume	Invert	Avail.Storage	Storage Description
#1	201.00'	11,928 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.00	400	0	0
202.00	2,390	1,395	1,395
203.00	5,085	3,738	5,133
204.00	8,505	6,795	11,928

Device	Routing	Invert	Outlet Devices
#1	Primary	203.00'	**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

Primary OutFlow Max=0.14 cfs @ 15.29 hrs HW=203.03' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 0.46 fps)

Summary for Pond 8.1CP:

Inflow Area = 68.160 ac, 6.25% Impervious, Inflow Depth = 1.31" for 02-YR event
Inflow = 22.20 cfs @ 12.53 hrs, Volume= 7.439 af
Outflow = 4.73 cfs @ 19.46 hrs, Volume= 3.395 af, Atten= 79%, Lag= 415.9 min
Primary = 4.73 cfs @ 19.46 hrs, Volume= 3.395 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 158.11' @ 19.46 hrs Surf.Area= 135,497 sf Storage= 190,623 cf

Plug-Flow detention time= 566.1 min calculated for 3.395 af (46% of inflow)
Center-of-Mass det. time= 318.7 min (1,376.8 - 1,058.0)

Volume	Invert	Avail.Storage	Storage Description
#1	156.40'	316,039 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.40	35,000	0	0
157.00	123,134	47,440	47,440
159.00	145,465	268,599	316,039

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**50.0' long x 25.0' 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

Primary OutFlow Max=4.71 cfs @ 19.46 hrs HW=158.11' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.71 cfs @ 0.88 fps)

Summary for Pond 8.2AP: Potentially Non-Contributing

Inflow Area = 1.292 ac, 9.56% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 1.15 cfs @ 12.43 hrs, Volume= 0.145 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 215.31' @ 25.64 hrs Surf.Area= 11,517 sf Storage= 6,319 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	214.00'	17,830 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
214.00	433	80.0	0	0	433
215.00	7,762	597.0	3,343	3,343	28,288
216.00	22,487	1,002.0	14,487	17,830	79,828

Device	Routing	Invert	Outlet Devices
#1	Primary	215.50'	**36.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=214.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.2BP:

```
Inflow Area =        5.136 ac,    3.32% Impervious,  Inflow Depth =   0.55"    for  02-YR event
Inflow      =        1.82 cfs @   12.42 hrs,  Volume=            0.234 af
Outflow     =        0.59 cfs @   13.06 hrs,  Volume=            0.161 af,  Atten= 67%,  Lag= 38.5 min
Primary     =        0.59 cfs @   13.06 hrs,  Volume=            0.161 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 199.62' @ 13.06 hrs Surf.Area= 9,583 sf Storage= 4,309 cf

Plug-Flow detention time= 222.7 min calculated for 0.161 af (69% of inflow)
Center-of-Mass det. time= 111.3 min (991.9 - 880.6)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	28,064 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	200	0	0
199.00	2,250	613	613
200.00	13,986	8,118	8,731
201.00	24,680	19,333	28,064

Device	Routing	Invert	Outlet Devices
#1	Primary	199.50'	**5.0' long x 25.0' 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

Primary OutFlow Max=0.59 cfs @ 13.06 hrs HW=199.62' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 0.95 fps)

Summary for Pond 8.2CP:

```
Inflow Area =        2.342 ac,  12.15% Impervious,  Inflow Depth =   1.35"    for  02-YR event
Inflow      =        1.85 cfs @   12.53 hrs,  Volume=            0.263 af
Outflow     =        0.00 cfs @    0.00 hrs,  Volume=            0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =        0.00 cfs @    0.00 hrs,  Volume=            0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 182.20' @ 26.14 hrs Surf.Area= 17,761 sf Storage= 11,450 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	181.00'	58,735 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
181.00	500	0	0
182.00	15,600	8,050	8,050
183.00	26,200	20,900	28,950
184.00	33,370	29,785	58,735

Device	Routing	Invert	Outlet Devices
#1	Primary	182.40'	**20.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.3AP:

Inflow Area = 7.860 ac, 18.05% Impervious, Inflow Depth = 0.40" for 02-YR event
Inflow = 2.21 cfs @ 12.38 hrs, Volume= 0.264 af
Outflow = 1.48 cfs @ 12.66 hrs, Volume= 0.165 af, Atten= 33%, Lag= 16.6 min
Primary = 1.48 cfs @ 12.66 hrs, Volume= 0.165 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 200.54' @ 12.66 hrs Surf.Area= 3,413 sf Storage= 4,500 cf

Plug-Flow detention time= 191.9 min calculated for 0.164 af (62% of inflow)
Center-of-Mass det. time= 81.2 min (941.0 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	6,209 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
198.50	916	144.0	0	0	916
199.00	1,731	172.0	651	651	1,625
200.00	2,691	278.0	2,193	2,844	5,427
201.00	4,086	269.0	3,364	6,209	5,905

Device	Routing	Invert	Outlet Devices
#1	Primary	200.50'	**65.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.44 cfs @ 12.66 hrs HW=200.54' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.44 cfs @ 0.51 fps)

Summary for Pond 8.3BP:

Inflow Area = 1.163 ac, 7.32% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 0.83 cfs @ 12.67 hrs, Volume= 0.131 af
Outflow = 0.83 cfs @ 12.68 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.8 min
Primary = 0.83 cfs @ 12.68 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 201.61' @ 12.68 hrs Surf.Area= 5,736 sf Storage= 72 cf

Plug-Flow detention time= 1.5 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (885.2 - 883.8)

Volume	Invert	Avail.Storage	Storage Description
#1	201.60'	18,071 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.60	5,455	0	0
202.00	14,150	3,921	3,921
203.00	14,150	14,150	18,071

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**202.0' long x 50.0' 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

Primary OutFlow Max=0.80 cfs @ 12.68 hrs HW=201.61' (Free Discharge)
↳**1=Broad-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 0.30 fps)

Summary for Pond 8.3CP:

Inflow Area = 4.448 ac, 0.00% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 2.07 cfs @ 13.15 hrs, Volume= 0.476 af
Outflow = 0.48 cfs @ 15.61 hrs, Volume= 0.178 af, Atten= 77%, Lag= 147.7 min
Primary = 0.48 cfs @ 15.61 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 155.02' @ 15.61 hrs Surf.Area= 20,021 sf Storage= 13,410 cf

Plug-Flow detention time= 356.0 min calculated for 0.178 af (37% of inflow)
Center-of-Mass det. time= 211.7 min (1,134.7 - 922.9)

Volume	Invert	Avail.Storage	Storage Description
#1	154.30'	34,473 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.30	17,065	0	0
155.00	19,950	12,955	12,955
156.00	23,085	21,518	34,473

Device	Routing	Invert	Outlet Devices
#1	Primary	155.00'	**50.0' long x 15.0' 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

Primary OutFlow Max=0.46 cfs @ 15.61 hrs HW=155.02' (Free Discharge)
⮤**1=Broad-Crested Rectangular Weir** (Weir Controls 0.46 cfs @ 0.40 fps)

Summary for Pond 8.4AP:

Inflow Area = 2.927 ac, 15.52% Impervious, Inflow Depth = 0.83" for 02-YR event
Inflow = 2.23 cfs @ 12.19 hrs, Volume= 0.201 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 207.46' @ 24.77 hrs Surf.Area= 7,718 sf Storage= 8,776 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	206.00'	54,709 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.00	4,077	240.0	0	0	4,077
207.00	6,895	338.0	5,425	5,425	8,594
208.00	8,749	385.0	7,804	13,228	11,322
209.00	12,565	552.0	10,600	23,828	23,783
210.00	16,428	882.0	14,453	38,281	61,448
211.00	16,428	882.0	16,428	54,709	62,330

Device	Routing	Invert	Outlet Devices
#1	Secondary	210.50'	**63.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63
#2	Primary	209.90'	**6.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
⮤**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
⮤**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.4BP:

```
Inflow Area =      1.974 ac,   0.75% Impervious,  Inflow Depth =   1.28"    for  02-YR event
Inflow      =      1.36 cfs @   12.61 hrs,  Volume=          0.211 af
Outflow     =      1.36 cfs @   12.65 hrs,  Volume=          0.206 af,  Atten= 0%,  Lag= 2.2 min
Primary     =      1.36 cfs @   12.65 hrs,  Volume=          0.206 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 182.39' @ 12.65 hrs Surf.Area= 1,584 sf Storage= 356 cf

Plug-Flow detention time= 21.5 min calculated for 0.206 af (97% of inflow)
Center-of-Mass det. time= 7.2 min (892.9 - 885.7)

Volume	Invert	Avail.Storage	Storage Description
#1	182.00'	6,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.00	260	0	0
183.00	3,690	1,975	1,975
184.00	5,900	4,795	6,770

Device	Routing	Invert	Outlet Devices
#1	Primary	182.30'	**20.0' long x 50.0' 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

Primary OutFlow Max=1.35 cfs @ 12.65 hrs HW=182.39' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.35 cfs @ 0.79 fps)

Summary for Pond 8.4CP:

```
Inflow Area =      2.760 ac,   8.29% Impervious,  Inflow Depth =   1.28"    for  02-YR event
Inflow      =      1.98 cfs @   12.59 hrs,  Volume=          0.295 af
Outflow     =      0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =      0.00 cfs @    0.00 hrs,  Volume=          0.000 af
Secondary =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 161.45' @ 26.27 hrs Surf.Area= 37,975 sf Storage= 12,860 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	161.10'	81,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.10	34,950	0	0
162.00	42,670	34,929	34,929
163.00	50,000	46,335	81,264

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**30.0' long x 50.0' 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	Secondary	161.50'	**80.0' long x 50.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.10' (Free Discharge)
↳**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.10' (Free Discharge)
↳**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.5AP:

Inflow Area = 2.981 ac, 5.72% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 3.10 cfs @ 12.25 hrs, Volume= 0.319 af
Outflow = 0.05 cfs @ 24.14 hrs, Volume= 0.005 af, Atten= 98%, Lag= 713.3 min
Primary = 0.04 cfs @ 24.14 hrs, Volume= 0.004 af
Secondary = 0.02 cfs @ 24.14 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 205.80' @ 24.14 hrs Surf.Area= 26,367 sf Storage= 13,744 cf

Plug-Flow detention time= 792.1 min calculated for 0.005 af (2% of inflow)
Center-of-Mass det. time= 591.7 min (1,453.1 - 861.3)

Volume	Invert	Avail.Storage	Storage Description
#1	205.20'	33,614 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
205.20	19,370	650.0	0	0	19,370
206.00	28,880	806.0	19,174	19,174	37,454
206.50	28,880	806.0	14,440	33,614	37,857

Device	Routing	Invert	Outlet Devices
#1	Primary	205.80'	**40.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Secondary	205.80'	**20.0' long x 25.0' 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

Primary OutFlow Max=0.02 cfs @ 24.14 hrs HW=205.80' (Free Discharge)
↰**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.15 fps)

Secondary OutFlow Max=0.01 cfs @ 24.14 hrs HW=205.80' (Free Discharge)
↰**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.16 fps)

Summary for Pond 8.5BP: (new Pond)

Inflow Area = 2.862 ac, 3.82% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 1.98 cfs @ 12.69 hrs, Volume= 0.321 af
Outflow = 0.13 cfs @ 18.02 hrs, Volume= 0.141 af, Atten= 93%, Lag= 319.7 min
Primary = 0.13 cfs @ 18.02 hrs, Volume= 0.141 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 167.95' @ 18.02 hrs Surf.Area= 17,593 sf Storage= 10,451 cf

Plug-Flow detention time= 643.0 min calculated for 0.141 af (44% of inflow)
Center-of-Mass det. time= 511.7 min (1,398.0 - 886.3)

Volume	Invert	Avail.Storage	Storage Description
#1	166.80'	33,637 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
166.80	2,000	0	0
167.00	3,313	531	531
168.00	18,361	10,837	11,368
169.00	26,176	22,269	33,637

Device	Routing	Invert	Outlet Devices
#1	Primary	167.75'	**12.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 167.75' / 167.50' S= 0.0078 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	168.50'	**27.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.13 cfs @ 18.02 hrs HW=167.95' (Free Discharge)
↰**1=Culvert** (Inlet Controls 0.13 cfs @ 1.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=166.80' (Free Discharge)
↰**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.5CP:

```
Inflow Area =         9.708 ac,  16.32% Impervious,  Inflow Depth =   0.39"    for  02-YR event
Inflow      =         2.26 cfs @   12.50 hrs,  Volume=            0.312 af
Outflow     =         0.00 cfs @    0.00 hrs,  Volume=            0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =         0.00 cfs @    0.00 hrs,  Volume=            0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 159.52' @ 26.03 hrs Surf.Area= 18,139 sf Storage= 13,603 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	93,198 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	3,500	0	0
159.00	9,395	6,448	6,448
160.00	26,219	17,807	24,255
161.00	33,641	29,930	54,185
162.00	44,385	39,013	93,198

Device	Routing	Invert	Outlet Devices
#1	Primary	160.60'	**40.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.6AP:

```
Inflow Area =         1.467 ac,  15.73% Impervious,  Inflow Depth =   1.48"    for  02-YR event
Inflow      =         1.48 cfs @   12.40 hrs,  Volume=            0.181 af
Outflow     =         1.48 cfs @   12.42 hrs,  Volume=            0.157 af,  Atten= 0%,  Lag= 1.0 min
Primary     =         1.48 cfs @   12.42 hrs,  Volume=            0.157 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 198.56' @ 12.42 hrs Surf.Area= 2,848 sf Storage= 1,180 cf

Plug-Flow detention time= 85.4 min calculated for 0.157 af (87% of inflow)
Center-of-Mass det. time= 26.2 min (887.1 - 860.9)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	2,740 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
198.00	1,450	147.0	0	0	1,450
199.00	4,280	230.0	2,740	2,740	3,947

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**42.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.48 cfs @ 12.42 hrs HW=198.56' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.48 cfs @ 0.59 fps)

Summary for Pond 8.6BP:

Inflow Area = 7.054 ac, 17.19% Impervious, Inflow Depth = 1.48" for 02-YR event
Inflow = 5.86 cfs @ 12.59 hrs, Volume= 0.870 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 156.74' @ 26.39 hrs Surf.Area= 34,651 sf Storage= 37,874 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	155.00'	438,508 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.00	7,503	0	0
156.00	24,570	16,037	16,037
157.00	38,240	31,405	47,442
158.00	51,342	44,791	92,233
159.00	65,795	58,569	150,801
160.00	88,790	77,293	228,094
161.00	105,299	97,045	325,138
162.00	121,440	113,370	438,508

Device	Routing	Invert	Outlet Devices
#1	Primary	161.80'	**100.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=155.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.6CP1:

```
Inflow Area =        9.642 ac,    1.26% Impervious,  Inflow Depth =   1.28"    for  02-YR event
Inflow      =        5.55 cfs @   12.83 hrs,  Volume=            1.032 af
Outflow     =        2.61 cfs @   13.62 hrs,  Volume=            0.671 af,  Atten= 53%,  Lag= 47.4 min
Primary     =        2.61 cfs @   13.62 hrs,  Volume=            0.671 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 160.77' @ 13.62 hrs Surf.Area= 46,686 sf Storage= 18,980 cf

Plug-Flow detention time= 216.2 min calculated for 0.671 af (65% of inflow)
Center-of-Mass det. time= 105.7 min (1,006.0 - 900.2)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	87,951 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	2,500	0	0
160.50	30,500	8,250	8,250
160.70	44,125	7,462	15,712
161.00	54,800	14,839	30,551
162.00	60,000	57,400	87,951

Device	Routing	Invert	Outlet Devices
#1	Primary	160.70'	**50.0' long x 50.0' 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

Primary OutFlow Max=2.59 cfs @ 13.62 hrs HW=160.77' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.59 cfs @ 0.72 fps)

Summary for Pond 8.6CP2:

```
Inflow Area =        9.642 ac,    1.26% Impervious,  Inflow Depth =   0.83"    for  02-YR event
Inflow      =        2.61 cfs @   13.62 hrs,  Volume=            0.671 af
Outflow     =        1.36 cfs @   14.80 hrs,  Volume=            0.544 af,  Atten= 48%,  Lag= 70.5 min
Primary     =        1.36 cfs @   14.80 hrs,  Volume=            0.544 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 158.22' @ 14.80 hrs Surf.Area= 13,736 sf Storage= 8,409 cf

Plug-Flow detention time= 172.2 min calculated for 0.544 af (81% of inflow)
Center-of-Mass det. time= 91.6 min (1,097.6 - 1,006.0)

Volume	Invert	Avail.Storage	Storage Description
#1	157.50'	41,223 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
157.50	9,290	0	0
158.00	12,800	5,523	5,523
159.00	17,100	14,950	20,473
160.00	24,400	20,750	41,223

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**5.0' long x 50.0' 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

Primary OutFlow Max=1.36 cfs @ 14.80 hrs HW=158.22' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 1.25 fps)

Summary for Pond 8.7CP:

Inflow Area = 0.773 ac, 0.00% Impervious, Inflow Depth = 1.22" for 02-YR event
Inflow = 0.66 cfs @ 12.36 hrs, Volume= 0.079 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 157.49' @ 25.39 hrs Surf.Area= 5,978 sf Storage= 3,427 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	16,653 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,500	0	0
157.00	3,217	1,179	1,179
158.00	8,865	6,041	7,220
159.00	10,000	9,433	16,653

Device	Routing	Invert	Outlet Devices
#1	Primary	157.60'	**40.0' long x 50.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=156.50' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 800P: Pond on YWD

[79] Warning: Submerged Pond C8P Primary device # 1 INLET by 0.26'

```
Inflow Area =      293.165 ac,    6.89% Impervious,  Inflow Depth >   1.05"    for  02-YR event
Inflow      =      58.05 cfs @   12.83 hrs,  Volume=          25.663 af
Outflow     =      57.81 cfs @   12.91 hrs,  Volume=          25.663 af,  Atten= 0%,  Lag= 4.4 min
Primary     =      57.81 cfs @   12.91 hrs,  Volume=          25.663 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 119.57' @ 12.91 hrs Surf.Area= 26,168 sf Storage= 21,290 cf

Plug-Flow detention time= 9.0 min calculated for 25.663 af (100% of inflow)
Center-of-Mass det. time= 9.0 min (1,036.0 - 1,027.1)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	712,300 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
118.00	959	441.0	0	0	959
119.00	19,570	637.0	8,287	8,287	17,781
120.00	31,765	1,121.0	25,423	33,710	85,497
121.00	97,714	2,249.0	61,731	95,440	388,005
122.00	119,554	2,295.0	108,451	203,891	404,793
123.00	162,662	2,787.0	140,556	344,447	603,780
124.00	185,002	2,707.0	173,712	518,159	638,864
125.00	203,425	2,711.0	194,141	712,300	642,075

Device	Routing	Invert	Outlet Devices
#1	Primary	118.00'	**4.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	119.00'	**32.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

```
Primary OutFlow  Max=57.77 cfs @ 12.91 hrs  HW=119.57'   (Free Discharge)
↑—1=Broad-Crested Rectangular Weir  (Weir Controls 20.82 cfs @ 3.31 fps)
└—2=Broad-Crested Rectangular Weir  (Weir Controls 36.95 cfs @ 2.02 fps)
```

Summary for Pond C6P: 357+50

```
Inflow Area =       38.114 ac,    8.60% Impervious,  Inflow Depth =   1.41"    for  02-YR event
Inflow      =      37.29 cfs @   12.29 hrs,  Volume=           4.479 af
Outflow     =      26.39 cfs @   12.51 hrs,  Volume=           4.479 af,  Atten= 29%,  Lag= 13.5 min
Primary     =      25.58 cfs @   12.51 hrs,  Volume=           4.451 af
Secondary =         0.81 cfs @   12.51 hrs,  Volume=           0.028 af
Tertiary    =       0.00 cfs @    0.00 hrs,  Volume=           0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 139.62' @ 12.51 hrs   Surf.Area= 40,964 sf   Storage= 21,895 cf

Plug-Flow detention time= 6.7 min calculated for 4.479 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (859.2 - 852.5)

Volume	Invert	Avail.Storage	Storage Description
#1	137.00'	344,264 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
137.00	500	250.0	0	0	500
138.00	1,167	359.2	810	810	5,803
139.00	11,959	1,301.5	5,621	6,431	130,334
140.00	67,539	1,621.9	35,973	42,404	204,886
141.00	113,172	3,559.0	89,379	131,783	1,003,523
142.00	155,057	3,703.0	133,566	265,349	1,086,819
142.50	160,618	3,712.0	78,915	344,264	1,092,443

Device	Routing	Invert	Outlet Devices
#1	Primary	136.90'	**36.0" Round Culvert STA357+00** L= 225.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 136.90' / 136.56' S= 0.0015 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	139.22'	**18.0" Round Culvert STA365+00** L= 297.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 139.22' / 136.87' S= 0.0079 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Tertiary	140.50'	**2.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=25.58 cfs @ 12.51 hrs HW=139.62' (Free Discharge)
↑—**1=Culvert STA357+00** (Barrel Controls 25.58 cfs @ 5.00 fps)

Secondary OutFlow Max=0.81 cfs @ 12.51 hrs HW=139.62' (Free Discharge)
↑—**2=Culvert STA365+00** (Inlet Controls 0.81 cfs @ 2.15 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=137.00' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C8AP:

Inflow Area = 43.650 ac, 8.41% Impervious, Inflow Depth = 1.25" for 02-YR event
Inflow = 27.34 cfs @ 12.75 hrs, Volume= 4.555 af
Outflow = 4.57 cfs @ 14.80 hrs, Volume= 4.555 af, Atten= 83%, Lag= 123.4 min
Primary = 4.57 cfs @ 14.80 hrs, Volume= 4.555 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 182.55' @ 14.80 hrs   Surf.Area= 259,045 sf   Storage= 93,380 cf

Plug-Flow detention time= 256.1 min calculated for 4.555 af (100% of inflow)
Center-of-Mass det. time= 256.0 min (1,141.3 - 885.2)

Volume	Invert	Avail.Storage	Storage Description
#1	181.50'	1,071,217 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
181.50	1,500	160.0	0	0	1,500
182.00	10,000	1,000.0	2,562	2,562	79,041
182.30	238,856	4,275.0	29,773	32,335	1,453,792
183.00	298,639	5,104.0	187,734	220,069	2,072,530
184.00	336,274	5,089.0	317,270	537,340	2,085,722
185.00	363,932	5,071.0	350,012	887,352	2,101,136
185.50	371,541	5,073.0	183,865	1,071,217	2,104,142

Device	Routing	Invert	Outlet Devices
#1	Primary	181.50'	**24.0" Round Culvert** L= 51.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0291 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf

Primary OutFlow Max=4.57 cfs @ 14.80 hrs HW=182.55' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.57 cfs @ 2.75 fps)

Summary for Pond C8BP:

Inflow Area = 44.071 ac, 5.93% Impervious, Inflow Depth > 1.15" for 02-YR event
Inflow = 23.63 cfs @ 12.71 hrs, Volume= 4.208 af
Outflow = 7.14 cfs @ 13.73 hrs, Volume= 4.154 af, Atten= 70%, Lag= 61.2 min
Primary = 7.14 cfs @ 13.73 hrs, Volume= 4.154 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 163.38' @ 13.73 hrs Surf.Area= 67,705 sf Storage= 61,688 cf

Plug-Flow detention time= 121.9 min calculated for 4.154 af (99% of inflow)
Center-of-Mass det. time= 109.5 min (1,026.9 - 917.4)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	759,850 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	2,075	247.8	0	0	2,075
162.00	14,443	1,163.1	7,331	7,331	104,844
163.00	52,542	1,444.5	31,511	38,842	163,250
164.00	96,433	2,067.5	73,385	112,227	337,373
165.00	140,706	2,820.8	117,875	230,102	630,416
166.00	195,436	3,605.7	167,323	397,425	1,031,830
167.00	249,936	3,675.8	222,128	619,553	1,072,612
167.50	312,413	3,957.0	140,297	759,850	1,243,423

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**18.0" Round Culvert** L= 51.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0097 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.14 cfs @ 13.73 hrs HW=163.38' (Free Discharge)
└─**1=Culvert** (Inlet Controls 7.14 cfs @ 4.04 fps)

Summary for Pond C8P: 375+00

```
Inflow Area =      255.203 ac,   7.12% Impervious,  Inflow Depth >   1.01"   for  02-YR event
Inflow      =       74.44 cfs @   12.69 hrs,  Volume=         21.399 af
Outflow     =       42.12 cfs @   13.41 hrs,  Volume=         21.398 af,  Atten= 43%,  Lag= 43.3 min
Primary     =       42.12 cfs @   13.41 hrs,  Volume=         21.398 af
Secondary =          0.00 cfs @    0.00 hrs,  Volume=          0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 122.51' @ 13.41 hrs Surf.Area= 2.097 ac Storage= 3.113 af

Plug-Flow detention time= 37.7 min calculated for 21.398 af (100% of inflow)
Center-of-Mass det. time= 37.7 min (1,056.2 - 1,018.5)

Volume	Invert	Avail.Storage	Storage Description
#1	119.30'	35.870 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
119.30	0.002	45.0	0.000	0.000	0.002
120.00	0.344	600.0	0.087	0.087	0.656
121.00	1.056	1,314.7	0.668	0.754	3.156
122.00	1.726	1,928.6	1.377	2.132	6.794
123.00	2.480	2,755.9	2.092	4.223	13.874
124.00	3.363	2,842.9	2.910	7.134	14.766
125.00	4.356	3,500.4	3.849	10.983	22.385
126.00	5.236	3,807.1	4.789	15.772	26.481
127.00	6.360	4,208.5	5.789	21.561	32.359
128.00	7.120	4,476.8	6.736	28.297	36.617
129.00	8.035	5,000.0	7.573	35.870	45.676

Device	Routing	Invert	Outlet Devices
#1	Primary	119.31'	**36.0" Round Culvert** L= 199.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 119.31' / 118.28' S= 0.0052 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	128.50'	**200.0' long x 95.0' 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

Primary OutFlow Max=42.13 cfs @ 13.41 hrs HW=122.51' (Free Discharge)
└─**1=Culvert** (Barrel Controls 42.13 cfs @ 6.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.30' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: Cape Neddick River by HNTB

```
Inflow Area =    2,130.640 ac,    7.98% Impervious,  Inflow Depth >   1.00"    for  02-YR event
Inflow       =        88.26 cfs @   12.40 hrs,  Volume=         176.796 af
Primary     =        88.26 cfs @   12.40 hrs,  Volume=         176.796 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

02-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
19.203	98	(8.1AS, 8.1BS, 8.1CS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8AS, 9AS, 9BS, 10S, 11AS, 11BS, 11CS, 91S, 112S, 113S, 1000S, C6S, C7S, C8AS, C8BS, C8CS)
1.111	89	<50% Grass cover, Poor, HSG D (8AS, 9AS, 10S, 11BS, 11CS)
7.569	77	Brush, Fair, HSG D (8.1CS, C8AS)
32.327	73	Brush, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C6S, C7S, C8BS, C8CS)
1.407	98	Pavement (800S)
48.653	79	Woods, Fair, HSG D (8.1CS, C8AS)
183.311	77	Woods, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C6S, C7S, C8BS, C8CS)
293.581	**78**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=2.90"
Flow Length=430' Tc=28.4 min CN=81 Runoff=5.50 cfs 0.673 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=2.54"
Flow Length=265' Tc=35.1 min CN=77 Runoff=2.58 cfs 0.351 af

Subcatchment 8.1CS: Runoff Area=1,067,628 sf 2.41% Impervious Runoff Depth=2.72"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=40.59 cfs 5.547 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=2.63"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=2.28 cfs 0.283 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=2.54"
Flow Length=372' Tc=28.8 min CN=77 Runoff=3.69 cfs 0.456 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=2.63"
Flow Length=475' Tc=37.1 min CN=78 Runoff=3.68 cfs 0.513 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=2.81"
Flow Length=420' Tc=26.1 min CN=80 Runoff=4.24 cfs 0.502 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=2.63"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=1.65 cfs 0.255 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=4.22 cfs 0.941 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=2.81"
Flow Length=260' Tc=13.2 min CN=80 Runoff=4.27 cfs 0.382 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=2.54"
Flow Length=506' Tc=43.8 min CN=77 Runoff=2.76 cfs 0.418 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=2.54"
Flow Length=365' Tc=40.2 min CN=77 Runoff=4.04 cfs 0.584 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=2.54"
Flow Length=150' Tc=17.5 min CN=77 Runoff=6.30 cfs 0.631 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=2.63"
Flow Length=717' Tc=47.8 min CN=78 Runoff=3.94 cfs 0.627 af

Subcatchment 8.5CS: Runoff Area=115,586 sf 14.02% Impervious Runoff Depth=2.72"
Flow Length=285' Tc=35.7 min CN=79 Runoff=4.41 cfs 0.601 af

Subcatchment 8.6AS: Runoff Area=63,890 sf 15.73% Impervious Runoff Depth=2.81"
Flow Length=445' Tc=27.3 min CN=80 Runoff=2.84 cfs 0.343 af

Subcatchment 8.6BS: Non Contributing Area
Runoff Area=307,280 sf 17.19% Impervious Runoff Depth=2.81"
Flow Length=450' Tc=41.5 min CN=80 Runoff=11.23 cfs 1.649 af

Subcatchment 8.6CS:
Runoff Area=420,023 sf 1.26% Impervious Runoff Depth=2.54"
Flow Length=875' Tc=59.5 min CN=77 Runoff=11.30 cfs 2.041 af

Subcatchment 8.7CS:
Runoff Area=33,655 sf 0.00% Impervious Runoff Depth=2.45"
Flow Length=135' Slope=0.1030 '/' Tc=24.3 min CN=76 Runoff=1.38 cfs 0.158 af

Subcatchment 8AS: 354+34_A
Runoff Area=22,267 sf 56.30% Impervious Runoff Depth=4.21"
Tc=5.0 min CN=94 Runoff=2.43 cfs 0.179 af

Subcatchment 9AS: 358+92
Runoff Area=46,654 sf 67.98% Impervious Runoff Depth=4.32"
Tc=5.0 min CN=95 Runoff=5.17 cfs 0.386 af

Subcatchment 9BS: 358+92
Runoff Area=6,166 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.70 cfs 0.055 af

Subcatchment 10S: 370+40
Runoff Area=29,978 sf 70.94% Impervious Runoff Depth=4.32"
Tc=5.0 min CN=95 Runoff=3.32 cfs 0.248 af

Subcatchment 11AS: 375+70 LEFT
Runoff Area=2,361 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.27 cfs 0.021 af

Subcatchment 11BS: 375+51 CENTER
Runoff Area=22,154 sf 66.93% Impervious Runoff Depth=4.32"
Tc=5.0 min CN=95 Runoff=2.45 cfs 0.183 af

Subcatchment 11CS: 375+70 CENTER
Runoff Area=22,485 sf 65.79% Impervious Runoff Depth=4.32"
Tc=5.0 min CN=95 Runoff=2.49 cfs 0.186 af

Subcatchment 91S: 359+12
Runoff Area=1,008 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.009 af

Subcatchment 112S: 375+59 RIGHT
Runoff Area=797 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment 113S: 380+84
Runoff Area=18,128 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=2.07 cfs 0.162 af

Subcatchment 800S: YWD Pond EAST SIDE
Runoff Area=1,262,903 sf 4.85% Impervious Runoff Depth=2.63"
Flow Length=1,350' Tc=47.7 min CN=78 Runoff=40.13 cfs 6.347 af

Subcatchment 1000S:
Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=2.63"
Flow Length=862' Tc=24.7 min CN=78 Runoff=16.97 cfs 1.960 af

Subcatchment C6S: 357+50
Runoff Area=30.640 ac 5.81% Impervious Runoff Depth=2.63"
Flow Length=1,098' Tc=21.4 min CN=78 Runoff=61.88 cfs 6.708 af

Subcatchment C7S: 365+50
Runoff Area=5.750 ac 5.91% Impervious Runoff Depth=2.63"
Flow Length=489' Tc=6.0 min CN=78 Runoff=17.72 cfs 1.259 af

Subcatchment C8AS:
Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=2.81"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=49.37 cfs 8.025 af

Subcatchment C8BS:
Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=2.63"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=42.84 cfs 6.848 af

Subcatchment C8CS: 375+00
Runoff Area=3,197,116 sf 6.20% Impervious Runoff Depth=2.63"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=107.27 cfs 16.068 af

Reach 1R: road ditch, sta354+34
Avg. Flow Depth=0.13' Max Vel=3.36 fps Inflow=2.43 cfs 0.179 af
n=0.035 L=70.0' S=0.1071 '/' Capacity=96.67 cfs Outflow=2.42 cfs 0.179 af

Reach 8.1BR1:
Avg. Flow Depth=0.23' Max Vel=0.95 fps Inflow=1.67 cfs 0.233 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=1.58 cfs 0.233 af

Reach 8.1BR2:
Avg. Flow Depth=0.41' Max Vel=0.51 fps Inflow=4.06 cfs 0.823 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=3.57 cfs 0.823 af

Reach 8.1BR3:
Avg. Flow Depth=0.49' Max Vel=2.44 fps Inflow=4.19 cfs 1.078 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=4.17 cfs 1.078 af

Reach 8.1BR4:
Avg. Flow Depth=0.45' Max Vel=2.15 fps Inflow=5.10 cfs 1.490 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=5.10 cfs 1.490 af

Reach 8.2AR1:
Avg. Flow Depth=0.18' Max Vel=0.39 fps Inflow=0.20 cfs 0.082 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.20 cfs 0.082 af

Reach 8.2BR1:
Avg. Flow Depth=0.35' Max Vel=1.31 fps Inflow=2.52 cfs 0.590 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=18.57 cfs Outflow=2.51 cfs 0.590 af

Reach 8.3AR1:
Avg. Flow Depth=0.54' Max Vel=1.32 fps Inflow=4.24 cfs 0.402 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=4.16 cfs 0.402 af

Reach 8.3CR1:
Avg. Flow Depth=0.18' Max Vel=0.83 fps Inflow=3.40 cfs 0.644 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=3.20 cfs 0.644 af

Reach 8.4CR1:
Avg. Flow Depth=0.19' Max Vel=0.50 fps Inflow=0.74 cfs 0.247 af
n=0.120 L=1,440.0' S=0.0178 '/' Capacity=48.74 cfs Outflow=0.54 cfs 0.247 af

Reach 8.6CR1:
Avg. Flow Depth=0.47' Max Vel=2.23 fps Inflow=7.15 cfs 1.616 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=7.12 cfs 1.616 af

Reach 8.6CR2:
Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.120 L=865.0' S=0.0079 '/' Capacity=34.51 cfs Outflow=0.00 cfs 0.000 af

Reach C6R1:
Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=0.00 cfs 0.000 af

Reach C7R1:
Avg. Flow Depth=0.25' Max Vel=2.92 fps Inflow=5.01 cfs 0.357 af
n=0.030 L=190.0' S=0.0316 '/' Capacity=1,060.34 cfs Outflow=5.01 cfs 0.357 af

Reach C8AR1: Avg. Flow Depth=0.17' Max Vel=1.33 fps Inflow=7.79 cfs 8.856 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=7.79 cfs 8.856 af

Reach C8AR2: Avg. Flow Depth=0.57' Max Vel=1.12 fps Inflow=7.79 cfs 8.856 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=566.71 cfs Outflow=7.78 cfs 8.856 af

Reach C8AR3: Avg. Flow Depth=0.67' Max Vel=2.91 fps Inflow=7.78 cfs 8.856 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=7.78 cfs 8.856 af

Reach C8AR6: Avg. Flow Depth=0.77' Max Vel=2.01 fps Inflow=11.96 cfs 10.358 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=11.95 cfs 10.358 af

Reach C8AR7: Avg. Flow Depth=1.10' Max Vel=1.00 fps Inflow=40.59 cfs 27.488 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=39.85 cfs 27.485 af

Reach C8BR1: Avg. Flow Depth=0.20' Max Vel=3.14 fps Inflow=9.98 cfs 8.727 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=9.98 cfs 8.727 af

Reach C8BR2: Avg. Flow Depth=0.17' Max Vel=5.32 fps Inflow=9.98 cfs 8.727 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=9.98 cfs 8.727 af

Reach C8BR3: Avg. Flow Depth=0.07' Max Vel=1.46 fps Inflow=9.98 cfs 8.727 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=9.98 cfs 8.727 af

Reach SP1000: POA STA380+00 Inflow=227.51 cfs 379.614 af
Outflow=227.51 cfs 379.614 af

Pond 8.1AP: Peak Elev=208.82' Storage=29,322 cf Inflow=5.50 cfs 0.673 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.16' Storage=5,972 cf Inflow=2.58 cfs 0.351 af
Outflow=1.67 cfs 0.233 af

Pond 8.1CP: Peak Elev=158.20' Storage=203,186 cf Inflow=42.95 cfs 14.403 af
Outflow=11.96 cfs 10.358 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.52' Storage=8,977 cf Inflow=2.28 cfs 0.283 af
Outflow=0.20 cfs 0.082 af

Pond 8.2BP: Peak Elev=199.83' Storage=6,487 cf Inflow=3.69 cfs 0.664 af
Outflow=2.52 cfs 0.590 af

Pond 8.2CP: Peak Elev=182.44' Storage=15,857 cf Inflow=3.68 cfs 0.513 af
Outflow=0.38 cfs 0.165 af

Pond 8.3AP: Peak Elev=200.59' Storage=4,656 cf Inflow=4.24 cfs 0.502 af
Outflow=4.24 cfs 0.402 af

Pond 8.3BP: Peak Elev=201.62' Storage=116 cf Inflow=1.65 cfs 0.255 af
Outflow=1.65 cfs 0.255 af

Pond 8.3CP: Peak Elev=155.09' Storage=14,687 cf Inflow=4.22 cfs 0.941 af
Outflow=3.40 cfs 0.644 af

Pond 8.4AP: Peak Elev=208.70' Storage=20,224 cf Inflow=4.27 cfs 0.464 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.44' Storage=443 cf Inflow=2.76 cfs 0.418 af
Outflow=2.76 cfs 0.412 af

Pond 8.4CP: Peak Elev=161.52' Storage=15,371 cf Inflow=4.04 cfs 0.584 af
Primary=0.20 cfs 0.067 af Secondary=0.54 cfs 0.180 af Outflow=0.74 cfs 0.247 af

Pond 8.5AP: Peak Elev=205.84' Storage=14,710 cf Inflow=6.30 cfs 0.631 af
Primary=0.81 cfs 0.208 af Secondary=0.43 cfs 0.110 af Outflow=1.24 cfs 0.317 af

Pond 8.5BP: (new Pond) Peak Elev=168.22' Storage=15,624 cf Inflow=3.94 cfs 0.627 af
Primary=0.67 cfs 0.445 af Secondary=0.00 cfs 0.000 af Outflow=0.67 cfs 0.445 af

Pond 8.5CP: Peak Elev=160.07' Storage=26,158 cf Inflow=4.41 cfs 0.601 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.59' Storage=1,273 cf Inflow=2.84 cfs 0.343 af
Outflow=2.84 cfs 0.320 af

Pond 8.6BP: Peak Elev=157.58' Storage=71,843 cf Inflow=11.23 cfs 1.649 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.87' Storage=23,881 cf Inflow=11.30 cfs 2.041 af
Outflow=9.66 cfs 1.680 af

Pond 8.6CP2: Peak Elev=158.65' Storage=14,683 cf Inflow=9.66 cfs 1.680 af
Outflow=6.97 cfs 1.553 af

Pond 8.7CP: Peak Elev=157.61' Storage=4,201 cf Inflow=1.38 cfs 0.158 af
Outflow=0.19 cfs 0.063 af

Pond 800P: Pond on YWD Peak Elev=119.88' Storage=29,916 cf Inflow=98.84 cfs 55.369 af
Outflow=97.83 cfs 55.368 af

Pond C6P: 357+50 Peak Elev=140.33' Storage=66,753 cf Inflow=73.02 cfs 8.586 af
Primary=35.26 cfs 8.229 af Secondary=5.01 cfs 0.357 af Tertiary=0.00 cfs 0.000 af Outflow=40.27 cfs 8.586 af

Pond C8AP: Peak Elev=182.94' Storage=201,463 cf Inflow=54.52 cfs 8.856 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=7.79 cfs 8.856 af

Pond C8BP: Peak Elev=164.46' Storage=160,648 cf Inflow=47.18 cfs 8.783 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=9.98 cfs 8.727 af

Pond C8P: 375+00 Peak Elev=124.32' Storage=8.268 af Inflow=143.42 cfs 47.055 af
Primary=59.87 cfs 47.055 af Secondary=0.00 cfs 0.000 af Outflow=59.87 cfs 47.055 af

Link 1L: Cape 10-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=174.80 cfs 324.084 af
Area= 2,130.640 ac 7.98% Imperv. Primary=174.80 cfs 324.084 af

Total Runoff Area = 293.581 ac Runoff Volume = 65.602 af Average Runoff Depth = 2.68"
92.98% Pervious = 272.972 ac 7.02% Impervious = 20.610 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=4.07"
Flow Length=430' Tc=28.4 min CN=81 Runoff=7.68 cfs 0.945 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=3.65"
Flow Length=265' Tc=35.1 min CN=77 Runoff=3.73 cfs 0.505 af

Subcatchment 8.1CS: Runoff Area=1,067,628 sf 2.41% Impervious Runoff Depth=3.86"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=57.63 cfs 7.881 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=3.76"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=3.25 cfs 0.404 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=3.65"
Flow Length=372' Tc=28.8 min CN=77 Runoff=5.32 cfs 0.656 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=3.76"
Flow Length=475' Tc=37.1 min CN=78 Runoff=5.27 cfs 0.733 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=3.96"
Flow Length=420' Tc=26.1 min CN=80 Runoff=5.97 cfs 0.708 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=3.76"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=2.37 cfs 0.364 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=3.65"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=6.11 cfs 1.355 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=3.96"
Flow Length=260' Tc=13.2 min CN=80 Runoff=6.01 cfs 0.540 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=3.65"
Flow Length=506' Tc=43.8 min CN=77 Runoff=3.98 cfs 0.601 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=3.65"
Flow Length=365' Tc=40.2 min CN=77 Runoff=5.82 cfs 0.840 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=3.65"
Flow Length=150' Tc=17.5 min CN=77 Runoff=9.10 cfs 0.908 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=3.76"
Flow Length=717' Tc=47.8 min CN=78 Runoff=5.64 cfs 0.896 af

Subcatchment 8.5CS: Runoff Area=115,586 sf 14.02% Impervious Runoff Depth=3.86"
Flow Length=285' Tc=35.7 min CN=79 Runoff=6.26 cfs 0.853 af

Subcatchment 8.6AS: Runoff Area=63,890 sf 15.73% Impervious Runoff Depth=3.96"
Flow Length=445' Tc=27.3 min CN=80 Runoff=4.00 cfs 0.484 af

Subcatchment 8.6BS: Non Contributing Area Runoff Area=307,280 sf 17.19% Impervious Runoff Depth=3.96"
Flow Length=450' Tc=41.5 min CN=80 Runoff=15.80 cfs 2.329 af

Subcatchment 8.6CS: Runoff Area=420,023 sf 1.26% Impervious Runoff Depth=3.65"
Flow Length=875' Tc=59.5 min CN=77 Runoff=16.31 cfs 2.936 af

Subcatchment 8.7CS: Runoff Area=33,655 sf 0.00% Impervious Runoff Depth=3.55"
Flow Length=135' Slope=0.1030 '/' Tc=24.3 min CN=76 Runoff=2.00 cfs 0.229 af

Subcatchment 8AS: 354+34_A Runoff Area=22,267 sf 56.30% Impervious Runoff Depth=5.49"
Tc=5.0 min CN=94 Runoff=3.13 cfs 0.234 af

Subcatchment 9AS: 358+92 Runoff Area=46,654 sf 67.98% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=95 Runoff=6.62 cfs 0.501 af

Subcatchment 9BS: 358+92 Runoff Area=6,166 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.89 cfs 0.070 af

Subcatchment 10S: 370+40 Runoff Area=29,978 sf 70.94% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=95 Runoff=4.25 cfs 0.322 af

Subcatchment 11AS: 375+70 LEFT Runoff Area=2,361 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.34 cfs 0.027 af

Subcatchment 11BS: 375+51 CENTER Runoff Area=22,154 sf 66.93% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=95 Runoff=3.14 cfs 0.238 af

Subcatchment 11CS: 375+70 CENTER Runoff Area=22,485 sf 65.79% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=95 Runoff=3.19 cfs 0.241 af

Subcatchment 91S: 359+12 Runoff Area=1,008 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.15 cfs 0.011 af

Subcatchment 112S: 375+59 RIGHT Runoff Area=797 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.12 cfs 0.009 af

Subcatchment 113S: 380+84 Runoff Area=18,128 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=2.62 cfs 0.207 af

Subcatchment 800S: YWD Pond EAST SIDE Runoff Area=1,262,903 sf 4.85% Impervious Runoff Depth=3.76"
Flow Length=1,350' Tc=47.7 min CN=78 Runoff=57.37 cfs 9.075 af

Subcatchment 1000S: Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=3.76"
Flow Length=862' Tc=24.7 min CN=78 Runoff=24.29 cfs 2.802 af

Subcatchment C6S: 357+50 Runoff Area=30.640 ac 5.81% Impervious Runoff Depth=3.76"
Flow Length=1,098' Tc=21.4 min CN=78 Runoff=88.52 cfs 9.591 af

Subcatchment C7S: 365+50 Runoff Area=5.750 ac 5.91% Impervious Runoff Depth=3.76"
Flow Length=489' Tc=6.0 min CN=78 Runoff=25.28 cfs 1.800 af

Subcatchment C8AS:
Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=3.96"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=69.55 cfs 11.333 af

Subcatchment C8BS:
Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=3.76"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=61.30 cfs 9.791 af

Subcatchment C8CS: 375+00
Runoff Area=3,197,116 sf 6.20% Impervious Runoff Depth=3.76"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=153.44 cfs 22.974 af

Reach 1R: road ditch, sta354+34
Avg. Flow Depth=0.15' Max Vel=3.67 fps Inflow=3.13 cfs 0.234 af
n=0.035 L=70.0' S=0.1071 '/' Capacity=96.67 cfs Outflow=3.12 cfs 0.234 af

Reach 8.1BR1:
Avg. Flow Depth=0.35' Max Vel=1.19 fps Inflow=3.32 cfs 0.387 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=3.24 cfs 0.387 af

Reach 8.1BR2:
Avg. Flow Depth=0.67' Max Vel=0.68 fps Inflow=9.26 cfs 1.359 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=8.33 cfs 1.359 af

Reach 8.1BR3:
Avg. Flow Depth=0.75' Max Vel=3.06 fps Inflow=9.71 cfs 1.723 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=9.68 cfs 1.723 af

Reach 8.1BR4:
Avg. Flow Depth=0.70' Max Vel=2.76 fps Inflow=11.82 cfs 2.318 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=11.81 cfs 2.318 af

Reach 8.2AR1:
Avg. Flow Depth=0.41' Max Vel=0.61 fps Inflow=1.01 cfs 0.204 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.90 cfs 0.204 af

Reach 8.2BR1:
Avg. Flow Depth=0.57' Max Vel=1.70 fps Inflow=6.04 cfs 0.972 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=18.57 cfs Outflow=6.03 cfs 0.972 af

Reach 8.3AR1:
Avg. Flow Depth=0.65' Max Vel=1.46 fps Inflow=5.96 cfs 0.608 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=5.91 cfs 0.608 af

Reach 8.3CR1:
Avg. Flow Depth=0.25' Max Vel=1.02 fps Inflow=5.87 cfs 1.057 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=5.74 cfs 1.057 af

Reach 8.4CR1:
Avg. Flow Depth=0.38' Max Vel=0.75 fps Inflow=3.23 cfs 0.504 af
n=0.120 L=1,440.0' S=0.0178 '/' Capacity=48.74 cfs Outflow=1.87 cfs 0.504 af

Reach 8.6CR1:
Avg. Flow Depth=0.64' Max Vel=2.65 fps Inflow=12.79 cfs 2.583 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=12.75 cfs 2.583 af

Reach 8.6CR2:
Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.120 L=865.0' S=0.0079 '/' Capacity=34.51 cfs Outflow=0.00 cfs 0.000 af

Reach C6R1:
Avg. Flow Depth=0.18' Max Vel=1.98 fps Inflow=1.02 cfs 0.040 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=1.01 cfs 0.040 af

Reach C7R1:
Avg. Flow Depth=0.31' Max Vel=3.36 fps Inflow=7.95 cfs 0.817 af
n=0.030 L=190.0' S=0.0316 '/' Capacity=1,060.34 cfs Outflow=7.95 cfs 0.817 af

Reach C8AR1: Avg. Flow Depth=0.21' Max Vel=1.47 fps Inflow=10.46 cfs 12.608 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=10.46 cfs 12.608 af

Reach C8AR2: Avg. Flow Depth=0.67' Max Vel=1.23 fps Inflow=10.46 cfs 12.608 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=566.71 cfs Outflow=10.45 cfs 12.608 af

Reach C8AR3: Avg. Flow Depth=0.76' Max Vel=3.13 fps Inflow=10.45 cfs 12.608 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=10.45 cfs 12.608 af

Reach C8AR6: Avg. Flow Depth=1.05' Max Vel=2.37 fps Inflow=21.65 cfs 16.443 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=21.54 cfs 16.442 af

Reach C8AR7: Avg. Flow Depth=1.39' Max Vel=1.14 fps Inflow=66.54 cfs 40.944 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=65.13 cfs 40.938 af

Reach C8BR1: Avg. Flow Depth=0.22' Max Vel=3.32 fps Inflow=11.63 cfs 12.767 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=11.63 cfs 12.767 af

Reach C8BR2: Avg. Flow Depth=0.19' Max Vel=5.55 fps Inflow=11.63 cfs 12.767 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=11.63 cfs 12.767 af

Reach C8BR3: Avg. Flow Depth=0.08' Max Vel=1.46 fps Inflow=11.63 cfs 12.767 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=11.63 cfs 12.766 af

Reach SP1000: POA STA380+00 Inflow=440.51 cfs 601.983 af
Outflow=440.51 cfs 601.983 af

Pond 8.1AP: Peak Elev=209.62' Storage=41,157 cf Inflow=7.68 cfs 0.945 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.25' Storage=6,500 cf Inflow=3.73 cfs 0.505 af
Outflow=3.32 cfs 0.387 af

Pond 8.1CP: Peak Elev=158.30' Storage=216,381 cf Inflow=60.63 cfs 20.489 af
Outflow=21.65 cfs 16.443 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.55' Storage=9,479 cf Inflow=3.25 cfs 0.404 af
Outflow=1.01 cfs 0.204 af

Pond 8.2BP: Peak Elev=200.08' Storage=9,953 cf Inflow=8.35 cfs 1.045 af
Outflow=6.04 cfs 0.972 af

Pond 8.2CP: Peak Elev=182.50' Storage=17,137 cf Inflow=5.27 cfs 0.733 af
Outflow=1.65 cfs 0.385 af

Pond 8.3AP: Peak Elev=200.61' Storage=4,736 cf Inflow=5.97 cfs 0.708 af
Outflow=5.96 cfs 0.608 af

Pond 8.3BP: Peak Elev=201.63' Storage=152 cf Inflow=2.37 cfs 0.364 af
Outflow=2.36 cfs 0.364 af

Pond 8.3CP: Peak Elev=155.12' Storage=15,455 cf Inflow=6.11 cfs 1.355 af
Outflow=5.87 cfs 1.057 af

Pond 8.4AP: Peak Elev=209.62' Storage=32,380 cf Inflow=6.01 cfs 0.743 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.48' Storage=513 cf Inflow=3.98 cfs 0.601 af
Outflow=3.97 cfs 0.596 af

Pond 8.4CP: Peak Elev=161.55' Storage=16,552 cf Inflow=5.82 cfs 0.840 af
Primary=0.88 cfs 0.137 af Secondary=2.35 cfs 0.366 af Outflow=3.23 cfs 0.504 af

Pond 8.5AP: Peak Elev=205.90' Storage=16,425 cf Inflow=9.10 cfs 0.908 af
Primary=3.35 cfs 0.389 af Secondary=1.76 cfs 0.205 af Outflow=5.11 cfs 0.594 af

Pond 8.5BP: (new Pond) Peak Elev=168.46' Storage=20,678 cf Inflow=5.64 cfs 0.896 af
Primary=1.33 cfs 0.714 af Secondary=0.00 cfs 0.000 af Outflow=1.33 cfs 0.714 af

Pond 8.5CP: Peak Elev=160.46' Storage=37,167 cf Inflow=6.26 cfs 0.853 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.61' Storage=1,343 cf Inflow=4.00 cfs 0.484 af
Outflow=4.00 cfs 0.461 af

Pond 8.6BP: Peak Elev=158.18' Storage=101,450 cf Inflow=15.80 cfs 2.329 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.93' Storage=27,012 cf Inflow=16.31 cfs 2.936 af
Outflow=15.20 cfs 2.576 af

Pond 8.6CP2: Peak Elev=158.96' Storage=19,821 cf Inflow=15.20 cfs 2.576 af
Outflow=12.41 cfs 2.449 af

Pond 8.7CP: Peak Elev=157.65' Storage=4,447 cf Inflow=2.00 cfs 0.229 af
Outflow=1.13 cfs 0.134 af

Pond 800P: Pond on YWD Peak Elev=120.07' Storage=36,136 cf Inflow=127.89 cfs 81.626 af
Outflow=126.91 cfs 81.626 af

Pond C6P: 357+50 Peak Elev=140.84' Storage=114,705 cf Inflow=103.73 cfs 12.196 af
Primary=39.21 cfs 11.338 af Secondary=7.95 cfs 0.817 af Tertiary=1.02 cfs 0.040 af Outflow=48.19 cfs 12.196 af

Pond C8AP: Peak Elev=183.26' Storage=299,608 cf Inflow=78.05 cfs 12.608 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=10.46 cfs 12.608 af

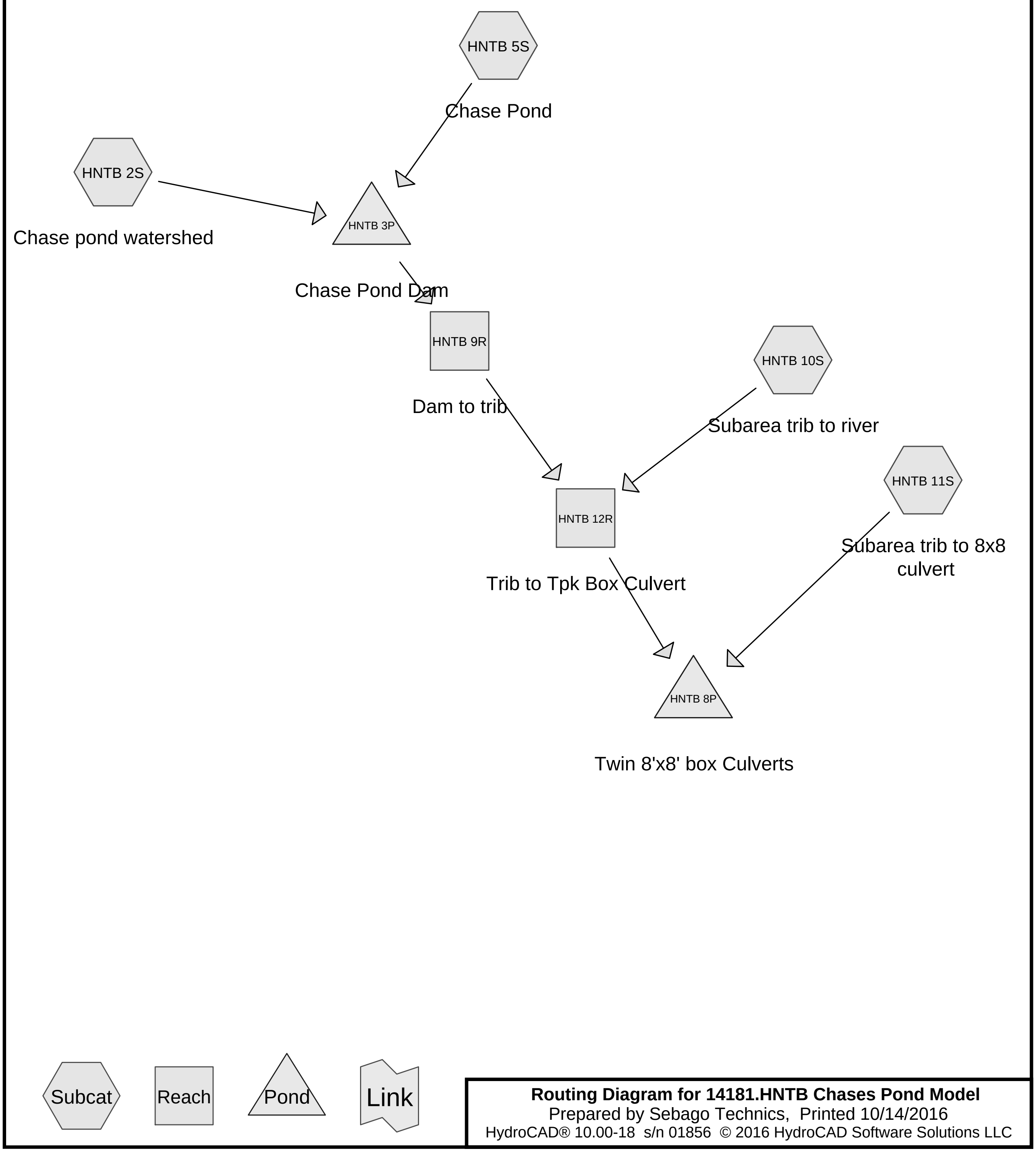
Pond C8BP: Peak Elev=165.25' Storage=266,377 cf Inflow=68.40 cfs 12.823 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=11.63 cfs 12.767 af

Pond C8P: 375+00 Peak Elev=126.00' Storage=15.769 af Inflow=200.12 cfs 69.701 af
Primary=74.57 cfs 69.700 af Secondary=0.00 cfs 0.000 af Outflow=74.57 cfs 69.700 af

Link 1L: Cape 25-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=360.51 cfs 520.151 af
Area= 2,130.640 ac 7.98% Imperv. Primary=360.51 cfs 520.151 af

Total Runoff Area = 293.581 ac Runoff Volume = 93.393 af Average Runoff Depth = 3.82"
92.98% Pervious = 272.972 ac 7.02% Impervious = 20.610 ac

Link Report (HNTB) Chases Pond Model



Routing Diagram for 14181.HNTB Chases Pond Model
Prepared by Sebago Technics, Printed 10/14/2016
HydroCAD® 10.00-18 s/n 01856 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
31.180	77	2 acre lots, 12% imp, HSG C (HNTB 10S)
170.000	98	Pond (HNTB 5S)
12.460	76	Woods/grass comb., Fair, HSG C (HNTB 11S)
1,917.000	84	Woods/grass comb., Fair, HSG D (HNTB 2S)
2,130.640	**85**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HNTB 10S: Subarea trib to river Runoff Area=31.180 ac 12.00% Impervious Runoff Depth=1.28"
Flow Length=2,350' Tc=23.3 min CN=77 Runoff=28.76 cfs 3.336 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert Runoff Area=12.460 ac 0.00% Impervious Runoff Depth=1.22"
Flow Length=725' Tc=18.6 min CN=76 Runoff=11.93 cfs 1.269 af

Subcatchment HNTB 2S: Chase pond watershed Runoff Area=1,917.000 ac 0.00% Impervious Runoff Depth=1.77"
Tc=25.0 min CN=84 Runoff=2,427.21 cfs 282.184 af

Subcatchment HNTB 5S: Chase Pond Runoff Area=170.000 ac 100.00% Impervious Runoff Depth=3.07"
Tc=21.2 min CN=98 Runoff=361.61 cfs 43.451 af

Reach HNTB 12R: Trib to Tpk Box Culvert Avg. Flow Depth=2.80' Max Vel=5.01 fps Inflow=79.18 cfs 182.069 af
n=0.035 L=950.0' S=0.0103 '/' Capacity=599.53 cfs Outflow=78.69 cfs 181.594 af

Reach HNTB 9R: Dam to trib Avg. Flow Depth=0.92' Max Vel=5.89 fps Inflow=53.37 cfs 178.949 af
n=0.035 L=530.0' S=0.0283 '/' Capacity=1,955.10 cfs Outflow=53.37 cfs 178.734 af

Pond HNTB 3P: Chase Pond Dam Peak Elev=157.46' Storage=258.115 af Inflow=2,769.27 cfs 325.635 af
Outflow=53.37 cfs 178.949 af

Pond HNTB 8P: Twin 8'x8' box Culverts Inflow=88.29 cfs 182.863 af
Primary=88.29 cfs 182.863 af

Total Runoff Area = 2,130.640 ac Runoff Volume = 330.240 af Average Runoff Depth = 1.86"
91.85% Pervious = 1,956.898 ac 8.15% Impervious = 173.742 ac

Summary for Subcatchment HNTB 10S: Subarea trib to river

Runoff = 28.76 cfs @ 12.34 hrs, Volume= 3.336 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (ac)	CN	Description
31.180	77	2 acre lots, 12% imp, HSG C
27.438		88.00% Pervious Area
3.742		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	100	0.0162	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
11.1	2,000	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.2	250	0.0400	3.50	10.51	**Channel Flow,** Area= 3.0 sf Perim= 4.0' r= 0.75' n= 0.070 Sluggish weedy reaches w/pools
23.3	2,350	Total			

Summary for Subcatchment HNTB 11S: Subarea trib to 8x8 culvert

Runoff = 11.93 cfs @ 12.27 hrs, Volume= 1.269 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (ac)	CN	Description
12.460	76	Woods/grass comb., Fair, HSG C
12.460		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0150	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
7.2	625	0.0848	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.6	725	Total			

Summary for Subcatchment HNTB 2S: Chase pond watershed

Runoff = 2,427.21 cfs @ 12.35 hrs, Volume= 282.184 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1,917.000	84	Woods/grass comb., Fair, HSG D
	1,917.000		100.00% Pervious Area

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

Summary for Subcatchment HNTB 5S: Chase Pond

Runoff = 361.61 cfs @ 12.28 hrs, Volume= 43.451 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	170.000	98	Pond
	170.000		100.00% Impervious Area

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

Summary for Reach HNTB 12R: Trib to Tpk Box Culvert

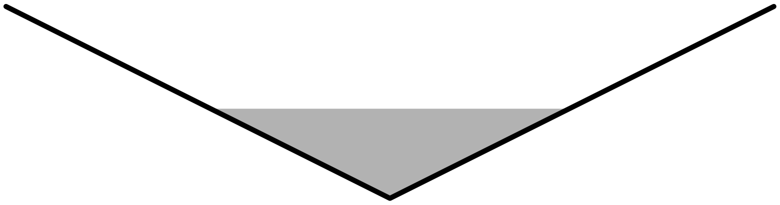
[62] Hint: Exceeded Reach HNTB 9R OUTLET depth by 1.91' @ 12.40 hrs

Inflow Area = 2,118.180 ac, 8.20% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 79.18 cfs @ 12.35 hrs, Volume= 182.069 af
Outflow = 78.69 cfs @ 12.45 hrs, Volume= 181.594 af, Atten= 1%, Lag= 5.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.01 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 4.19 fps, Avg. Travel Time= 3.8 min

Peak Storage= 14,919 cf @ 12.40 hrs
Average Depth at Peak Storage= 2.80'
Bank-Full Depth= 6.00' Flow Area= 72.0 sf, Capacity= 599.53 cfs

0.00' x 6.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 24.00'
Length= 950.0' Slope= 0.0103 '/'
Inlet Invert= 130.00', Outlet Invert= 120.20'



Summary for Reach HNTB 9R: Dam to trib

[81] Warning: Exceeded Pond HNTB 3P by 2.20' @ 0.00 hrs

Inflow Area = 2,087.000 ac, 8.15% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af
Outflow = 53.37 cfs @ 23.99 hrs, Volume= 178.734 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.89 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 5.30 fps, Avg. Travel Time= 1.7 min

Peak Storage= 4,804 cf @ 23.97 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,955.10 cfs

8.00' x 6.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 32.00'
Length= 530.0' Slope= 0.0283 '/'
Inlet Invert= 145.00', Outlet Invert= 130.00'

Summary for Pond HNTB 3P: Chase Pond Dam

Inflow Area = 2,087.000 ac, 8.15% Impervious, Inflow Depth = 1.87" for 02-YR event
Inflow = 2,769.27 cfs @ 12.34 hrs, Volume= 325.635 af
Outflow = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af, Atten= 98%, Lag= 696.7 min
Primary = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 157.46' @ 23.95 hrs Surf.Area= 136.327 ac Storage= 258.115 af

Plug-Flow detention time= 1,039.0 min calculated for 178.770 af (55% of inflow)
Center-of-Mass det. time= 925.6 min (1,761.2 - 835.6)

Volume	Invert	Avail.Storage	Storage Description
#1	142.80'	859.250 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
142.80	0.000	0.000	0.000
154.00	1.000	5.600	5.600
155.00	25.000	13.000	18.600
156.70	135.500	136.425	155.025
157.00	136.000	40.725	195.750
157.70	136.500	95.375	291.125
158.00	137.000	41.025	332.150
159.00	138.000	137.500	469.650
160.00	139.000	138.500	608.150
161.80	140.000	251.100	859.250

Device	Routing	Invert	Outlet Devices
#1	Primary	142.80'	**18.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600
#2	Primary	157.70'	**90.0 deg x 35.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.50 (C= 3.13)
#3	Primary	161.80'	**300.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=53.37 cfs @ 23.95 hrs HW=157.46' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 53.37 cfs @ 17.79 fps)
—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond HNTB 8P: Twin 8'x8' box Culverts

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,130.640 ac, 8.15% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 88.29 cfs @ 12.41 hrs, Volume= 182.863 af
Primary = 88.29 cfs @ 12.41 hrs, Volume= 182.863 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
31.180	77	2 acre lots, 12% imp, HSG C (HNTB 10S)
170.000	98	Pond (HNTB 5S)
12.460	76	Woods/grass comb., Fair, HSG C (HNTB 11S)
1,917.000	84	Woods/grass comb., Fair, HSG D (HNTB 2S)
2,130.640	**85**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HNTB 10S: Subarea trib to river Runoff Area=31.180 ac 12.00% Impervious Runoff Depth=2.54"
Flow Length=2,350' Tc=23.3 min CN=77 Runoff=58.39 cfs 6.599 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert Runoff Area=12.460 ac 0.00% Impervious Runoff Depth=2.45"
Flow Length=725' Tc=18.6 min CN=76 Runoff=24.74 cfs 2.547 af

Subcatchment HNTB 2S: Chase pond watershed Runoff Area=1,917.000 ac 0.00% Impervious Runoff Depth=3.18"
Tc=25.0 min CN=84 Runoff=4,354.15 cfs 507.858 af

Subcatchment HNTB 5S: Chase Pond Runoff Area=170.000 ac 100.00% Impervious Runoff Depth=4.66"
Tc=21.2 min CN=98 Runoff=540.85 cfs 66.064 af

Reach HNTB 12R: Trib to Tpk Box Culvert Avg. Flow Depth=3.77' Max Vel=6.11 fps Inflow=173.30 cfs 327.635 af
n=0.035 L=950.0' S=0.0103 '/' Capacity=599.53 cfs Outflow=173.30 cfs 327.189 af

Reach HNTB 9R: Dam to trib Avg. Flow Depth=1.76' Max Vel=8.42 fps Inflow=171.01 cfs 321.223 af
n=0.035 L=530.0' S=0.0283 '/' Capacity=1,955.10 cfs Outflow=171.01 cfs 321.036 af

Pond HNTB 3P: Chase Pond Dam Peak Elev=158.71' Storage=429.472 af Inflow=4,871.07 cfs 573.922 af
Outflow=171.01 cfs 321.223 af

Pond HNTB 8P: Twin 8'x8' box Culverts Inflow=174.19 cfs 329.736 af
Primary=174.19 cfs 329.736 af

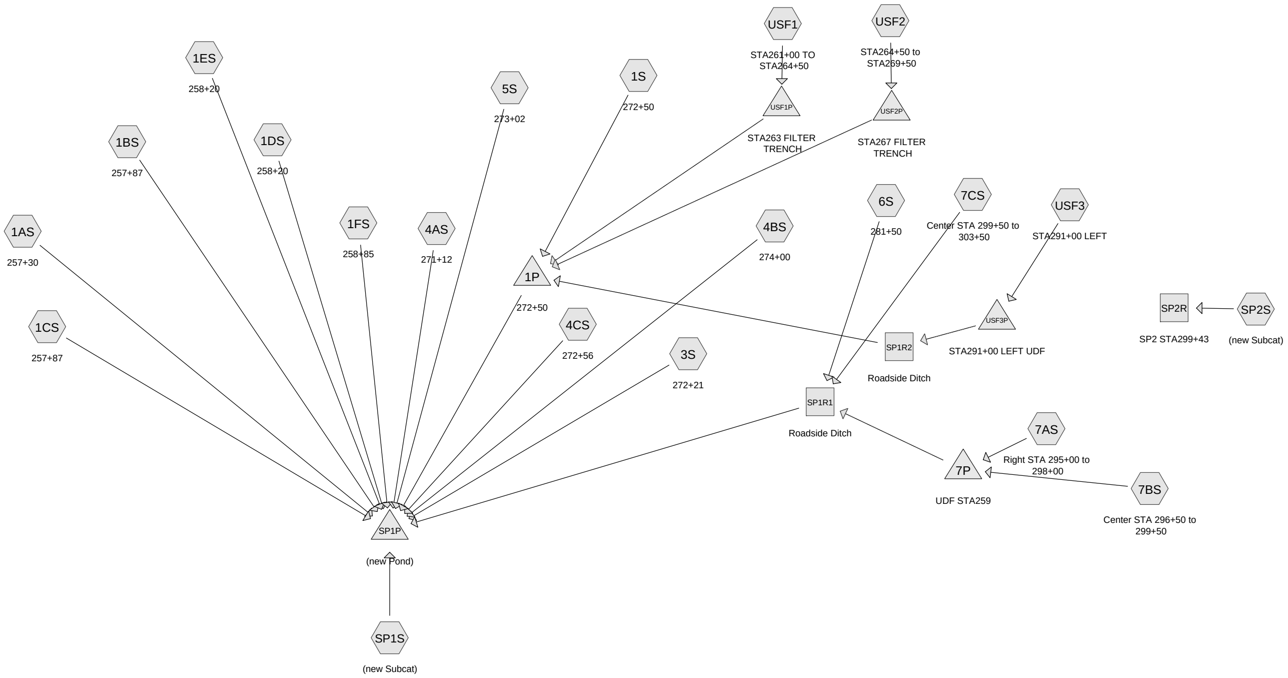
Total Runoff Area = 2,130.640 ac Runoff Volume = 583.068 af Average Runoff Depth = 3.28"
91.85% Pervious = 1,956.898 ac 8.15% Impervious = 173.742 ac

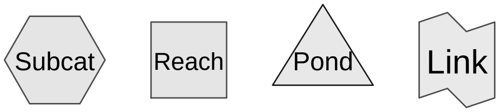
Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

```
Subcatchment HNTB 10S: Subarea trib to river         Runoff Area=31.180 ac   12.00% Impervious   Runoff Depth=3.65"
                                                  Flow Length=2,350'   Tc=23.3 min   CN=77   Runoff=84.31 cfs  9.495 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert   Runoff Area=12.460 ac   0.00% Impervious   Runoff Depth=3.55"
                                                    Flow Length=725'   Tc=18.6 min   CN=76   Runoff=35.97 cfs  3.690 af

Subcatchment HNTB 2S: Chase pond watershed          Runoff Area=1,917.000 ac   0.00% Impervious   Runoff Depth=4.38"
                                                           Tc=25.0 min   CN=84   Runoff=5,953.24 cfs  700.347 af

Subcatchment HNTB 5S: Chase Pond                    Runoff Area=170.000 ac   100.00% Impervious   Runoff Depth=5.96"
                                                              Tc=21.2 min   CN=98   Runoff=685.99 cfs  84.457 af

Reach HNTB 12R: Trib to Tpk Box Culvert       Avg. Flow Depth=4.94'   Max Vel=7.32 fps   Inflow=357.78 cfs  522.494 af
                                 n=0.035   L=950.0'   S=0.0103 '/'   Capacity=599.53 cfs   Outflow=357.77 cfs  522.078 af

Reach HNTB 9R: Dam to trib                    Avg. Flow Depth=2.59'   Max Vel=10.34 fps   Inflow=352.95 cfs  513.173 af
                               n=0.035   L=530.0'   S=0.0283 '/'   Capacity=1,955.10 cfs   Outflow=352.94 cfs  512.999 af

Pond HNTB 3P: Chase Pond Dam                   Peak Elev=159.57'  Storage=548.305 af   Inflow=6,611.85 cfs  784.803 af
                                                                                        Outflow=352.95 cfs  513.173 af

Pond HNTB 8P: Twin 8'x8' box Culverts                                                    Inflow=359.62 cfs  525.767 af
                                                                                        Primary=359.62 cfs  525.767 af

                     Total Runoff Area = 2,130.640 ac   Runoff Volume = 797.988 af   Average Runoff Depth = 4.49"
                                                    91.85% Pervious = 1,956.898 ac     8.15% Impervious = 173.742 ac
```

POSTDEVELOPMENT

Mile 7.3





Routing Diagram for 14181_7.3 POST 10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.029	98	(1AS, 1BS, 1CS, 1DS, 1ES, 1FS, 3S, 4AS, 4BS, 4CS, 5S, 6S, 7CS, SP2S)
0.697	74	>75% Grass cover, Good, HSG C (6S, 7AS, 7BS, 7CS)
3.732	80	>75% Grass cover, Good, HSG D (1AS, 1BS, 1DS, 1FS, 4AS, 4BS, 4CS, 6S, 7CS, USF1, USF2, USF3)
3.012	30	Brush, Good, HSG A (1S)
6.913	48	Brush, Good, HSG B (SP1S)
6.301	65	Brush, Good, HSG C (1S, 7AS, SP1S, SP2S)
48.649	73	Brush, Good, HSG D (1S, SP1S, SP2S)
1.721	98	MTA CORRIDOR (USF1, USF2, USF3)
9.601	98	MTA PAVE (SP1S)
0.242	98	Paved parking, HSG C (7BS)
0.269	98	Unconnected pavement, HSG C (7AS)
6.614	30	Woods, Good, HSG A (1S)
2.903	55	Woods, Good, HSG B (SP1S)
10.800	70	Woods, Good, HSG C (1S, SP1S, SP2S)
240.662	77	Woods, Good, HSG D (1S, SP1S, SP2S)
10.213	98	iMPERVIOUS (1S)
357.357	**76**	**TOTAL AREA**

Notes Listing (all nodes)

Line#	Node Number	Notes
1	SP1P	The outlet culvert is modeled as a 9-ft by 9-ft box. These dimensions have not been field verified.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

```
Subcatchment 1AS: 257+30                 Runoff Area=29,080 sf   79.93% Impervious   Runoff Depth=2.64"
                                                        Tc=5.0 min   CN=94   Runoff=2.05 cfs  0.147 af

Subcatchment 1BS: 257+87                  Runoff Area=3,848 sf   73.93% Impervious   Runoff Depth=2.54"
                                                        Tc=5.0 min   CN=93   Runoff=0.26 cfs  0.019 af

Subcatchment 1CS: 257+87                 Runoff Area=1,869 sf   100.00% Impervious   Runoff Depth=3.07"
                                                        Tc=5.0 min   CN=98   Runoff=0.14 cfs  0.011 af

Subcatchment 1DS: 258+20                  Runoff Area=3,745 sf   86.22% Impervious   Runoff Depth=2.85"
                                                        Tc=0.0 min   CN=96   Runoff=0.33 cfs  0.020 af

Subcatchment 1ES: 258+20                 Runoff Area=1,223 sf   100.00% Impervious   Runoff Depth=3.07"
                                                        Tc=5.0 min   CN=98   Runoff=0.09 cfs  0.007 af

Subcatchment 1FS: 258+85                 Runoff Area=30,468 sf   80.03% Impervious   Runoff Depth=2.64"
                                                        Tc=5.0 min   CN=94   Runoff=2.15 cfs  0.154 af

Subcatchment 1S: 272+50                 Runoff Area=210.559 ac   4.85% Impervious   Runoff Depth=1.16"
                                 Flow Length=3,413'   Tc=62.6 min   CN=75   Runoff=105.15 cfs  20.393 af

Subcatchment 3S: 272+21                  Runoff Area=1,291 sf   100.00% Impervious   Runoff Depth=3.07"
                                                        Tc=5.0 min   CN=98   Runoff=0.10 cfs  0.008 af

Subcatchment 4AS: 271+12                 Runoff Area=31,230 sf   80.07% Impervious   Runoff Depth=2.64"
                                                        Tc=5.0 min   CN=94   Runoff=2.20 cfs  0.158 af

Subcatchment 4BS: 274+00                 Runoff Area=37,362 sf   79.73% Impervious   Runoff Depth=2.64"
                                                        Tc=5.0 min   CN=94   Runoff=2.63 cfs  0.189 af

Subcatchment 4CS: 272+56                 Runoff Area=14,230 sf   80.00% Impervious   Runoff Depth=2.64"
                                                        Tc=5.0 min   CN=94   Runoff=1.00 cfs  0.072 af

Subcatchment 5S: 273+02                    Runoff Area=852 sf   100.00% Impervious   Runoff Depth=3.07"
                                                        Tc=5.0 min   CN=98   Runoff=0.06 cfs  0.005 af

Subcatchment 6S: 281+50                  Runoff Area=76,278 sf   71.46% Impervious   Runoff Depth=2.45"
                                                        Tc=5.0 min   CN=92   Runoff=5.07 cfs  0.357 af

Subcatchment 7AS: Right STA 295+00 to 298+00   Runoff Area=46,170 sf   25.34% Impervious   Runoff Depth=1.05"
                                             Tc=6.0 min   UI Adjusted CN=73   Runoff=1.23 cfs  0.093 af

Subcatchment 7BS: Center STA 296+50 to 299+50  Runoff Area=14,989 sf   70.24% Impervious   Runoff Depth=2.35"
                                                        Tc=6.0 min   CN=91   Runoff=0.93 cfs  0.067 af

Subcatchment 7CS: Center STA 299+50 to 303+50  Runoff Area=19,658 sf   71.51% Impervious   Runoff Depth=2.45"
                                                        Tc=5.0 min   CN=92   Runoff=1.31 cfs  0.092 af
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Subcatchment SP1S: (new Subcat)
Runoff Area=133.177 ac 7.21% Impervious Runoff Depth=1.16"
Flow Length=1,660' Tc=16.2 min CN=75 Runoff=127.24 cfs 12.898 af

Subcatchment SP2S: (new Subcat)
Runoff Area=93,684 sf 27.10% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=77 Runoff=3.28 cfs 0.230 af

Subcatchment USF1: STA261+00 TO STA264+50
Runoff Area=27,929 sf 45.96% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=88 Runoff=1.56 cfs 0.112 af

Subcatchment USF2: STA264+50 to STA269+50
Runoff Area=43,724 sf 43.33% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=88 Runoff=2.45 cfs 0.175 af

Subcatchment USF3: STA291+00 LEFT
Runoff Area=115,680 sf 37.33% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=87 Runoff=6.23 cfs 0.443 af

Reach SP1R1: Roadside Ditch
Avg. Flow Depth=0.51' Max Vel=2.83 fps Inflow=6.45 cfs 0.609 af
n=0.035 L=351.0' S=0.0199 '/' Capacity=139.65 cfs Outflow=6.14 cfs 0.609 af

Reach SP1R2: Roadside Ditch
Avg. Flow Depth=0.27' Max Vel=2.40 fps Inflow=2.42 cfs 0.443 af
n=0.035 L=1,285.0' S=0.0280 '/' Capacity=165.52 cfs Outflow=2.14 cfs 0.443 af

Reach SP2R: SP2 STA299+43
Avg. Flow Depth=0.13' Max Vel=2.06 fps Inflow=3.28 cfs 0.230 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=3.26 cfs 0.230 af

Pond 1P: 272+50
Peak Elev=39.06' Storage=94,644 cf Inflow=107.65 cfs 21.122 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=76.85 cfs 21.122 af

Pond 7P: UDF STA259
Peak Elev=104.18' Storage=3,955 cf Inflow=2.16 cfs 0.160 af
Primary=0.08 cfs 0.160 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.160 af

Pond SP1P: (new Pond)
Peak Elev=38.15' Storage=563,370 cf Inflow=160.67 cfs 35.418 af
Primary=60.90 cfs 34.474 af Secondary=0.00 cfs 0.000 af Outflow=60.90 cfs 34.474 af

Pond USF1P: STA263 FILTER TRENCH
Peak Elev=43.47' Storage=1,772 cf Inflow=1.56 cfs 0.112 af
Primary=0.64 cfs 0.112 af Secondary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.112 af

Pond USF2P: STA267 FILTER TRENCH
Peak Elev=42.55' Storage=2,725 cf Inflow=2.45 cfs 0.175 af
Primary=0.93 cfs 0.175 af Secondary=0.00 cfs 0.000 af Outflow=0.93 cfs 0.175 af

Pond USF3P: STA291+00 LEFT UDF
Peak Elev=84.57' Storage=6,922 cf Inflow=6.23 cfs 0.443 af
Primary=1.87 cfs 0.433 af Secondary=0.56 cfs 0.010 af Outflow=2.42 cfs 0.443 af

Total Runoff Area = 357.357 ac Runoff Volume = 35.648 af Average Runoff Depth = 1.20"
92.42% Pervious = 330.282 ac 7.58% Impervious = 27.074 ac

Summary for Subcatchment 1AS: 257+30

Runoff = 2.05 cfs @ 12.07 hrs, Volume= 0.147 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	23,243	98	
	5,837	80	>75% Grass cover, Good, HSG D
	29,080	94	Weighted Average
	5,837		20.07% Pervious Area
	23,243		79.93% Impervious Area

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

Summary for Subcatchment 1BS: 257+87

Runoff = 0.26 cfs @ 12.07 hrs, Volume= 0.019 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	2,845	98	
	1,003	80	>75% Grass cover, Good, HSG D
	3,848	93	Weighted Average
	1,003		26.07% Pervious Area
	2,845		73.93% Impervious Area

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

Summary for Subcatchment 1CS: 257+87

Runoff = 0.14 cfs @ 12.07 hrs, Volume= 0.011 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,869	98	
	1,869		100.00% Impervious Area

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

Summary for Subcatchment 1DS: 258+20

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.33 cfs @ 12.00 hrs, Volume= 0.020 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	3,229	98	
	516	80	>75% Grass cover, Good, HSG D
	3,745	96	Weighted Average
	516		13.78% Pervious Area
	3,229		86.22% Impervious Area

Summary for Subcatchment 1ES: 258+20

Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,223	98	
	1,223		100.00% Impervious Area

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

Summary for Subcatchment 1FS: 258+85

Runoff = 2.15 cfs @ 12.07 hrs, Volume= 0.154 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	24,385	98	
	6,083	80	>75% Grass cover, Good, HSG D
	30,468	94	Weighted Average
	6,083		19.97% Pervious Area
	24,385		80.03% Impervious Area

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

Summary for Subcatchment 1S: 272+50

Runoff = 105.15 cfs @ 12.87 hrs, Volume= 20.393 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	10.213	98	iMPERVIOUS
	6.614	30	Woods, Good, HSG A
	3.012	30	Brush, Good, HSG A
	1.063	70	Woods, Good, HSG C
	1.957	65	Brush, Good, HSG C
	156.876	77	Woods, Good, HSG D
	30.824	73	Brush, Good, HSG D
	210.559	75	Weighted Average
	200.346		95.15% Pervious Area
	10.213		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	95	0.1111	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
6.5	583	0.0900	1.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	65	0.0600	1.71		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	316	0.0820	33.41	17,640.39	**Channel Flow, D-E** Area= 528.0 sf Perim= 24.0' r= 22.00' n= 0.100 Heavy timber, flow below branches
4.4	190	0.0210	0.72		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.9	259	0.0230	2.27		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
8.0	275	0.0130	0.57		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
16.2	1,219	0.0070	1.25		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
14.0	296	0.0050	0.35		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.6	115	0.0090	2.96	29.60	**Channel Flow, J-K** Area= 10.0 sf Perim= 20.0' r= 0.50' n= 0.030 Short grass
62.6	3,413	Total			

Summary for Subcatchment 3S: 272+21

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,291	98	
	1,291		100.00% Impervious Area

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

Summary for Subcatchment 4AS: 271+12

Runoff = 2.20 cfs @ 12.07 hrs, Volume= 0.158 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,005	98	
	6,225	80	>75% Grass cover, Good, HSG D
	31,230	94	Weighted Average
	6,225		19.93% Pervious Area
	25,005		80.07% Impervious Area

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

Summary for Subcatchment 4BS: 274+00

Runoff = 2.63 cfs @ 12.07 hrs, Volume= 0.189 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	7,572	80	>75% Grass cover, Good, HSG D
*	29,790	98	
	37,362	94	Weighted Average
	7,572		20.27% Pervious Area
	29,790		79.73% Impervious Area

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

Summary for Subcatchment 4CS: 272+56

Runoff = 1.00 cfs @ 12.07 hrs, Volume= 0.072 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	11,384	98	
	2,846	80	>75% Grass cover, Good, HSG D
	14,230	94	Weighted Average
	2,846		20.00% Pervious Area
	11,384		80.00% Impervious Area

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

Summary for Subcatchment 5S: 273+02

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.005 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	852	98	
	852		100.00% Impervious Area

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

Summary for Subcatchment 6S: 281+50

Runoff = 5.07 cfs @ 12.07 hrs, Volume= 0.357 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	54,510	98	
	5,807	74	>75% Grass cover, Good, HSG C
	15,961	80	>75% Grass cover, Good, HSG D
	76,278	92	Weighted Average
	21,768		28.54% Pervious Area
	54,510		71.46% Impervious Area

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

Summary for Subcatchment 7AS: Right STA 295+00 to 298+00

Runoff = 1.23 cfs @ 12.10 hrs, Volume= 0.093 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (sf)	CN	Adj	Description
11,701	98		Unconnected pavement, HSG C
18,631	74		>75% Grass cover, Good, HSG C
15,838	65		Brush, Good, HSG C
46,170	77	73	Weighted Average, UI Adjusted
34,469			74.66% Pervious Area
11,701			25.34% Impervious Area
11,701			100.00% Unconnected

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

Summary for Subcatchment 7BS: Center STA 296+50 to 299+50

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.067 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (sf)	CN	Description
10,528	98	Paved parking, HSG C
4,461	74	>75% Grass cover, Good, HSG C
14,989	91	Weighted Average
4,461		29.76% Pervious Area
10,528		70.24% Impervious Area

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

Summary for Subcatchment 7CS: Center STA 299+50 to 303+50

Runoff = 1.31 cfs @ 12.07 hrs, Volume= 0.092 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,057	98	
	4,138	80	>75% Grass cover, Good, HSG D
	1,463	74	>75% Grass cover, Good, HSG C
	19,658	92	Weighted Average
	5,601		28.49% Pervious Area
	14,057		71.51% Impervious Area

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

Summary for Subcatchment SP1S: (new Subcat)

Runoff = 127.24 cfs @ 12.23 hrs, Volume= 12.898 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	9.601	98	MTA PAVE
	83.604	77	Woods, Good, HSG D
	9.283	70	Woods, Good, HSG C
	2.903	55	Woods, Good, HSG B
	17.674	73	Brush, Good, HSG D
	3.199	65	Brush, Good, HSG C
	6.913	48	Brush, Good, HSG B
	133.177	75	Weighted Average
	123.576		92.79% Pervious Area
	9.601		7.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	52	0.0860	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	74	0.0950	1.54		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	118	0.0170	0.65		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.7	86	0.0930	2.13		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0150	1.84		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
0.2	33	0.0050	3.21	2.52	**Pipe Channel, CMP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.5	249	0.0440	9.20	551.98	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=3.00' D=2.00' Z= 15.0 & 12.0 '/' Top.W=57.00' n= 0.035 Earth, dense weeds
1.7	343	0.0150	3.41	260.91	**Trap/Vee/Rect Channel Flow, H-I** Bot.W=9.00' D=1.00' Z= 75.0 & 60.0 '/' Top.W=144.00' n= 0.035 Earth, dense weeds
1.7	640	0.0210	6.40	179.30	**Trap/Vee/Rect Channel Flow, I-J** Bot.W=2.00' D=2.00' Z= 8.0 & 4.0 '/' Top.W=26.00' n= 0.035 Earth, dense weeds
16.2	1,660	Total			

Summary for Subcatchment SP2S: (new Subcat)

Runoff = 3.28 cfs @ 12.08 hrs, Volume= 0.230 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,391	98	
	6,568	73	Brush, Good, HSG D
	34,035	65	Brush, Good, HSG C
	7,912	77	Woods, Good, HSG D
	19,778	70	Woods, Good, HSG C
	93,684	77	Weighted Average
	68,293		72.90% Pervious Area
	25,391		27.10% Impervious Area

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

Summary for Subcatchment USF1: STA261+00 TO STA264+50

Runoff = 1.56 cfs @ 12.09 hrs, Volume= 0.112 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	15,094	80	>75% Grass cover, Good, HSG D
*	12,835	98	MTA CORRIDOR
	27,929	88	Weighted Average
	15,094		54.04% Pervious Area
	12,835		45.96% Impervious Area

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

Summary for Subcatchment USF2: STA264+50 to STA269+50

Runoff = 2.45 cfs @ 12.09 hrs, Volume= 0.175 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	24,778	80	>75% Grass cover, Good, HSG D
*	18,946	98	MTA CORRIDOR
	43,724	88	Weighted Average
	24,778		56.67% Pervious Area
	18,946		43.33% Impervious Area

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

Summary for Subcatchment USF3: STA291+00 LEFT

Runoff = 6.23 cfs @ 12.09 hrs, Volume= 0.443 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	72,500	80	>75% Grass cover, Good, HSG D
*	43,180	98	MTA CORRIDOR
	115,680	87	Weighted Average
	72,500		62.67% Pervious Area
	43,180		37.33% Impervious Area

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

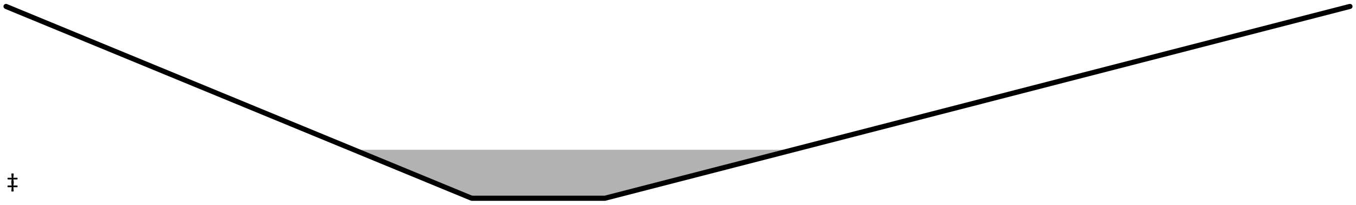
Summary for Reach SP1R1: Roadside Ditch

```
Inflow Area =       3.606 ac, 57.80% Impervious, Inflow Depth =  2.03"   for 02-YR event
Inflow      =       6.45 cfs @  12.07 hrs, Volume=         0.609 af
Outflow     =       6.14 cfs @  12.13 hrs, Volume=         0.609 af, Atten= 5%, Lag= 3.5 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 6.6 min

Peak Storage= 763 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.00' Flow Area= 22.2 sf, Capacity= 139.65 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.5 5.6 '/' Top Width= 20.20'
Length= 351.0' Slope= 0.0199 '/'
Inlet Invert= 49.00', Outlet Invert= 42.00'



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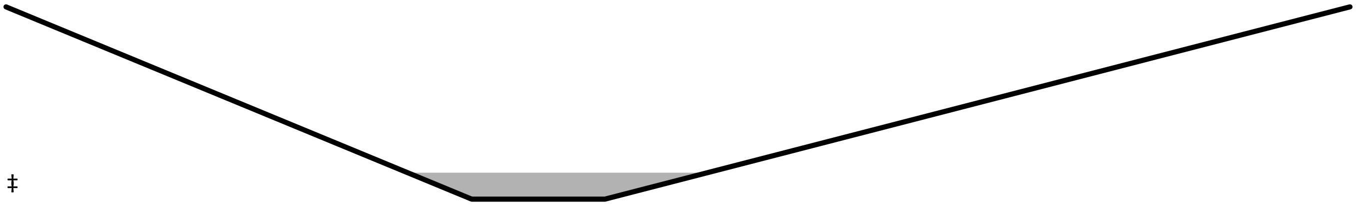
Summary for Reach SP1R2: Roadside Ditch

```
Inflow Area =       2.656 ac, 37.33% Impervious, Inflow Depth =  2.00"   for 02-YR event
Inflow      =       2.42 cfs @  12.34 hrs, Volume=         0.443 af
Outflow     =       2.14 cfs @  12.61 hrs, Volume=         0.443 af, Atten= 12%, Lag= 16.2 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 8.9 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 24.4 min

Peak Storage= 1,148 cf @ 12.46 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 22.2 sf, Capacity= 165.52 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.5 5.6 '/' Top Width= 20.20'
Length= 1,285.0' Slope= 0.0280 '/'
Inlet Invert= 78.00', Outlet Invert= 42.00'



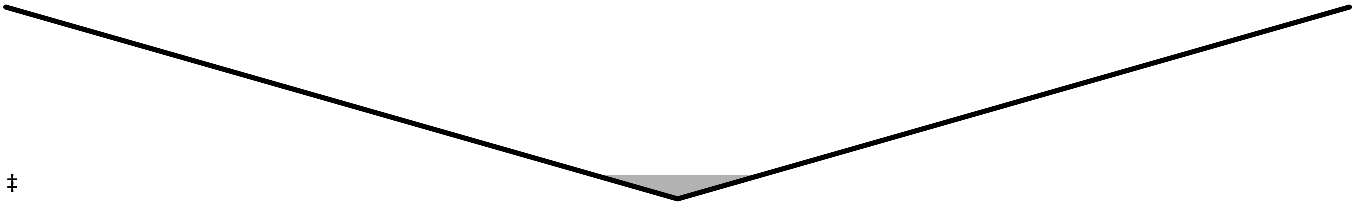
Summary for Reach SP2R: SP2 STA299+43

Inflow Area = 2.151 ac, 27.10% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 3.28 cfs @ 12.08 hrs, Volume= 0.230 af
Outflow = 3.26 cfs @ 12.10 hrs, Volume= 0.230 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 1.4 min

Peak Storage= 122 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 100.0 sf, Capacity= 820.11 cfs

0.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 100.0 '/' Top Width= 200.00'
Length= 77.0' Slope= 0.0940 '/'
Inlet Invert= 114.24', Outlet Invert= 107.00'



Summary for Pond 1P: 272+50

[79] Warning: Submerged Pond USF2P Primary device # 1 OUTLET by 0.53'

Inflow Area = 214.860 ac, 5.55% Impervious, Inflow Depth = 1.18" for 02-YR event
Inflow = 107.65 cfs @ 12.87 hrs, Volume= 21.122 af
Outflow = 76.85 cfs @ 13.34 hrs, Volume= 21.122 af, Atten= 29%, Lag= 28.0 min
Primary = 76.85 cfs @ 13.34 hrs, Volume= 21.122 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 39.06' @ 13.34 hrs Surf.Area= 146,093 sf Storage= 94,644 cf

Plug-Flow detention time= 7.8 min calculated for 21.122 af (100% of inflow)
Center-of-Mass det. time= 7.8 min (924.9 - 917.1)

Volume	Invert	Avail.Storage	Storage Description
#1	37.00'	1,813,588 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
37.00	2,863	918.2	0	0	2,863
38.00	26,586	2,276.7	12,724	12,724	348,255
39.00	134,675	3,072.1	73,699	86,424	686,822
40.00	393,337	4,851.0	252,723	339,147	1,808,426
41.00	742,346	5,944.1	558,682	897,829	2,747,466
42.00	1,100,908	6,521.2	915,758	1,813,588	3,319,958

Device	Routing	Invert	Outlet Devices
#1	Primary	34.89'	**54.0" Round Culvert** L= 185.9' Ke= 0.500 Inlet / Outlet Invert= 34.89' / 34.59' S= 0.0016 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 15.90 sf

Primary OutFlow Max=76.85 cfs @ 13.34 hrs HW=39.06' (Free Discharge)
└─**1=Culvert** (Barrel Controls 76.85 cfs @ 6.52 fps)

Summary for Pond 7P: UDF STA259

Inflow Area =	1.404 ac, 36.35% Impervious, Inflow Depth = 1.37" for 02-YR event		
Inflow =	2.16 cfs @ 12.09 hrs,	Volume=	0.160 af
Outflow =	0.08 cfs @ 16.11 hrs,	Volume=	0.160 af, Atten= 96%, Lag= 241.1 min
Primary =	0.08 cfs @ 16.11 hrs,	Volume=	0.160 af
Secondary =	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 104.18' @ 16.11 hrs Surf.Area= 3,771 sf Storage= 3,955 cf

Plug-Flow detention time= 508.1 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 508.1 min (1,345.3 - 837.2)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	9,698 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	2,952	0	0
104.00	3,639	3,296	3,296
105.00	4,383	4,011	7,307
105.50	5,183	2,392	9,698

Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	**15.0" Round RCP_Round 15"** L= 111.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 101.00' / 96.00' S= 0.0450 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	101.00'	**2.0" W x 0.7" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	104.50'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	104.75'	**10.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.08 cfs @ 16.11 hrs HW=104.18' (Free Discharge)
1=RCP_Round 15" (Passes 0.08 cfs of 9.44 cfs potential flow)
  2=Orifice/Grate (Orifice Controls 0.08 cfs @ 8.54 fps)
  3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond SP1P: (new Pond)

The outlet culvert is modeled as a 9-ft by 9-ft box. These dimensions have not been field verified.

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[81] Warning: Exceeded Pond 1P by 1.05' @ 14.93 hrs

Inflow Area = 355.206 ac, 7.46% Impervious, Inflow Depth = 1.20" for 02-YR event
Inflow = 160.67 cfs @ 12.23 hrs, Volume= 35.418 af
Outflow = 60.90 cfs @ 14.45 hrs, Volume= 34.474 af, Atten= 62%, Lag= 133.0 min
Primary = 60.90 cfs @ 14.45 hrs, Volume= 34.474 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 38.15' @ 14.45 hrs Surf.Area= 513,185 sf Storage= 563,370 cf

Plug-Flow detention time= 160.2 min calculated for 34.467 af (97% of inflow)
Center-of-Mass det. time= 142.2 min (1,043.0 - 900.8)

Volume	Invert	Avail.Storage	Storage Description
#1	34.00'	7,139,730 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
34.00	25	20.0	0	0	25
35.00	25	20.0	25	25	45
36.00	63,877	2,213.0	21,722	21,747	389,735
37.00	234,622	3,974.0	140,307	162,054	1,256,762
38.00	436,029	4,766.0	330,166	492,220	1,807,620
39.00	1,068,655	9,433.0	729,100	1,221,320	7,080,964
40.00	1,853,982	9,172.0	1,443,404	2,664,724	7,467,497
41.00	2,208,027	10,197.0	2,028,428	4,693,152	9,047,396
42.00	2,693,152	10,069.0	2,446,578	7,139,730	9,254,072

Device	Routing	Invert	Outlet Devices
#1	Primary	36.23'	**108.0" W x 108.0" H Box Culvert** L= 37.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 36.23' / 36.14' S= 0.0024 '/' Cc= 0.900 n= 0.013, Flow Area= 81.00 sf
#2	Secondary	40.00'	**300.0' long x 22.0' 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

Primary OutFlow Max=60.89 cfs @ 14.45 hrs HW=38.15' (Free Discharge)
└─**1=Culvert** (Barrel Controls 60.89 cfs @ 4.70 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond USF1P: STA263 FILTER TRENCH

Inflow Area = 0.641 ac, 45.96% Impervious, Inflow Depth = 2.09" for 02-YR event
Inflow = 1.56 cfs @ 12.09 hrs, Volume= 0.112 af
Outflow = 0.64 cfs @ 12.32 hrs, Volume= 0.112 af, Atten= 59%, Lag= 13.8 min
Primary = 0.64 cfs @ 12.32 hrs, Volume= 0.112 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 43.47' @ 12.32 hrs Surf.Area= 5,064 sf Storage= 1,772 cf

Plug-Flow detention time= 393.4 min calculated for 0.111 af (100% of inflow)
Center-of-Mass det. time= 393.5 min (1,207.3 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	43.00'	5,240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
43.00	2,512	0	0
44.00	7,967	5,240	5,240

Device	Routing	Invert	Outlet Devices
#1	Primary	40.57'	**12.0" Round Outlet Pipe** L= 81.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 40.57' / 40.16' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	40.67'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	40.67'	**0.7" Vert. Orifice at OCS** C= 0.600
#4	Device 1	43.40'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	43.60'	**10.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.64 cfs @ 12.32 hrs HW=43.47' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.64 cfs of 4.76 cfs potential flow)
  ├─**2=Header Pipe** (Passes 0.02 cfs of 2.64 cfs potential flow)
  │ └─**3=Orifice at OCS** (Orifice Controls 0.02 cfs @ 8.01 fps)
  └─**4=Catch Basin Grate** (Orifice Controls 0.61 cfs @ 1.25 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=43.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond USF2P: STA267 FILTER TRENCH

Inflow Area =	1.004 ac, 43.33% Impervious, Inflow Depth = 2.09" for 02-YR event			
Inflow =	2.45 cfs @	12.09 hrs, Volume=	0.175 af	
Outflow =	0.93 cfs @	12.34 hrs, Volume=	0.175 af,	Atten= 62%, Lag= 15.4 min
Primary =	0.93 cfs @	12.34 hrs, Volume=	0.175 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 42.55' @ 12.34 hrs Surf.Area= 6,633 sf Storage= 2,725 cf

Plug-Flow detention time= 322.4 min calculated for 0.175 af (100% of inflow)
Center-of-Mass det. time= 322.6 min (1,136.4 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	42.00'	6,361 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
42.00	3,358	0	0
43.00	9,363	6,361	6,361

Device	Routing	Invert	Outlet Devices
#1	Primary	39.15'	**12.0" Round Outlet Pipe** L= 62.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.15' / 38.53' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	39.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	39.65'	**0.8" Vert. Orifice at OCS** C= 0.600
#4	Device 1	42.40'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	42.60'	**10.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.93 cfs @ 12.34 hrs HW=42.55' (Free Discharge)
└**1=Outlet Pipe** (Passes 0.93 cfs of 5.90 cfs potential flow)
  ├**2=Header Pipe** (Passes 0.03 cfs of 2.69 cfs potential flow)
  │ └**3=Orifice at OCS** (Orifice Controls 0.03 cfs @ 8.15 fps)
  └**4=Catch Basin Grate** (Orifice Controls 0.90 cfs @ 1.84 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=42.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond USF3P: STA291+00 LEFT UDF

Inflow Area =	2.656 ac, 37.33% Impervious, Inflow Depth = 2.00" for 02-YR event			
Inflow =	6.23 cfs @	12.09 hrs, Volume=	0.443 af	
Outflow =	2.42 cfs @	12.34 hrs, Volume=	0.443 af,	Atten= 61%, Lag= 15.1 min
Primary =	1.87 cfs @	12.34 hrs, Volume=	0.433 af	
Secondary =	0.56 cfs @	12.34 hrs, Volume=	0.010 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 84.57' @ 12.34 hrs Surf.Area= 5,208 sf Storage= 6,922 cf

Plug-Flow detention time= 264.1 min calculated for 0.443 af (100% of inflow)
Center-of-Mass det. time= 264.2 min (1,081.8 - 817.6)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	9,265 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	3,630	0	0
84.00	4,625	4,128	4,128
85.00	5,650	5,138	9,265

Device	Routing	Invert	Outlet Devices
#1	Primary	80.15'	**12.0" Round Outlet Pipe** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 80.15' / 79.00' S= 0.0523 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	80.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	80.65'	**1.3" Vert. Orifice at OCS** C= 0.600
#4	Device 1	84.00'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	84.50'	**12.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

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Primary OutFlow  Max=1.87 cfs @ 12.34 hrs  HW=84.57'   (Free Discharge)
└─1=Outlet Pipe  (Passes 1.87 cfs of 7.49 cfs potential flow)
   ├─2=Header Pipe  (Passes 0.09 cfs of 3.18 cfs potential flow)
   │  └─3=Orifice at OCS  (Orifice Controls 0.09 cfs @ 9.47 fps)
   └─4=Catch Basin Grate  (Orifice Controls 1.78 cfs @ 3.63 fps)

Secondary OutFlow  Max=0.55 cfs @ 12.34 hrs  HW=84.57'   (Free Discharge)
└─5=Broad-Crested Rectangular Weir  (Weir Controls 0.55 cfs @ 0.67 fps)
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.029	98	(1AS, 1BS, 1CS, 1DS, 1ES, 1FS, 3S, 4AS, 4BS, 4CS, 5S, 6S, 7CS, SP2S)
0.697	74	>75% Grass cover, Good, HSG C (6S, 7AS, 7BS, 7CS)
3.732	80	>75% Grass cover, Good, HSG D (1AS, 1BS, 1DS, 1FS, 4AS, 4BS, 4CS, 6S, 7CS, USF1, USF2, USF3)
3.012	30	Brush, Good, HSG A (1S)
6.913	48	Brush, Good, HSG B (SP1S)
6.301	65	Brush, Good, HSG C (1S, 7AS, SP1S, SP2S)
48.649	73	Brush, Good, HSG D (1S, SP1S, SP2S)
1.721	98	MTA CORRIDOR (USF1, USF2, USF3)
9.601	98	MTA PAVE (SP1S)
0.242	98	Paved parking, HSG C (7BS)
0.269	98	Unconnected pavement, HSG C (7AS)
6.614	30	Woods, Good, HSG A (1S)
2.903	55	Woods, Good, HSG B (SP1S)
10.800	70	Woods, Good, HSG C (1S, SP1S, SP2S)
240.662	77	Woods, Good, HSG D (1S, SP1S, SP2S)
10.213	98	iMPERVIOUS (1S)
357.357	**76**	**TOTAL AREA**

Notes Listing (all nodes)

Line#	Node Number	Notes
1	SP1P	The outlet culvert is modeled as a 9-ft by 9-ft box. These dimensions have not been field verified.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1AS: 257+30	Runoff Area=29,080 sf 79.93% Impervious Runoff Depth=4.21" Tc=5.0 min CN=94 Runoff=3.18 cfs 0.234 af
Subcatchment 1BS: 257+87	Runoff Area=3,848 sf 73.93% Impervious Runoff Depth=4.10" Tc=5.0 min CN=93 Runoff=0.41 cfs 0.030 af
Subcatchment 1CS: 257+87	Runoff Area=1,869 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.21 cfs 0.017 af
Subcatchment 1DS: 258+20	Runoff Area=3,745 sf 86.22% Impervious Runoff Depth=4.43" Tc=0.0 min CN=96 Runoff=0.49 cfs 0.032 af
Subcatchment 1ES: 258+20	Runoff Area=1,223 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.14 cfs 0.011 af
Subcatchment 1FS: 258+85	Runoff Area=30,468 sf 80.03% Impervious Runoff Depth=4.21" Tc=5.0 min CN=94 Runoff=3.33 cfs 0.245 af
Subcatchment 1S: 272+50	Runoff Area=210.559 ac 4.85% Impervious Runoff Depth=2.37" Flow Length=3,413' Tc=62.6 min CN=75 Runoff=223.43 cfs 41.558 af
Subcatchment 3S: 272+21	Runoff Area=1,291 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.15 cfs 0.012 af
Subcatchment 4AS: 271+12	Runoff Area=31,230 sf 80.07% Impervious Runoff Depth=4.21" Tc=5.0 min CN=94 Runoff=3.41 cfs 0.251 af
Subcatchment 4BS: 274+00	Runoff Area=37,362 sf 79.73% Impervious Runoff Depth=4.21" Tc=5.0 min CN=94 Runoff=4.08 cfs 0.301 af
Subcatchment 4CS: 272+56	Runoff Area=14,230 sf 80.00% Impervious Runoff Depth=4.21" Tc=5.0 min CN=94 Runoff=1.55 cfs 0.115 af
Subcatchment 5S: 273+02	Runoff Area=852 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af
Subcatchment 6S: 281+50	Runoff Area=76,278 sf 71.46% Impervious Runoff Depth=3.99" Tc=5.0 min CN=92 Runoff=8.07 cfs 0.582 af
Subcatchment 7AS: Right STA 295+00 to 298+00	Runoff Area=46,170 sf 25.34% Impervious Runoff Depth=2.20" Tc=6.0 min UI Adjusted CN=73 Runoff=2.72 cfs 0.195 af
Subcatchment 7BS: Center STA 296+50 to 299+50	Runoff Area=14,989 sf 70.24% Impervious Runoff Depth=3.89" Tc=6.0 min CN=91 Runoff=1.50 cfs 0.111 af
Subcatchment 7CS: Center STA 299+50 to 303+50	Runoff Area=19,658 sf 71.51% Impervious Runoff Depth=3.99" Tc=5.0 min CN=92 Runoff=2.08 cfs 0.150 af

Subcatchment SP1S: (new Subcat) Runoff Area=133.177 ac 7.21% Impervious Runoff Depth=2.37"
Flow Length=1,660' Tc=16.2 min CN=75 Runoff=270.29 cfs 26.285 af

Subcatchment SP2S: (new Subcat) Runoff Area=93,684 sf 27.10% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=77 Runoff=6.64 cfs 0.455 af

Subcatchment USF1: STA261+00 TO STA264+50 Runoff Area=27,929 sf 45.96% Impervious Runoff Depth=3.57"
Tc=6.0 min CN=88 Runoff=2.63 cfs 0.191 af

Subcatchment USF2: STA264+50 to STA269+50 Runoff Area=43,724 sf 43.33% Impervious Runoff Depth=3.57"
Tc=6.0 min CN=88 Runoff=4.11 cfs 0.299 af

Subcatchment USF3: STA291+00 LEFT Runoff Area=115,680 sf 37.33% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=87 Runoff=10.63 cfs 0.769 af

Reach SP1R1: Roadside Ditch Avg. Flow Depth=0.63' Max Vel=3.20 fps Inflow=10.23 cfs 1.039 af
n=0.035 L=351.0' S=0.0199 '/' Capacity=139.65 cfs Outflow=9.83 cfs 1.039 af

Reach SP1R2: Roadside Ditch Avg. Flow Depth=0.50' Max Vel=3.33 fps Inflow=8.91 cfs 0.769 af
n=0.035 L=1,285.0' S=0.0280 '/' Capacity=165.52 cfs Outflow=7.12 cfs 0.769 af

Reach SP2R: SP2 STA299+43 Avg. Flow Depth=0.16' Max Vel=2.46 fps Inflow=6.64 cfs 0.455 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=6.61 cfs 0.455 af

Pond 1P: 272+50 Peak Elev=40.18' Storage=414,027 cf Inflow=227.10 cfs 42.816 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=106.62 cfs 42.816 af

Pond 7P: UDF STA259 Peak Elev=104.63' Storage=5,755 cf Inflow=4.21 cfs 0.306 af
Primary=1.06 cfs 0.306 af Secondary=0.00 cfs 0.000 af Outflow=1.06 cfs 0.306 af

Pond SP1P: (new Pond) Peak Elev=38.90' Storage=1,117,656 cf Inflow=330.29 cfs 71.395 af
Primary=98.93 cfs 70.447 af Secondary=0.00 cfs 0.000 af Outflow=98.93 cfs 70.447 af

Pond USF1P: STA263 FILTER TRENCH Peak Elev=43.63' Storage=2,667 cf Inflow=2.63 cfs 0.191 af
Primary=1.15 cfs 0.189 af Secondary=0.14 cfs 0.002 af Outflow=1.29 cfs 0.191 af

Pond USF2P: STA267 FILTER TRENCH Peak Elev=42.71' Storage=3,935 cf Inflow=4.11 cfs 0.299 af
Primary=1.35 cfs 0.273 af Secondary=1.00 cfs 0.026 af Outflow=2.36 cfs 0.299 af

Pond USF3P: STA291+00 LEFT UDF Peak Elev=84.86' Storage=8,459 cf Inflow=10.63 cfs 0.769 af
Primary=2.27 cfs 0.614 af Secondary=6.64 cfs 0.155 af Outflow=8.91 cfs 0.769 af

Total Runoff Area = 357.357 ac Runoff Volume = 71.850 af Average Runoff Depth = 2.41"
92.42% Pervious = 330.282 ac 7.58% Impervious = 27.074 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1AS: 257+30	Runoff Area=29,080 sf 79.93% Impervious Runoff Depth=5.49" Tc=5.0 min CN=94 Runoff=4.09 cfs 0.306 af
Subcatchment 1BS: 257+87	Runoff Area=3,848 sf 73.93% Impervious Runoff Depth=5.38" Tc=5.0 min CN=93 Runoff=0.53 cfs 0.040 af
Subcatchment 1CS: 257+87	Runoff Area=1,869 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.27 cfs 0.021 af
Subcatchment 1DS: 258+20	Runoff Area=3,745 sf 86.22% Impervious Runoff Depth=5.73" Tc=0.0 min CN=96 Runoff=0.63 cfs 0.041 af
Subcatchment 1ES: 258+20	Runoff Area=1,223 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.18 cfs 0.014 af
Subcatchment 1FS: 258+85	Runoff Area=30,468 sf 80.03% Impervious Runoff Depth=5.49" Tc=5.0 min CN=94 Runoff=4.28 cfs 0.320 af
Subcatchment 1S: 272+50	Runoff Area=210.559 ac 4.85% Impervious Runoff Depth=3.45" Flow Length=3,413' Tc=62.6 min CN=75 Runoff=327.89 cfs 60.591 af
Subcatchment 3S: 272+21	Runoff Area=1,291 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af
Subcatchment 4AS: 271+12	Runoff Area=31,230 sf 80.07% Impervious Runoff Depth=5.49" Tc=5.0 min CN=94 Runoff=4.39 cfs 0.328 af
Subcatchment 4BS: 274+00	Runoff Area=37,362 sf 79.73% Impervious Runoff Depth=5.49" Tc=5.0 min CN=94 Runoff=5.25 cfs 0.393 af
Subcatchment 4CS: 272+56	Runoff Area=14,230 sf 80.00% Impervious Runoff Depth=5.49" Tc=5.0 min CN=94 Runoff=2.00 cfs 0.150 af
Subcatchment 5S: 273+02	Runoff Area=852 sf 100.00% Impervious Runoff Depth=5.96" Tc=5.0 min CN=98 Runoff=0.12 cfs 0.010 af
Subcatchment 6S: 281+50	Runoff Area=76,278 sf 71.46% Impervious Runoff Depth=5.27" Tc=5.0 min CN=92 Runoff=10.48 cfs 0.768 af
Subcatchment 7AS: Right STA 295+00 to 298+00	Runoff Area=46,170 sf 25.34% Impervious Runoff Depth=3.26" Tc=6.0 min UI Adjusted CN=73 Runoff=4.05 cfs 0.288 af
Subcatchment 7BS: Center STA 296+50 to 299+50	Runoff Area=14,989 sf 70.24% Impervious Runoff Depth=5.15" Tc=6.0 min CN=91 Runoff=1.96 cfs 0.148 af
Subcatchment 7CS: Center STA 299+50 to 303+50	Runoff Area=19,658 sf 71.51% Impervious Runoff Depth=5.27" Tc=5.0 min CN=92 Runoff=2.70 cfs 0.198 af

Subcatchment SP1S: (new Subcat) Runoff Area=133.177 ac 7.21% Impervious Runoff Depth=3.45"
Flow Length=1,660' Tc=16.2 min CN=75 Runoff=396.56 cfs 38.323 af

Subcatchment SP2S: (new Subcat) Runoff Area=93,684 sf 27.10% Impervious Runoff Depth=3.65"
Tc=5.0 min CN=77 Runoff=9.55 cfs 0.655 af

Subcatchment USF1: STA261+00 TO STA264+50 Runoff Area=27,929 sf 45.96% Impervious Runoff Depth=4.82"
Tc=6.0 min CN=88 Runoff=3.49 cfs 0.257 af

Subcatchment USF2: STA264+50 to STA269+50 Runoff Area=43,724 sf 43.33% Impervious Runoff Depth=4.82"
Tc=6.0 min CN=88 Runoff=5.47 cfs 0.403 af

Subcatchment USF3: STA291+00 LEFT Runoff Area=115,680 sf 37.33% Impervious Runoff Depth=4.71"
Tc=6.0 min CN=87 Runoff=14.22 cfs 1.042 af

Reach SP1R1: Roadside Ditch Avg. Flow Depth=0.71' Max Vel=3.43 fps Inflow=13.27 cfs 1.402 af
n=0.035 L=351.0' S=0.0199 '/' Capacity=139.65 cfs Outflow=12.80 cfs 1.402 af

Reach SP1R2: Roadside Ditch Avg. Flow Depth=0.61' Max Vel=3.71 fps Inflow=12.73 cfs 1.042 af
n=0.035 L=1,285.0' S=0.0280 '/' Capacity=165.52 cfs Outflow=10.71 cfs 1.042 af

Reach SP2R: SP2 STA299+43 Avg. Flow Depth=0.19' Max Vel=2.69 fps Inflow=9.55 cfs 0.655 af
n=0.035 L=77.0' S=0.0940 '/' Capacity=820.11 cfs Outflow=9.50 cfs 0.655 af

Pond 1P: 272+50 Peak Elev=40.85' Storage=790,520 cf Inflow=332.19 cfs 62.293 af
54.0" Round Culvert n=0.012 L=185.9' S=0.0016 '/' Outflow=117.05 cfs 62.293 af

Pond 7P: UDF STA259 Peak Elev=104.79' Storage=6,382 cf Inflow=6.00 cfs 0.435 af
Primary=3.05 cfs 0.434 af Secondary=0.16 cfs 0.002 af Outflow=3.21 cfs 0.435 af

Pond SP1P: (new Pond) Peak Elev=39.29' Storage=1,555,322 cf Inflow=477.25 cfs 103.655 af
Primary=120.75 cfs 102.705 af Secondary=0.00 cfs 0.000 af Outflow=120.75 cfs 102.705 af

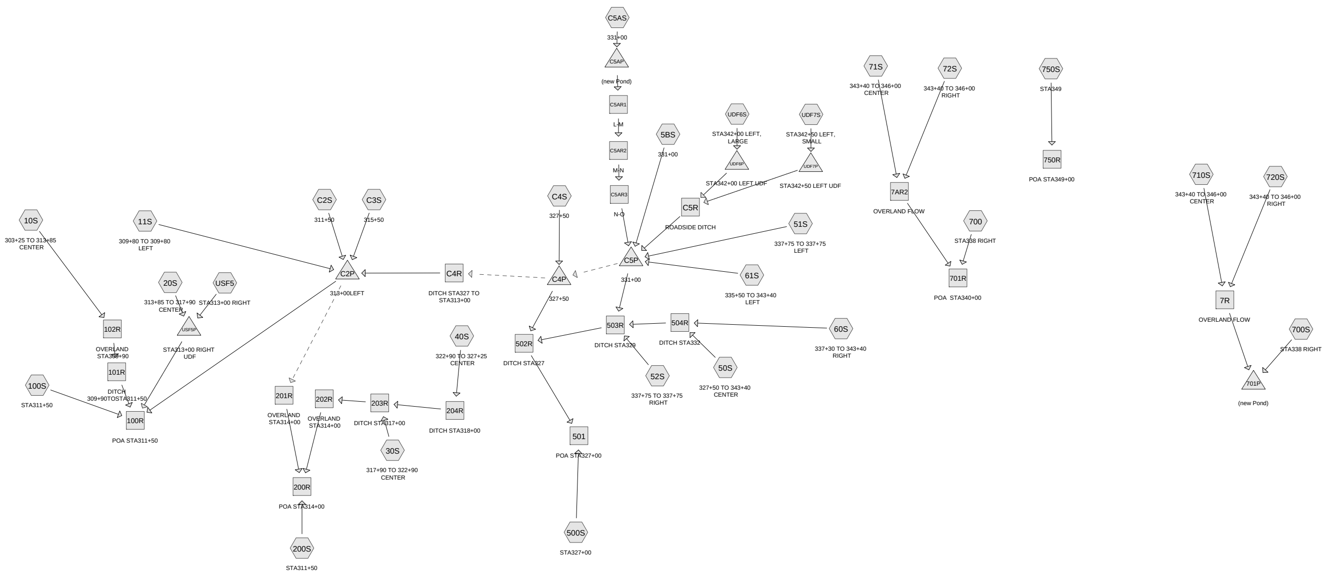
Pond USF1P: STA263 FILTER TRENCH Peak Elev=43.70' Storage=3,108 cf Inflow=3.49 cfs 0.257 af
Primary=1.32 cfs 0.239 af Secondary=0.84 cfs 0.018 af Outflow=2.16 cfs 0.257 af

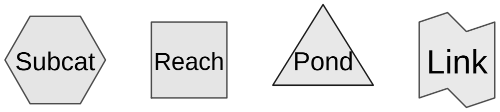
Pond USF2P: STA267 FILTER TRENCH Peak Elev=42.79' Storage=4,539 cf Inflow=5.47 cfs 0.403 af
Primary=1.51 cfs 0.342 af Secondary=2.15 cfs 0.061 af Outflow=3.66 cfs 0.403 af

Pond USF3P: STA291+00 LEFT UDF Peak Elev=84.97' Storage=9,108 cf Inflow=14.22 cfs 1.042 af
Primary=2.42 cfs 0.764 af Secondary=10.32 cfs 0.278 af Outflow=12.73 cfs 1.042 af

Total Runoff Area = 357.357 ac Runoff Volume = 104.310 af Average Runoff Depth = 3.50"
92.42% Pervious = 330.282 ac 7.58% Impervious = 27.074 ac

Mile 8.8, STA300+00 to STA350+00





Routing Diagram for 14181_8.8POST_STA300-STA350 _10-14-16
Prepared by Sebago Technics, Printed 10/14/2016
HydroCAD® 10.00-18 s/n 01856

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.592	98	(5BS, C2S, C4S, C5AS)
0.090	74	>75% Grass cover, Good, HSG C (10S)
2.299	80	>75% Grass cover, Good, HSG D (UDF6S, UDF7S, USF5)
1.645	30	Brush, Good, HSG A (C2S)
25.794	73	Brush, Good, HSG D (5BS, 100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS)
1.314	98	Impervious (C3S)
1.203	98	MTA CORRIDOR (UDF6S, UDF7S, USF5)
7.910	98	MTA PAVEMENT (10S, 11S, 20S, 30S, 40S, 50S, 51S, 52S, 60S, 61S, 71S, 72S, 710S, 720S)
5.841	98	Pavement (100S, 500S, 700, 700S, 750S)
2.883	30	Woods, Good, HSG A (C2S)
188.929	77	Woods, Good, HSG D (5BS, 100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS)
1.307	98	pavement (200S)
251.806	**78**	**TOTAL AREA**

```
                    Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
                      Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
          Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

Subcatchment 5BS: 331+00                      Runoff Area=41.478 ac   9.24% Impervious   Runoff Depth=1.41"
                                      Flow Length=1,929'   Tc=64.4 min   CN=79   Runoff=25.32 cfs  4.882 af

Subcatchment 10S: 303+25 TO 313+85 CENTER     Runoff Area=54,402 sf   92.83% Impervious   Runoff Depth=2.85"
                                                            Tc=5.0 min   CN=96   Runoff=4.01 cfs  0.296 af

Subcatchment 11S: 309+80 TO 309+80 LEFT         Runoff Area=971 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=0.07 cfs  0.006 af

Subcatchment 20S: 313+85 TO 317+90 CENTER    Runoff Area=20,843 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=1.59 cfs  0.122 af

Subcatchment 30S: 317+90 TO 322+90 CENTER    Runoff Area=26,755 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=2.04 cfs  0.157 af

Subcatchment 40S: 322+90 TO 327+25 CENTER    Runoff Area=21,605 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=1.65 cfs  0.127 af

Subcatchment 50S: 327+50 TO 343+40 CENTER    Runoff Area=80,647 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=6.15 cfs  0.473 af

Subcatchment 51S: 337+75 TO 337+75 LEFT       Runoff Area=1,672 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=0.13 cfs  0.010 af

Subcatchment 52S: 337+75 TO 337+75 RIGHT      Runoff Area=2,055 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=0.16 cfs  0.012 af

Subcatchment 60S: 337+30 TO 343+40 RIGHT     Runoff Area=26,409 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=2.01 cfs  0.155 af

Subcatchment 61S: 335+50 TO 343+40  LEFT     Runoff Area=34,668 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=2.64 cfs  0.203 af

Subcatchment 71S: 343+40 TO 346+00 CENTER    Runoff Area=25,915 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=1.98 cfs  0.152 af

Subcatchment 72S: 343+40 TO 346+00 RIGHT     Runoff Area=13,297 sf   100.00% Impervious   Runoff Depth=3.07"
                                                            Tc=5.0 min   CN=98   Runoff=1.01 cfs  0.078 af

Subcatchment 100S: STA311+50                   Runoff Area=1.659 ac   30.56% Impervious   Runoff Depth=1.69"
                                                            Tc=5.0 min   CN=83   Runoff=3.41 cfs  0.234 af

Subcatchment 200S: STA311+50                   Runoff Area=3.584 ac   36.47% Impervious   Runoff Depth=1.69"
                                                Flow Length=640'   Tc=5.0 min   CN=83   Runoff=7.36 cfs  0.505 af

Subcatchment 500S: STA327+00                   Runoff Area=5.749 ac   33.03% Impervious   Runoff Depth=1.62"
                                               Flow Length=925'   Tc=16.4 min   CN=82   Runoff=7.94 cfs  0.776 af
```

Subcatchment 700: STA338 RIGHT
Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=1.62"
Flow Length=575' Tc=22.4 min CN=82 Runoff=6.41 cfs 0.711 af

Subcatchment 700S: STA338 RIGHT
Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=1.62"
Flow Length=575' Tc=22.4 min CN=82 Runoff=6.41 cfs 0.711 af

Subcatchment 710S: 343+40 TO 346+00 CENTER
Runoff Area=25,915 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=1.98 cfs 0.152 af

Subcatchment 720S: 343+40 TO 346+00 RIGHT
Runoff Area=13,297 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=1.01 cfs 0.078 af

Subcatchment 750S: STA349
Runoff Area=1.170 ac 46.58% Impervious Runoff Depth=1.92"
Flow Length=80' Tc=3.1 min CN=86 Runoff=2.93 cfs 0.187 af

Subcatchment C2S: 311+50
Runoff Area=143.813 ac 5.04% Impervious Runoff Depth=1.22"
Flow Length=2,483' Tc=35.1 min CN=76 Runoff=104.82 cfs 14.646 af

Subcatchment C3S: 315+50
Runoff Area=3.014 ac 43.60% Impervious Runoff Depth=1.84"
Flow Length=731' Tc=15.0 min CN=85 Runoff=4.93 cfs 0.463 af

Subcatchment C4S: 327+50
Runoff Area=8.047 ac 5.51% Impervious Runoff Depth=1.35"
Flow Length=869' Tc=20.2 min CN=78 Runoff=8.35 cfs 0.903 af

Subcatchment C5AS: 331+00
Runoff Area=21.245 ac 5.02% Impervious Runoff Depth=1.35"
Flow Length=423' Tc=10.2 min CN=78 Runoff=28.51 cfs 2.385 af

Subcatchment UDF6S: STA342+00 LEFT, LARGE
Runoff Area=103,120 sf 27.33% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=85 Runoff=5.12 cfs 0.364 af

Subcatchment UDF7S: STA342+50 LEFT, SMALL
Runoff Area=28,267 sf 65.01% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=92 Runoff=1.81 cfs 0.132 af

Subcatchment USF5: STA313+00 RIGHT
Runoff Area=21,134 sf 27.59% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=85 Runoff=1.05 cfs 0.075 af

Reach 7AR2: OVERLAND FLOW
Avg. Flow Depth=0.07' Max Vel=1.91 fps Inflow=2.99 cfs 0.230 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=2.90 cfs 0.230 af

Reach 7R: OVERLAND FLOW
Avg. Flow Depth=0.07' Max Vel=1.91 fps Inflow=2.99 cfs 0.230 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=2.90 cfs 0.230 af

Reach 100R: POA STA311+50
Inflow=53.62 cfs 16.387 af
Outflow=53.62 cfs 16.387 af

Reach 101R: DITCH 309+90TOSTA311+50
Avg. Flow Depth=0.18' Max Vel=1.79 fps Inflow=4.00 cfs 0.296 af
n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=3.89 cfs 0.296 af

Reach 102R: OVERLAND STA309+90
Avg. Flow Depth=0.07' Max Vel=2.56 fps Inflow=4.01 cfs 0.296 af
n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=4.00 cfs 0.296 af

Reach 200R: POA STA314+00 Inflow=9.09 cfs 0.789 af
Outflow=9.09 cfs 0.789 af

Reach 201R: OVERLAND STA314+00 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 202R: OVERLAND STA314+00 Avg. Flow Depth=0.07' Max Vel=1.92 fps Inflow=2.95 cfs 0.284 af
n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=2.86 cfs 0.284 af

Reach 203R: DITCH STA317+00 Avg. Flow Depth=0.26' Max Vel=2.41 fps Inflow=2.96 cfs 0.284 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=2.95 cfs 0.284 af

Reach 204R: DITCH STA318+00 Avg. Flow Depth=0.17' Max Vel=2.05 fps Inflow=1.65 cfs 0.127 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=1.47 cfs 0.127 af

Reach 501: POA STA327+00 Inflow=23.82 cfs 9.652 af
Outflow=23.82 cfs 9.652 af

Reach 502R: DITCH STA327 Avg. Flow Depth=0.80' Max Vel=2.83 fps Inflow=20.21 cfs 8.877 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=20.21 cfs 8.876 af

Reach 503R: DITCH STA329 Avg. Flow Depth=0.77' Max Vel=2.89 fps Inflow=19.71 cfs 8.526 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=19.71 cfs 8.525 af

Reach 504R: DITCH STA332 Avg. Flow Depth=0.53' Max Vel=1.86 fps Inflow=8.16 cfs 0.628 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=7.60 cfs 0.628 af

Reach 701R: POA STA340+00 Inflow=7.65 cfs 0.941 af
Outflow=7.65 cfs 0.941 af

Reach 750R: POA STA349+00 Inflow=2.93 cfs 0.187 af
Outflow=2.93 cfs 0.187 af

Reach C4R: DITCH STA327 TO STA313+00 Avg. Flow Depth=0.38' Max Vel=3.19 fps Inflow=5.09 cfs 0.551 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=4.82 cfs 0.551 af

Reach C5AR1: L-M Avg. Flow Depth=0.15' Max Vel=0.17 fps Inflow=6.18 cfs 2.346 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=4.65 cfs 2.333 af

Reach C5AR2: M-N Avg. Flow Depth=0.23' Max Vel=1.45 fps Inflow=4.65 cfs 2.333 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=4.65 cfs 2.333 af

Reach C5AR3: N-O Avg. Flow Depth=0.45' Max Vel=7.59 fps Inflow=4.65 cfs 2.333 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=4.65 cfs 2.333 af

Reach C5R: ROADSIDE DITCH Avg. Flow Depth=0.10' Max Vel=1.82 fps Inflow=1.07 cfs 0.461 af
n=0.035 L=160.0' S=0.0437 '/' Capacity=860.03 cfs Outflow=1.04 cfs 0.460 af

Pond 701P: (new Pond) Peak Elev=143.63' Storage=349 cf Inflow=7.65 cfs 0.941 af
Primary=7.62 cfs 0.941 af Secondary=0.00 cfs 0.000 af Outflow=7.62 cfs 0.941 af

Pond C2P: 313+00LEFT Peak Elev=112.08' Storage=170,791 cf Inflow=111.84 cfs 15.666 af
Primary=52.69 cfs 15.666 af Secondary=0.00 cfs 0.000 af Outflow=52.69 cfs 15.666 af

Pond C4P: 327+50 Peak Elev=146.01' Storage=0 cf Inflow=8.35 cfs 0.903 af
Primary=3.25 cfs 0.352 af Secondary=5.09 cfs 0.551 af Outflow=8.35 cfs 0.903 af

Pond C5AP: (new Pond) Peak Elev=182.91' Storage=37,688 cf Inflow=28.51 cfs 2.385 af
15.0" Round Culvert n=0.025 L=27.0' S=0.0100 '/' Outflow=6.18 cfs 2.346 af

Pond C5P: 331+00 Peak Elev=144.56' Storage=29,970 cf Inflow=26.41 cfs 7.888 af
Primary=19.13 cfs 7.886 af Secondary=0.00 cfs 0.000 af Outflow=19.13 cfs 7.886 af

Pond UDF6P: STA342+00 LEFT UDF Peak Elev=163.06' Storage=7,995 cf Inflow=5.12 cfs 0.364 af
Primary=0.66 cfs 0.329 af Secondary=0.00 cfs 0.000 af Outflow=0.66 cfs 0.329 af

Pond UDF7P: STA342+50 LEFT UDF Peak Elev=163.37' Storage=2,222 cf Inflow=1.81 cfs 0.132 af
Primary=0.84 cfs 0.131 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.131 af

Pond USF5P: STA313+00 RIGHT UDF Peak Elev=116.19' Storage=3,348 cf Inflow=2.62 cfs 0.197 af
Primary=1.05 cfs 0.191 af Secondary=0.00 cfs 0.000 af Outflow=1.05 cfs 0.191 af

Total Runoff Area = 251.806 ac Runoff Volume = 28.996 af Average Runoff Depth = 1.38"
88.02% Pervious = 221.639 ac 11.98% Impervious = 30.167 ac

Summary for Subcatchment 5BS: 331+00

Runoff = 25.32 cfs @ 12.88 hrs, Volume= 4.882 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	3.833	98	
	33.795	77	Woods, Good, HSG D
	3.850	73	Brush, Good, HSG D
	41.478	79	Weighted Average
	37.645		90.76% Pervious Area
	3.833		9.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	36	0.0972	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.30"
3.6	166	0.0120	0.77		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.6	56	0.0893	1.49		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	83	0.0120	0.77		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.6	40	0.0250	1.11		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
1.0	95	0.0526	1.61		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
5.0	131	0.0076	0.44		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.6	56	0.1071	1.64		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
3.7	108	0.0093	0.48		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.3	33	0.1515	1.95		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.8	40	0.0250	0.79		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
0.6	63	0.1111	1.67		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
1.4	88	0.0455	1.07		**Shallow Concentrated Flow, M-N** Woodland Kv= 5.0 fps
30.9	444	0.0023	0.24		**Shallow Concentrated Flow, N-O** Woodland Kv= 5.0 fps
2.0	103	0.0291	0.85		**Shallow Concentrated Flow, O-P** Woodland Kv= 5.0 fps
1.0	76	0.0658	1.28		**Shallow Concentrated Flow, P-Q** Woodland Kv= 5.0 fps
6.2	152	0.0066	0.41		**Shallow Concentrated Flow, Q-R** Woodland Kv= 5.0 fps
0.5	50	0.1200	1.73		**Shallow Concentrated Flow, R-S** Woodland Kv= 5.0 fps
0.0	9	1.0000	5.00		**Shallow Concentrated Flow, S-T** Woodland Kv= 5.0 fps
0.1	12	0.2500	3.50		**Shallow Concentrated Flow, T-U** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, U-V** Short Grass Pasture Kv= 7.0 fps
64.4	1,929	Total			

Summary for Subcatchment 10S: 303+25 TO 313+85 CENTER

Runoff = 4.01 cfs @ 12.07 hrs, Volume= 0.296 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	50,503	98	MTA PAVEMENT
	3,899	74	>75% Grass cover, Good, HSG C
	54,402	96	Weighted Average
	3,899		7.17% Pervious Area
	50,503		92.83% Impervious Area

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

Summary for Subcatchment 11S: 309+80 TO 309+80 LEFT

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 0.006 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	971	98	MTA PAVEMENT
	971		100.00% Impervious Area

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

Summary for Subcatchment 20S: 313+85 TO 317+90 CENTER

Runoff = 1.59 cfs @ 12.07 hrs, Volume= 0.122 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	20,843	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	20,843	98	Weighted Average
	20,843		100.00% Impervious Area

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

Summary for Subcatchment 30S: 317+90 TO 322+90 CENTER

Runoff = 2.04 cfs @ 12.07 hrs, Volume= 0.157 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,755	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	26,755	98	Weighted Average
	26,755		100.00% Impervious Area

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

Summary for Subcatchment 40S: 322+90 TO 327+25 CENTER

Runoff = 1.65 cfs @ 12.07 hrs, Volume= 0.127 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	21,605	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	21,605	98	Weighted Average
	21,605		100.00% Impervious Area

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

Summary for Subcatchment 50S: 327+50 TO 343+40 CENTER

Runoff = 6.15 cfs @ 12.07 hrs, Volume= 0.473 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	80,647	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	80,647	98	Weighted Average
	80,647		100.00% Impervious Area

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

Summary for Subcatchment 51S: 337+75 TO 337+75 LEFT

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.010 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,672	98	MTA PAVEMENT
	1,672		100.00% Impervious Area

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

Summary for Subcatchment 52S: 337+75 TO 337+75 RIGHT

Runoff = 0.16 cfs @ 12.07 hrs, Volume= 0.012 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	2,055	98	MTA PAVEMENT
	2,055		100.00% Impervious Area

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

Summary for Subcatchment 60S: 337+30 TO 343+40 RIGHT

Runoff = 2.01 cfs @ 12.07 hrs, Volume= 0.155 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,409	98	MTA PAVEMENT
	26,409		100.00% Impervious Area

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

Summary for Subcatchment 61S: 335+50 TO 343+40 LEFT

Runoff = 2.64 cfs @ 12.07 hrs, Volume= 0.203 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	34,668	98	MTA PAVEMENT
	34,668		100.00% Impervious Area

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

Summary for Subcatchment 71S: 343+40 TO 346+00 CENTER

Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.152 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,915	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	25,915	98	Weighted Average
	25,915		100.00% Impervious Area

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

Summary for Subcatchment 72S: 343+40 TO 346+00 RIGHT

Runoff = 1.01 cfs @ 12.07 hrs, Volume= 0.078 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	13,297	98	MTA PAVEMENT
	13,297		100.00% Impervious Area

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

Summary for Subcatchment 100S: STA311+50

Runoff = 3.41 cfs @ 12.08 hrs, Volume= 0.234 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.507	98	Pavement
	0.245	73	Brush, Good, HSG D
	0.907	77	Woods, Good, HSG D
	1.659	83	Weighted Average
	1.152		69.44% Pervious Area
	0.507		30.56% Impervious Area

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

Summary for Subcatchment 200S: STA311+50

Runoff = 7.36 cfs @ 12.08 hrs, Volume= 0.505 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.307	98	pavement
	1.103	73	Brush, Good, HSG D
	1.174	77	Woods, Good, HSG D
	3.584	83	Weighted Average
	2.277		63.53% Pervious Area
	1.307		36.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	30	0.1500	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	590	0.0300	13.83	2,455.21	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=5.00' Z= 5.0 & 8.0 '/' Top.W=68.00' n= 0.035 Earth, dense weeds
0.6					**Direct Entry,**
5.0	640	Total			

Summary for Subcatchment 500S: STA327+00

Runoff = 7.94 cfs @ 12.23 hrs, Volume= 0.776 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.899	98	Pavement
	2.669	73	Brush, Good, HSG D
	1.181	77	Woods, Good, HSG D
	5.749	82	Weighted Average
	3.850		66.97% Pervious Area
	1.899		33.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	90	0.0900	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
4.1	360	0.0440	1.47		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.7	475	0.0060	4.66	279.49	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=5.00' D=3.00' Z= 5.0 '/' Top.W=35.00' n= 0.035 Earth, dense weeds
16.4	925	Total			

Summary for Subcatchment 700: STA338 RIGHT

Runoff = 6.41 cfs @ 12.32 hrs, Volume= 0.711 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	2.754	77	Woods, Good, HSG D
	1.074	73	Brush, Good, HSG D
*	1.445	98	Pavement
	5.273	82	Weighted Average
	3.828		72.60% Pervious Area
	1.445		27.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0250	0.13		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.30"
7.1	300	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.4	175	0.0600	1.22		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
22.4	575	Total			

Summary for Subcatchment 700S: STA338 RIGHT

Runoff = 6.41 cfs @ 12.32 hrs, Volume= 0.711 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	2.754	77	Woods, Good, HSG D
	1.074	73	Brush, Good, HSG D
*	1.445	98	Pavement
	5.273	82	Weighted Average
	3.828		72.60% Pervious Area
	1.445		27.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0250	0.13		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.30"
7.1	300	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.4	175	0.0600	1.22		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
22.4	575	Total			

Summary for Subcatchment 710S: 343+40 TO 346+00 CENTER

Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.152 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	25,915	98	MTA PAVEMENT
	0	80	>75% Grass cover, Good, HSG D
	25,915	98	Weighted Average
	25,915		100.00% Impervious Area

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

Summary for Subcatchment 720S: 343+40 TO 346+00 RIGHT

Runoff = 1.01 cfs @ 12.07 hrs, Volume= 0.078 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	13,297	98	MTA PAVEMENT
	13,297		100.00% Impervious Area

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

Summary for Subcatchment 750S: STA349

Runoff = 2.93 cfs @ 12.05 hrs, Volume= 0.187 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
	0.417	77	Woods, Good, HSG D
	0.208	73	Brush, Good, HSG D
*	0.545	98	Pavement
	1.170	86	Weighted Average
	0.625		53.42% Pervious Area
	0.545		46.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.1000	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.30"
0.3	50	0.2000	3.13		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
3.1	80	Total			

Summary for Subcatchment C2S: 311+50

Runoff = 104.82 cfs @ 12.52 hrs, Volume= 14.646 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	7.250	98	
	2.883	30	Woods, Good, HSG A
	1.645	30	Brush, Good, HSG A
	120.075	77	Woods, Good, HSG D
	11.960	73	Brush, Good, HSG D
	143.813	76	Weighted Average
	136.563		94.96% Pervious Area
	7.250		5.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	29	0.0760	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	60	0.0333	1.28		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.4	115	0.0780	1.40		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
12.9	521	0.0020	0.67		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
0.8	120	0.0250	2.53	48.11	**Channel Flow, E-F** Area= 19.0 sf Perim= 29.0' r= 0.66' n= 0.070 Sluggish weedy reaches w/pools
0.3	113	0.0370	6.49	470.44	**Channel Flow, F-G** Area= 72.5 sf Perim= 129.0' r= 0.56' n= 0.030 Earth, grassed & winding
2.2	124	0.0040	0.95		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
6.1	361	0.0390	0.99		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
0.9	463	0.0713	9.00	413.84	**Channel Flow, I-J** Area= 46.0 sf Perim= 82.0' r= 0.56' n= 0.030 Earth, grassed & winding
3.2	123	0.0160	0.63		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.4	167	0.0540	7.25	65.26	**Channel Flow, K-L** Area= 9.0 sf Perim= 18.0' r= 0.50' n= 0.030 Earth, grassed & winding
1.5	287	0.0105	3.20	30.38	**Channel Flow, L-M** Area= 9.5 sf Perim= 19.0' r= 0.50' n= 0.030 Earth, grassed & winding
35.1	2,483	Total			

Summary for Subcatchment C3S: 315+50

Runoff = 4.93 cfs @ 12.21 hrs, Volume= 0.463 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.314	98	Impervious
	0.932	77	Woods, Good, HSG D
	0.768	73	Brush, Good, HSG D
	3.014	85	Weighted Average
	1.700		56.40% Pervious Area
	1.314		43.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	62	0.4840	0.26		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	101	0.0890	1.49		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	22	0.4090	3.20		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
9.8	546	0.0348	0.93		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
15.0	731	Total			

Summary for Subcatchment C4S: 327+50

Runoff = 8.35 cfs @ 12.28 hrs, Volume= 0.903 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.443	98	
	7.260	77	Woods, Good, HSG D
	0.344	73	Brush, Good, HSG D
	8.047	78	Weighted Average
	7.604		94.49% Pervious Area
	0.443		5.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	28	0.0357	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	44	0.0909	1.51		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.4	128	0.0156	0.62		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	51	0.0980	1.57		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	24	0.2083	2.28		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.1	62	0.0323	0.90		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
0.5	62	0.1613	2.01		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.3	28	0.1071	1.64		**Shallow Concentrated Flow, H-I** Woodland Kv= 5.0 fps
0.5	30	0.0333	0.91		**Shallow Concentrated Flow, I-J** Woodland Kv= 5.0 fps
0.1	24	0.2917	2.70		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
0.3	27	0.1111	1.67		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
0.4	26	0.0385	0.98		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
0.5	68	0.2353	2.43		**Shallow Concentrated Flow, M-N** Woodland Kv= 5.0 fps
0.3	24	0.0833	1.44		**Shallow Concentrated Flow, N-O** Woodland Kv= 5.0 fps
0.4	52	0.1538	1.96		**Shallow Concentrated Flow, O-P** Woodland Kv= 5.0 fps
5.1	191	0.0157	0.63		**Shallow Concentrated Flow, P-Q** Woodland Kv= 5.0 fps
20.2	869	Total			

Summary for Subcatchment C5AS: 331+00

Runoff = 28.51 cfs @ 12.15 hrs, Volume= 2.385 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.066	98	
	17.680	77	Woods, Good, HSG D
	2.499	73	Brush, Good, HSG D
	21.245	78	Weighted Average
	20.179		94.98% Pervious Area
	1.066		5.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0750	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	81	0.9877	4.97		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
4.3	150	0.0133	0.58		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.8	79	0.1013	1.59		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	34	0.2059	2.27		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.6	55	0.1091	1.65		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
10.2	423	Total			

Summary for Subcatchment UDF6S: STA342+00 LEFT, LARGE

Runoff = 5.12 cfs @ 12.09 hrs, Volume= 0.364 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	74,938	80	>75% Grass cover, Good, HSG D
*	28,182	98	MTA CORRIDOR
	103,120	85	Weighted Average
	74,938		72.67% Pervious Area
	28,182		27.33% Impervious Area

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

Summary for Subcatchment UDF7S: STA342+50 LEFT, SMALL

Runoff = 1.81 cfs @ 12.09 hrs, Volume= 0.132 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	9,891	80	>75% Grass cover, Good, HSG D
*	18,376	98	MTA CORRIDOR
	28,267	92	Weighted Average
	9,891		34.99% Pervious Area
	18,376		65.01% Impervious Area

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

Summary for Subcatchment USF5: STA313+00 RIGHT

Runoff = 1.05 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
	15,303	80	>75% Grass cover, Good, HSG D
*	5,831	98	MTA CORRIDOR
	21,134	85	Weighted Average
	15,303		72.41% Pervious Area
	5,831		27.59% Impervious Area

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

Summary for Reach 7AR2: OVERLAND FLOW

Inflow Area = 0.900 ac,100.00% Impervious, Inflow Depth = 3.07" for 02-YR event
Inflow = 2.99 cfs @ 12.07 hrs, Volume= 0.230 af
Outflow = 2.90 cfs @ 12.12 hrs, Volume= 0.230 af, Atten= 3%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 5.6 min

Peak Storage= 304 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 354.74 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 200.0' Slope= 0.0750 '/'
Inlet Invert= 160.00', Outlet Invert= 145.00'

Summary for Reach 7R: OVERLAND FLOW

```
Inflow Area =       0.900 ac,100.00% Impervious,  Inflow Depth =   3.07"    for  02-YR event
Inflow      =        2.99 cfs @   12.07 hrs,  Volume=           0.230 af
Outflow     =        2.90 cfs @   12.12 hrs,  Volume=           0.230 af,  Atten= 3%,  Lag= 2.9 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 5.6 min

Peak Storage= 304 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 354.74 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 200.0' Slope= 0.0750 '/'
Inlet Invert= 160.00', Outlet Invert= 145.00'

Summary for Reach 100R: POA STA311+50

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow Area =     150.721 ac,    7.21% Impervious,  Inflow Depth >   1.30"    for  02-YR event
Inflow      =       53.62 cfs @   13.00 hrs,  Volume=          16.387 af
Outflow     =       53.62 cfs @   13.00 hrs,  Volume=          16.387 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 101R: DITCH 309+90TOSTA311+50

[62] Hint: Exceeded Reach 102R OUTLET depth by 0.11' @ 12.11 hrs

```
Inflow Area =       1.249 ac,  92.83% Impervious,  Inflow Depth =   2.85"    for  02-YR event
Inflow      =        4.00 cfs @   12.08 hrs,  Volume=           0.296 af
Outflow     =        3.89 cfs @   12.13 hrs,  Volume=           0.296 af,  Atten= 3%,  Lag= 2.6 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.79 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 6.1 min

Peak Storage= 370 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 92.78 cfs

10.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 170.0' Slope= 0.0206 '/'
Inlet Invert= 107.00', Outlet Invert= 103.50'

Summary for Reach 102R: OVERLAND STA309+90

Inflow Area = 1.249 ac, 92.83% Impervious, Inflow Depth = 2.85" for 02-YR event
Inflow = 4.01 cfs @ 12.07 hrs, Volume= 0.296 af
Outflow = 4.00 cfs @ 12.08 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.56 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 1.3 min

Peak Storage= 94 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 467.03 cfs

20.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 60.0' Slope= 0.1300 '/'
Inlet Invert= 114.80', Outlet Invert= 107.00'

Summary for Reach 200R: POA STA314+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.694 ac, 51.49% Impervious, Inflow Depth = 2.02" for 02-YR event
Inflow = 9.09 cfs @ 12.09 hrs, Volume= 0.789 af
Outflow = 9.09 cfs @ 12.09 hrs, Volume= 0.789 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 201R: OVERLAND STA314+00

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow    =         0.00 cfs @    0.00 hrs,  Volume=          0.000 af
Outflow   =         0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 202R: OVERLAND STA314+00

[61] Hint: Exceeded Reach 203R outlet invert by 0.07' @ 12.16 hrs

```
Inflow Area =        1.110 ac,100.00% Impervious,  Inflow Depth =   3.07"    for  02-YR event
Inflow    =         2.95 cfs @   12.12 hrs,  Volume=          0.284 af
Outflow   =         2.86 cfs @   12.20 hrs,  Volume=          0.284 af,  Atten= 3%,  Lag= 5.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.92 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 8.7 min

Peak Storage= 486 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00' Flow Area= 40.0 sf, Capacity= 359.26 cfs

20.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 60.00'
Length= 325.0' Slope= 0.0769 '/'
Inlet Invert= 126.00', Outlet Invert= 101.00'

Summary for Reach 203R: DITCH STA317+00

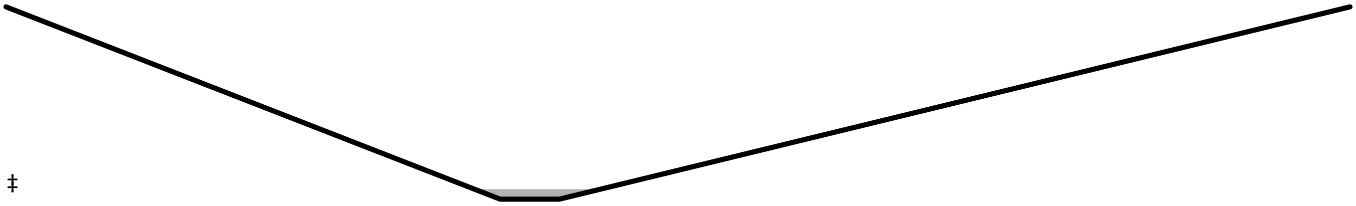
[62] Hint: Exceeded Reach 204R OUTLET depth by 0.09' @ 12.20 hrs

```
Inflow Area =        1.110 ac,100.00% Impervious,  Inflow Depth =   3.07"    for  02-YR event
Inflow    =         2.96 cfs @   12.09 hrs,  Volume=          0.284 af
Outflow   =         2.95 cfs @   12.12 hrs,  Volume=          0.284 af,  Atten= 0%,  Lag= 1.6 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.41 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 2.0 min

Peak Storage= 147 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 5.00' Flow Area= 177.5 sf, Capacity= 2,420.87 cfs

3.00' x 5.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 8.0 '/' Top Width= 68.00'
Length= 120.0' Slope= 0.0292 '/'
Inlet Invert= 129.50', Outlet Invert= 126.00'



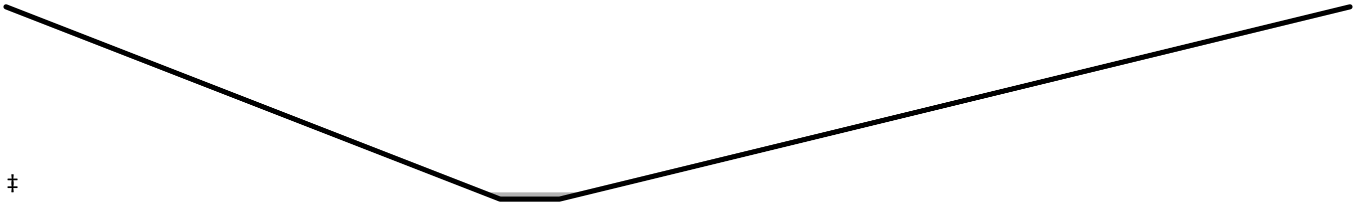
Summary for Reach 204R: DITCH STA318+00

Inflow Area = 0.496 ac,100.00% Impervious, Inflow Depth = 3.07" for 02-YR event
Inflow = 1.65 cfs @ 12.07 hrs, Volume= 0.127 af
Outflow = 1.47 cfs @ 12.17 hrs, Volume= 0.127 af, Atten= 11%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 7.9 min

Peak Storage= 342 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 5.00' Flow Area= 177.5 sf, Capacity= 2,560.64 cfs

3.00' x 5.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 8.0 '/' Top Width= 68.00'
Length= 475.0' Slope= 0.0326 '/'
Inlet Invert= 145.00', Outlet Invert= 129.50'



Summary for Reach 501: POA STA327+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 82.874 ac, 14.06% Impervious, Inflow Depth > 1.40" for 02-YR event
Inflow = 23.82 cfs @ 12.24 hrs, Volume= 9.652 af
Outflow = 23.82 cfs @ 12.24 hrs, Volume= 9.652 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 502R: DITCH STA327

[62] Hint: Exceeded Reach 503R OUTLET depth by 0.11' @ 12.26 hrs
[79] Warning: Submerged Pond C4P Primary device # 1 OUTLET by 0.27'

```
Inflow Area =        77.125 ac,  12.64% Impervious,  Inflow Depth >   1.38"    for  02-YR event
Inflow      =        20.21 cfs @   13.36 hrs,  Volume=             8.877 af
Outflow     =        20.21 cfs @   13.38 hrs,  Volume=             8.876 af,  Atten= 0%,  Lag= 1.5 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 2.4 min

Peak Storage= 1,071 cf @ 13.37 hrs
Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 142.33 cfs

5.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 138.50', Outlet Invert= 137.00'

‡

Summary for Reach 503R: DITCH STA329

[79] Warning: Submerged Pond C5P Primary device # 1 INLET by 0.47'

```
Inflow Area =        69.078 ac,  13.47% Impervious,  Inflow Depth >   1.48"    for  02-YR event
Inflow      =        19.71 cfs @   13.33 hrs,  Volume=             8.526 af
Outflow     =        19.71 cfs @   13.37 hrs,  Volume=             8.525 af,  Atten= 0%,  Lag= 2.7 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.89 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 4.3 min

Peak Storage= 1,844 cf @ 13.35 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 147.51 cfs

5.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 270.0' Slope= 0.0107 '/'
Inlet Invert= 141.40', Outlet Invert= 138.50'

‡

Summary for Reach 504R: DITCH STA332

Inflow Area = 2.458 ac,100.00% Impervious, Inflow Depth = 3.07" for 02-YR event
Inflow = 8.16 cfs @ 12.07 hrs, Volume= 0.628 af
Outflow = 7.60 cfs @ 12.14 hrs, Volume= 0.628 af, Atten= 7%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.86 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 9.6 min

Peak Storage= 1,230 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 30.0 sf, Capacity= 116.22 cfs

5.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 25.00'
Length= 300.0' Slope= 0.0067 '/'
Inlet Invert= 146.00', Outlet Invert= 144.00'

‡

Summary for Reach 701R: POA STA340+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.173 ac, 37.99% Impervious, Inflow Depth = 1.83" for 02-YR event
Inflow = 7.65 cfs @ 12.28 hrs, Volume= 0.941 af
Outflow = 7.65 cfs @ 12.28 hrs, Volume= 0.941 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 750R: POA STA349+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.170 ac, 46.58% Impervious, Inflow Depth = 1.92" for 02-YR event
Inflow = 2.93 cfs @ 12.05 hrs, Volume= 0.187 af
Outflow = 2.93 cfs @ 12.05 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

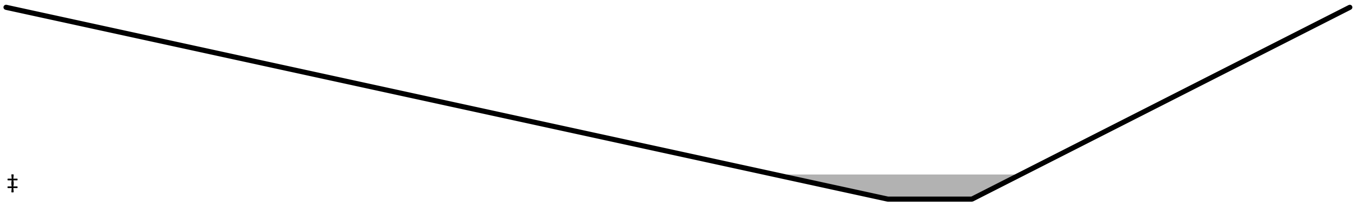
Summary for Reach C4R: DITCH STA327 TO STA313+00

Inflow	=	5.09 cfs @	12.28 hrs, Volume=	0.551 af
Outflow	=	4.82 cfs @	12.45 hrs, Volume=	0.551 af, Atten= 5%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.19 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 13.2 min

Peak Storage= 1,525 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 3.00' Flow Area= 51.0 sf, Capacity= 545.10 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 3.0 '/' Top Width= 32.00'
Length= 1,010.0' Slope= 0.0257 '/'
Inlet Invert= 144.00', Outlet Invert= 118.00'



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Summary for Reach C5AR1: L-M

Inflow Area =	21.245 ac,	5.02% Impervious, Inflow Depth > 1.33" for 02-YR event		
Inflow	=	6.18 cfs @	12.66 hrs, Volume=	2.346 af
Outflow	=	4.65 cfs @	15.91 hrs, Volume=	2.333 af, Atten= 25%, Lag= 195.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.17 fps, Min. Travel Time= 88.5 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 238.9 min

Peak Storage= 24,694 cf @ 14.44 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00' Flow Area= 182.0 sf, Capacity= 108.51 cfs

175.00' x 1.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 8.0 6.0 '/' Top Width= 189.00'
Length= 922.0' Slope= 0.0011 '/'
Inlet Invert= 178.00', Outlet Invert= 177.00'

Summary for Reach C5AR2: M-N

[62] Hint: Exceeded Reach C5AR1 OUTLET depth by 0.11' @ 17.05 hrs

Inflow Area = 21.245 ac, 5.02% Impervious, Inflow Depth > 1.32" for 02-YR event
Inflow = 4.65 cfs @ 15.91 hrs, Volume= 2.333 af
Outflow = 4.65 cfs @ 15.95 hrs, Volume= 2.333 af, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 4.0 min

Peak Storage= 440 cf @ 15.93 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 21.0 sf, Capacity= 69.43 cfs

11.70' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 10.6 8.0 '/' Top Width= 30.30'
Length= 137.0' Slope= 0.0073 '/'
Inlet Invert= 177.00', Outlet Invert= 176.00'

Summary for Reach C5AR3: N-O

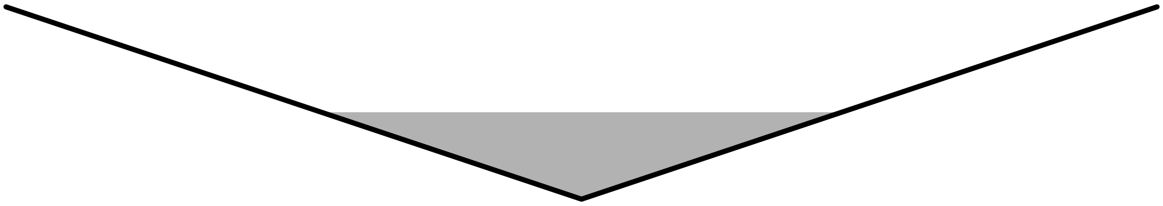
[62] Hint: Exceeded Reach C5AR2 OUTLET depth by 0.22' @ 16.06 hrs

Inflow Area = 21.245 ac, 5.02% Impervious, Inflow Depth > 1.32" for 02-YR event
Inflow = 4.65 cfs @ 15.95 hrs, Volume= 2.333 af
Outflow = 4.65 cfs @ 15.96 hrs, Volume= 2.333 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.59 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.81 fps, Avg. Travel Time= 0.7 min

Peak Storage= 94 cf @ 15.96 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 38.66 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 153.0' Slope= 0.1830 '/'
Inlet Invert= 176.00', Outlet Invert= 148.00'



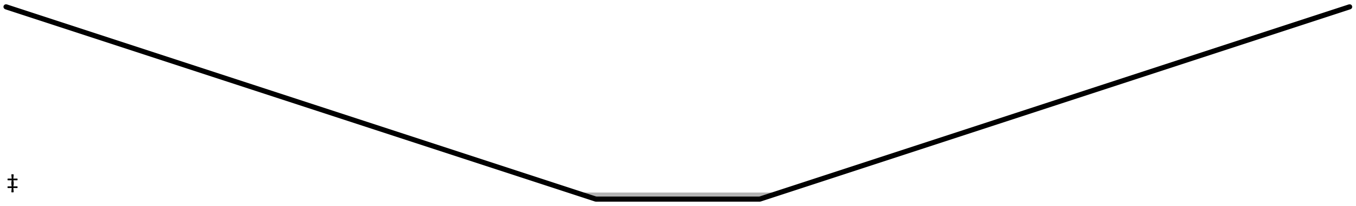
Summary for Reach C5R: ROADSIDE DITCH

Inflow Area = 3.016 ac, 35.44% Impervious, Inflow Depth > 1.83" for 02-YR event
Inflow = 1.07 cfs @ 12.53 hrs, Volume= 0.461 af
Outflow = 1.04 cfs @ 12.58 hrs, Volume= 0.460 af, Atten= 2%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.82 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 3.0 min

Peak Storage= 92 cf @ 12.55 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 3.00' Flow Area= 69.0 sf, Capacity= 860.03 cfs

5.00' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 6.0 '/' Top Width= 41.00'
Length= 160.0' Slope= 0.0437 '/'
Inlet Invert= 156.00', Outlet Invert= 149.00'



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Summary for Pond 701P: (new Pond)

Inflow Area = 6.173 ac, 37.99% Impervious, Inflow Depth = 1.83" for 02-YR event
Inflow = 7.65 cfs @ 12.28 hrs, Volume= 0.941 af
Outflow = 7.62 cfs @ 12.31 hrs, Volume= 0.941 af, Atten= 0%, Lag= 1.6 min
Primary = 7.62 cfs @ 12.31 hrs, Volume= 0.941 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 143.63' @ 12.31 hrs Surf.Area= 911 sf Storage= 349 cf

Plug-Flow detention time= 1.5 min calculated for 0.941 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (829.3 - 828.2)

Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	52,314 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
142.00	50	10.0	0	0	50
143.00	100	20.0	74	74	78
144.00	1,770	194.0	764	837	3,043
145.00	28,791	939.0	12,567	13,404	70,216
146.00	50,000	2,000.0	38,911	52,314	318,365

Device	Routing	Invert	Outlet Devices
#1	Primary	142.45'	**24.0" Round Culvert** L= 26.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 142.45' / 141.96' S= 0.0188 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Secondary	144.50'	**200.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.62 cfs @ 12.31 hrs HW=143.63' (Free Discharge)
↑**1=Culvert** (Barrel Controls 7.62 cfs @ 5.69 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=142.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C2P: 313+00LEFT

Inflow Area = 146.849 ac, 5.85% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 111.84 cfs @ 12.52 hrs, Volume= 15.666 af
Outflow = 52.69 cfs @ 13.02 hrs, Volume= 15.666 af, Atten= 53%, Lag= 30.0 min
Primary = 52.69 cfs @ 13.02 hrs, Volume= 15.666 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 112.08' @ 13.02 hrs Surf.Area= 159,754 sf Storage= 170,791 cf

Plug-Flow detention time= 44.5 min calculated for 15.663 af (100% of inflow)
Center-of-Mass det. time= 44.6 min (923.7 - 879.1)

Volume	Invert	Avail.Storage	Storage Description
#1	109.00'	2,272,428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
109.00	19,183	958.9	0	0	19,183
110.00	28,032	1,282.6	23,468	23,468	76,933
111.00	47,773	1,796.1	37,467	60,935	202,748
112.00	157,032	2,961.9	97,139	158,074	644,160
113.00	192,597	3,080.9	174,512	332,586	701,464
114.00	225,197	3,246.6	208,685	541,271	784,958
115.00	262,192	3,905.1	243,460	784,731	1,159,737
116.00	312,689	4,095.9	287,070	1,071,801	1,281,285
117.00	353,942	4,361.6	333,103	1,404,904	1,460,158
118.00	447,427	3,488.1	399,773	1,804,676	2,005,812
119.00	488,375	4,125.0	467,752	2,272,428	2,391,685

Device	Routing	Invert	Outlet Devices
#1	Primary	108.70'	**48.0" Round Culvert** L= 235.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 108.70' / 108.12' S= 0.0025 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Secondary	115.55'	**18.0" Round Culvert** L= 211.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.55' / 109.60' S= 0.0282 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=52.69 cfs @ 13.02 hrs HW=112.08' (Free Discharge)
↑**1=Culvert** (Barrel Controls 52.69 cfs @ 6.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=109.00' (Free Discharge)
↑**2=Culvert** (Controls 0.00 cfs)

Summary for Pond C4P: 327+50

Inflow Area = 8.047 ac, 5.51% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 8.35 cfs @ 12.28 hrs, Volume= 0.903 af
Outflow = 8.35 cfs @ 12.28 hrs, Volume= 0.903 af, Atten= 0%, Lag= 0.0 min
Primary = 3.25 cfs @ 12.28 hrs, Volume= 0.352 af
Secondary = 5.09 cfs @ 12.28 hrs, Volume= 0.551 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 146.01' @ 12.28 hrs Surf.Area= 27 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.903 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (860.7 - 860.7)

Volume	Invert	Avail.Storage	Storage Description
#1	146.00'	27,066 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.00	22	27.1	0	0	22
147.00	4,250	726.7	1,526	1,526	41,990
148.00	13,227	840.3	8,325	9,851	56,177
149.00	21,540	863.6	17,215	27,066	59,449

Device	Routing	Invert	Outlet Devices
#1	Primary	143.41'	**18.0" Round Culvert** L= 255.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 143.41' / 139.03' S= 0.0172 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Secondary	145.00'	**6.5' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=11.57 cfs @ 12.28 hrs HW=146.01' (Free Discharge)
↳**1=Culvert** (Inlet Controls 11.57 cfs @ 6.55 fps)

Secondary OutFlow Max=17.64 cfs @ 12.28 hrs HW=146.01' (Free Discharge)
↳**2=Broad-Crested Rectangular Weir** (Weir Controls 17.64 cfs @ 2.69 fps)

Summary for Pond C5AP: (new Pond)

Inflow Area = 21.245 ac, 5.02% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 28.51 cfs @ 12.15 hrs, Volume= 2.385 af
Outflow = 6.18 cfs @ 12.66 hrs, Volume= 2.346 af, Atten= 78%, Lag= 30.6 min
Primary = 6.18 cfs @ 12.66 hrs, Volume= 2.346 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 182.91' @ 12.66 hrs Surf.Area= 24,468 sf Storage= 37,688 cf

Plug-Flow detention time= 94.7 min calculated for 2.346 af (98% of inflow)
Center-of-Mass det. time= 85.4 min (936.8 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	180.00'	356,034 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
180.00	5,233	331.6	0	0	5,233
181.00	9,056	413.5	7,058	7,058	10,103
182.00	15,897	572.6	12,317	19,375	22,598
183.00	25,365	730.2	20,448	39,822	38,950
184.00	134,830	3,722.3	72,892	112,714	1,099,109
185.00	171,754	3,831.3	152,920	265,634	1,164,737
185.50	190,000	3,900.0	90,400	356,034	1,207,048

Device	Routing	Invert	Outlet Devices
#1	Primary	180.27'	**15.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 180.27' / 180.00' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf

Primary OutFlow Max=6.18 cfs @ 12.66 hrs HW=182.91' (Free Discharge)
↳**1=Culvert** (Barrel Controls 6.18 cfs @ 5.03 fps)

Summary for Pond C5P: 331+00

```
Inflow Area =      66.573 ac,  10.22% Impervious,  Inflow Depth >  1.42"    for  02-YR event
Inflow      =      26.41 cfs @   12.88 hrs,  Volume=         7.888 af
Outflow     =      19.13 cfs @   13.34 hrs,  Volume=         7.886 af,  Atten= 28%,  Lag= 27.3 min
Primary     =      19.13 cfs @   13.34 hrs,  Volume=         7.886 af
Secondary =         0.00 cfs @    0.00 hrs,  Volume=         0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 144.56' @ 13.34 hrs Surf.Area= 30,490 sf Storage= 29,970 cf

Plug-Flow detention time= 14.5 min calculated for 7.884 af (100% of inflow)
Center-of-Mass det. time= 14.1 min (1,013.4 - 999.3)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	297,542 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	20	15.0	0	0	20
141.70	50	30.0	7	7	74
142.00	1,500	400.0	182	189	12,735
143.00	3,404	858.6	2,388	2,577	58,671
144.00	23,914	1,161.1	12,113	14,691	107,300
145.00	36,142	1,360.8	29,818	44,509	147,397
146.00	50,955	1,644.8	43,337	87,846	215,340
147.00	64,383	1,674.9	57,538	145,384	223,463
148.00	78,650	1,939.5	71,398	216,782	299,590
149.00	82,890	2,150.0	80,761	297,542	368,124

Device	Routing	Invert	Outlet Devices
#1	Primary	141.70'	**30.0" Round Culvert** L= 285.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 141.70' / 141.50' S= 0.0007 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Secondary	147.00'	**50.0' long x 25.0' 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

Primary OutFlow Max=19.13 cfs @ 13.34 hrs HW=144.56' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 19.13 cfs @ 4.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond UDF6P: STA342+00 LEFT UDF

```
Inflow Area =       2.367 ac,  27.33% Impervious,  Inflow Depth =  1.84"    for  02-YR event
Inflow      =       5.12 cfs @   12.09 hrs,  Volume=         0.364 af
Outflow     =       0.66 cfs @   12.73 hrs,  Volume=         0.329 af,  Atten= 87%,  Lag= 38.7 min
Primary     =       0.66 cfs @   12.73 hrs,  Volume=         0.329 af
Secondary =         0.00 cfs @    0.00 hrs,  Volume=         0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 163.06' @ 12.73 hrs Surf.Area= 4,742 sf Storage= 7,995 cf

Plug-Flow detention time= 669.5 min calculated for 0.329 af (91% of inflow)
Center-of-Mass det. time= 622.9 min (1,447.6 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	18,832 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.00	3,067	0	0
162.00	3,828	3,448	3,448
163.00	4,689	4,259	7,706
164.00	5,549	5,119	12,825
165.00	6,465	6,007	18,832

Device	Routing	Invert	Outlet Devices
#1	Primary	158.15'	**12.0" Round Outlet Pipe** L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.15' / 157.99' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	158.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	158.65'	**1.2" Vert. Orifice at OCS** C= 0.600
#4	Device 1	163.00'	**1.2" x 1.2" Horiz. Catch Basin Grate** X 49 rows C= 0.600 Limited to weir flow at low heads
#5	Secondary	164.50'	**12.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.66 cfs @ 12.73 hrs HW=163.06' (Free Discharge)
└**1=Outlet Pipe** (Passes 0.66 cfs of 7.94 cfs potential flow)
  ├**2=Header Pipe** (Passes 0.08 cfs of 3.39 cfs potential flow)
  │ └**3=Orifice at OCS** (Orifice Controls 0.08 cfs @ 10.06 fps)
  └**4=Catch Basin Grate** (Orifice Controls 0.58 cfs @ 1.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond UDF7P: STA342+50 LEFT UDF

Inflow Area = 0.649 ac, 65.01% Impervious, Inflow Depth = 2.45" for 02-YR event
Inflow = 1.81 cfs @ 12.09 hrs, Volume= 0.132 af
Outflow = 0.84 cfs @ 12.25 hrs, Volume= 0.131 af, Atten= 53%, Lag= 10.2 min
Primary = 0.84 cfs @ 12.25 hrs, Volume= 0.131 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 163.37' @ 12.25 hrs Surf.Area= 2,081 sf Storage= 2,222 cf

Plug-Flow detention time= 492.4 min calculated for 0.131 af (99% of inflow)

Center-of-Mass det. time= 488.7 min (1,285.3 - 796.7)

Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	3,705 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,266	0	0
163.00	1,756	1,511	1,511
164.00	2,632	2,194	3,705

Device	Routing	Invert	Outlet Devices
#1	Primary	159.15'	**12.0" Round Outlet Pipe** L= 15.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.15' / 159.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	159.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	159.65'	**0.7" Vert. Orifice at OCS** C= 0.600
#4	Device 1	163.25'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	163.75'	**12.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.84 cfs @ 12.25 hrs HW=163.37' (Free Discharge)
└**1=Outlet Pipe** (Passes 0.84 cfs of 7.29 cfs potential flow)
  ├**2=Header Pipe** (Passes 0.02 cfs of 3.09 cfs potential flow)
  │ └**3=Orifice at OCS** (Orifice Controls 0.02 cfs @ 9.25 fps)
  └**4=Catch Basin Grate** (Orifice Controls 0.82 cfs @ 1.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=162.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond USF5P: STA313+00 RIGHT UDF

Inflow Area = 0.964 ac, 63.54% Impervious, Inflow Depth = 2.45" for 02-YR event
Inflow = 2.62 cfs @ 12.08 hrs, Volume= 0.197 af
Outflow = 1.05 cfs @ 12.29 hrs, Volume= 0.191 af, Atten= 60%, Lag= 13.0 min
Primary = 1.05 cfs @ 12.29 hrs, Volume= 0.191 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 116.19' @ 12.29 hrs Surf.Area= 3,313 sf Storage= 3,348 cf

Plug-Flow detention time= 461.0 min calculated for 0.191 af (97% of inflow)
Center-of-Mass det. time= 441.7 min (1,223.0 - 781.3)

Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	6,343 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	2,345	0	0
116.00	3,142	2,744	2,744
117.00	4,057	3,600	6,343

Device	Routing	Invert	Outlet Devices
#1	Primary	112.15'	**12.0" Round Outlet Pipe** L= 63.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 112.15' / 110.00' S= 0.0341 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	112.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	112.65'	**0.8" Vert. Orifice at OCS** C= 0.600
#4	Device 1	116.00'	**1.2" x 1.2" Horiz. Orifice/Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	117.00'	**112.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

```
Primary OutFlow  Max=1.05 cfs @ 12.29 hrs  HW=116.19'   (Free Discharge)
└─1=Outlet Pipe  (Passes 1.05 cfs of 7.11 cfs potential flow)
  ├─2=Header Pipe  (Passes 0.03 cfs of 3.01 cfs potential flow)
  │ └─3=Orifice at OCS  (Orifice Controls 0.03 cfs @ 9.01 fps)
  └─4=Orifice/Grate  (Orifice Controls 1.02 cfs @ 2.08 fps)

Secondary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=115.00'   (Free Discharge)
└─5=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.592	98	(5BS, C2S, C4S, C5AS)
0.090	74	>75% Grass cover, Good, HSG C (10S)
2.299	80	>75% Grass cover, Good, HSG D (UDF6S, UDF7S, USF5)
1.645	30	Brush, Good, HSG A (C2S)
25.794	73	Brush, Good, HSG D (5BS, 100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS)
1.314	98	Impervious (C3S)
1.203	98	MTA CORRIDOR (UDF6S, UDF7S, USF5)
7.910	98	MTA PAVEMENT (10S, 11S, 20S, 30S, 40S, 50S, 51S, 52S, 60S, 61S, 71S, 72S, 710S, 720S)
5.841	98	Pavement (100S, 500S, 700, 700S, 750S)
2.883	30	Woods, Good, HSG A (C2S)
188.929	77	Woods, Good, HSG D (5BS, 100S, 200S, 500S, 700, 700S, 750S, C2S, C3S, C4S, C5AS)
1.307	98	pavement (200S)
251.806	**78**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5BS: 331+00	Runoff Area=41.478 ac 9.24% Impervious Runoff Depth=2.72" Flow Length=1,929' Tc=64.4 min CN=79 Runoff=49.66 cfs 9.387 af
Subcatchment 10S: 303+25 TO 313+85 CENTER	Runoff Area=54,402 sf 92.83% Impervious Runoff Depth=4.43" Tc=5.0 min CN=96 Runoff=6.10 cfs 0.461 af
Subcatchment 11S: 309+80 TO 309+80 LEFT	Runoff Area=971 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.11 cfs 0.009 af
Subcatchment 20S: 313+85 TO 317+90 CENTER	Runoff Area=20,843 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=2.38 cfs 0.186 af
Subcatchment 30S: 317+90 TO 322+90 CENTER	Runoff Area=26,755 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=3.05 cfs 0.239 af
Subcatchment 40S: 322+90 TO 327+25 CENTER	Runoff Area=21,605 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=2.46 cfs 0.193 af
Subcatchment 50S: 327+50 TO 343+40 CENTER	Runoff Area=80,647 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=9.19 cfs 0.719 af
Subcatchment 51S: 337+75 TO 337+75 LEFT	Runoff Area=1,672 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af
Subcatchment 52S: 337+75 TO 337+75 RIGHT	Runoff Area=2,055 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=0.23 cfs 0.018 af
Subcatchment 60S: 337+30 TO 343+40 RIGHT	Runoff Area=26,409 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=3.01 cfs 0.236 af
Subcatchment 61S: 335+50 TO 343+40 LEFT	Runoff Area=34,668 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=3.95 cfs 0.309 af
Subcatchment 71S: 343+40 TO 346+00 CENTER	Runoff Area=25,915 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=2.95 cfs 0.231 af
Subcatchment 72S: 343+40 TO 346+00 RIGHT	Runoff Area=13,297 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=98 Runoff=1.52 cfs 0.119 af
Subcatchment 100S: STA311+50	Runoff Area=1.659 ac 30.56% Impervious Runoff Depth=3.08" Tc=5.0 min CN=83 Runoff=6.19 cfs 0.426 af
Subcatchment 200S: STA311+50	Runoff Area=3.584 ac 36.47% Impervious Runoff Depth=3.08" Flow Length=640' Tc=5.0 min CN=83 Runoff=13.38 cfs 0.921 af
Subcatchment 500S: STA327+00	Runoff Area=5.749 ac 33.03% Impervious Runoff Depth=2.99" Flow Length=925' Tc=16.4 min CN=82 Runoff=14.73 cfs 1.432 af

Subcatchment 700: STA338 RIGHT
Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=2.99"
Flow Length=575' Tc=22.4 min CN=82 Runoff=11.87 cfs 1.314 af

Subcatchment 700S: STA338 RIGHT
Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=2.99"
Flow Length=575' Tc=22.4 min CN=82 Runoff=11.87 cfs 1.314 af

Subcatchment 710S: 343+40 TO 346+00 CENTER
Runoff Area=25,915 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=2.95 cfs 0.231 af

Subcatchment 720S: 343+40 TO 346+00 RIGHT
Runoff Area=13,297 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=1.52 cfs 0.119 af

Subcatchment 750S: STA349
Runoff Area=1.170 ac 46.58% Impervious Runoff Depth=3.37"
Flow Length=80' Tc=3.1 min CN=86 Runoff=5.07 cfs 0.329 af

Subcatchment C2S: 311+50
Runoff Area=143.813 ac 5.04% Impervious Runoff Depth=2.45"
Flow Length=2,483' Tc=35.1 min CN=76 Runoff=216.36 cfs 29.402 af

Subcatchment C3S: 315+50
Runoff Area=3.014 ac 43.60% Impervious Runoff Depth=3.28"
Flow Length=731' Tc=15.0 min CN=85 Runoff=8.70 cfs 0.823 af

Subcatchment C4S: 327+50
Runoff Area=8.047 ac 5.51% Impervious Runoff Depth=2.63"
Flow Length=869' Tc=20.2 min CN=78 Runoff=16.65 cfs 1.762 af

Subcatchment C5AS: 331+00
Runoff Area=21.245 ac 5.02% Impervious Runoff Depth=2.63"
Flow Length=423' Tc=10.2 min CN=78 Runoff=56.81 cfs 4.651 af

Subcatchment UDF6S: STA342+00 LEFT, LARGE
Runoff Area=103,120 sf 27.33% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=85 Runoff=9.01 cfs 0.646 af

Subcatchment UDF7S: STA342+50 LEFT, SMALL
Runoff Area=28,267 sf 65.01% Impervious Runoff Depth=3.99"
Tc=6.0 min CN=92 Runoff=2.89 cfs 0.216 af

Subcatchment USF5: STA313+00 RIGHT
Runoff Area=21,134 sf 27.59% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=85 Runoff=1.85 cfs 0.132 af

Reach 7AR2: OVERLAND FLOW
Avg. Flow Depth=0.09' Max Vel=2.22 fps Inflow=4.47 cfs 0.350 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=4.36 cfs 0.350 af

Reach 7R: OVERLAND FLOW
Avg. Flow Depth=0.09' Max Vel=2.22 fps Inflow=4.47 cfs 0.350 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=4.36 cfs 0.350 af

Reach 100R: POA STA311+50
Inflow=85.23 cfs 32.508 af
Outflow=85.23 cfs 32.508 af

Reach 101R: DITCH 309+90TOSTA311+50
Avg. Flow Depth=0.23' Max Vel=2.06 fps Inflow=6.08 cfs 0.461 af
n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=5.94 cfs 0.461 af

Reach 102R: OVERLAND STA309+90
Avg. Flow Depth=0.09' Max Vel=2.98 fps Inflow=6.10 cfs 0.461 af
n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=6.08 cfs 0.461 af

Reach 200R: POA STA314+00
Inflow=16.19 cfs 1.352 af
Outflow=16.19 cfs 1.352 af

Reach 201R: OVERLAND STA314+00
Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 202R: OVERLAND STA314+00
Avg. Flow Depth=0.09' Max Vel=2.25 fps Inflow=4.56 cfs 0.431 af
n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=4.45 cfs 0.431 af

Reach 203R: DITCH STA317+00
Avg. Flow Depth=0.33' Max Vel=2.72 fps Inflow=4.57 cfs 0.431 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=4.56 cfs 0.431 af

Reach 204R: DITCH STA318+00
Avg. Flow Depth=0.22' Max Vel=2.31 fps Inflow=2.46 cfs 0.193 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=2.23 cfs 0.193 af

Reach 501: POA STA327+00
Inflow=42.20 cfs 18.222 af
Outflow=42.20 cfs 18.222 af

Reach 502R: DITCH STA327
Avg. Flow Depth=0.99' Max Vel=3.19 fps Inflow=31.48 cfs 16.790 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=31.48 cfs 16.789 af

Reach 503R: DITCH STA329
Avg. Flow Depth=0.96' Max Vel=3.26 fps Inflow=30.67 cfs 16.104 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=30.66 cfs 16.103 af

Reach 504R: DITCH STA332
Avg. Flow Depth=0.66' Max Vel=2.09 fps Inflow=12.20 cfs 0.955 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=11.51 cfs 0.955 af

Reach 701R: POA STA340+00
Inflow=13.73 cfs 1.664 af
Outflow=13.73 cfs 1.664 af

Reach 750R: POA STA349+00
Inflow=5.07 cfs 0.329 af
Outflow=5.07 cfs 0.329 af

Reach C4R: DITCH STA327 TO STA313+00
Avg. Flow Depth=0.54' Max Vel=3.85 fps Inflow=10.16 cfs 1.075 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=9.74 cfs 1.075 af

Reach C5AR1: L-M
Avg. Flow Depth=0.20' Max Vel=0.21 fps Inflow=7.61 cfs 4.612 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=7.19 cfs 4.598 af

Reach C5AR2: M-N
Avg. Flow Depth=0.30' Max Vel=1.67 fps Inflow=7.19 cfs 4.598 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=7.19 cfs 4.598 af

Reach C5AR3: N-O
Avg. Flow Depth=0.53' Max Vel=8.46 fps Inflow=7.19 cfs 4.598 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=7.19 cfs 4.598 af

Reach C5R: ROADSIDE DITCH
Avg. Flow Depth=0.21' Max Vel=2.80 fps Inflow=3.77 cfs 0.824 af
n=0.035 L=160.0' S=0.0437 '/' Capacity=860.03 cfs Outflow=3.76 cfs 0.824 af

Pond 701P: (new Pond)
Peak Elev=144.15' Storage=1,231 cf Inflow=13.73 cfs 1.664 af
Primary=13.35 cfs 1.663 af Secondary=0.00 cfs 0.000 af Outflow=13.35 cfs 1.663 af

Pond C2P: 313+00LEFT Peak Elev=113.46' Storage=423,662 cf Inflow=229.91 cfs 31.308 af
Primary=83.62 cfs 31.308 af Secondary=0.00 cfs 0.000 af Outflow=83.62 cfs 31.308 af

Pond C4P: 327+50 Peak Elev=146.02' Storage=0 cf Inflow=16.65 cfs 1.762 af
Primary=6.49 cfs 0.687 af Secondary=10.16 cfs 1.075 af Outflow=16.65 cfs 1.762 af

Pond C5AP: (new Pond) Peak Elev=183.77' Storage=85,769 cf Inflow=56.81 cfs 4.651 af
15.0" Round Culvert n=0.025 L=27.0' S=0.0100 '/' Outflow=7.61 cfs 4.612 af

Pond C5P: 331+00 Peak Elev=146.16' Storage=95,929 cf Inflow=52.69 cfs 15.133 af
Primary=29.87 cfs 15.131 af Secondary=0.00 cfs 0.000 af Outflow=29.87 cfs 15.131 af

Pond UDF6P: STA342+00 LEFT UDF Peak Elev=163.89' Storage=12,197 cf Inflow=9.01 cfs 0.646 af
Primary=2.31 cfs 0.610 af Secondary=0.00 cfs 0.000 af Outflow=2.31 cfs 0.610 af

Pond UDF7P: STA342+50 LEFT UDF Peak Elev=163.72' Storage=2,991 cf Inflow=2.89 cfs 0.216 af
Primary=1.63 cfs 0.214 af Secondary=0.00 cfs 0.000 af Outflow=1.63 cfs 0.214 af

Pond USF5P: STA313+00 RIGHT UDF Peak Elev=116.60' Storage=4,782 cf Inflow=4.20 cfs 0.318 af
Primary=1.86 cfs 0.312 af Secondary=0.00 cfs 0.000 af Outflow=1.86 cfs 0.312 af

Total Runoff Area = 251.806 ac Runoff Volume = 55.840 af Average Runoff Depth = 2.66"
88.02% Pervious = 221.639 ac 11.98% Impervious = 30.167 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5BS: 331+00
Runoff Area=41.478 ac 9.24% Impervious Runoff Depth=3.86"
Flow Length=1,929' Tc=64.4 min CN=79 Runoff=70.54 cfs 13.338 af

Subcatchment 10S: 303+25 TO 313+85 CENTER
Runoff Area=54,402 sf 92.83% Impervious Runoff Depth=5.73"
Tc=5.0 min CN=96 Runoff=7.78 cfs 0.596 af

Subcatchment 11S: 309+80 TO 309+80 LEFT
Runoff Area=971 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.14 cfs 0.011 af

Subcatchment 20S: 313+85 TO 317+90 CENTER
Runoff Area=20,843 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.01 cfs 0.238 af

Subcatchment 30S: 317+90 TO 322+90 CENTER
Runoff Area=26,755 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.87 cfs 0.305 af

Subcatchment 40S: 322+90 TO 327+25 CENTER
Runoff Area=21,605 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.12 cfs 0.246 af

Subcatchment 50S: 327+50 TO 343+40 CENTER
Runoff Area=80,647 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=11.66 cfs 0.920 af

Subcatchment 51S: 337+75 TO 337+75 LEFT
Runoff Area=1,672 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.24 cfs 0.019 af

Subcatchment 52S: 337+75 TO 337+75 RIGHT
Runoff Area=2,055 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.30 cfs 0.023 af

Subcatchment 60S: 337+30 TO 343+40 RIGHT
Runoff Area=26,409 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.82 cfs 0.301 af

Subcatchment 61S: 335+50 TO 343+40 LEFT
Runoff Area=34,668 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=5.01 cfs 0.395 af

Subcatchment 71S: 343+40 TO 346+00 CENTER
Runoff Area=25,915 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.75 cfs 0.296 af

Subcatchment 72S: 343+40 TO 346+00 RIGHT
Runoff Area=13,297 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=1.92 cfs 0.152 af

Subcatchment 100S: STA311+50
Runoff Area=1.659 ac 30.56% Impervious Runoff Depth=4.28"
Tc=5.0 min CN=83 Runoff=8.51 cfs 0.591 af

Subcatchment 200S: STA311+50
Runoff Area=3.584 ac 36.47% Impervious Runoff Depth=4.28"
Flow Length=640' Tc=5.0 min CN=83 Runoff=18.38 cfs 1.278 af

Subcatchment 500S: STA327+00
Runoff Area=5.749 ac 33.03% Impervious Runoff Depth=4.17"
Flow Length=925' Tc=16.4 min CN=82 Runoff=20.41 cfs 1.998 af

Subcatchment 700: STA338 RIGHT Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=4.17"
Flow Length=575' Tc=22.4 min CN=82 Runoff=16.46 cfs 1.833 af

Subcatchment 700S: STA338 RIGHT Runoff Area=5.273 ac 27.40% Impervious Runoff Depth=4.17"
Flow Length=575' Tc=22.4 min CN=82 Runoff=16.46 cfs 1.833 af

Subcatchment 710S: 343+40 TO 346+00 CENTER Runoff Area=25,915 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=3.75 cfs 0.296 af

Subcatchment 720S: 343+40 TO 346+00 RIGHT Runoff Area=13,297 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=1.92 cfs 0.152 af

Subcatchment 750S: STA349 Runoff Area=1.170 ac 46.58% Impervious Runoff Depth=4.60"
Flow Length=80' Tc=3.1 min CN=86 Runoff=6.83 cfs 0.448 af

Subcatchment C2S: 311+50 Runoff Area=143.813 ac 5.04% Impervious Runoff Depth=3.55"
Flow Length=2,483' Tc=35.1 min CN=76 Runoff=314.46 cfs 42.584 af

Subcatchment C3S: 315+50 Runoff Area=3.014 ac 43.60% Impervious Runoff Depth=4.49"
Flow Length=731' Tc=15.0 min CN=85 Runoff=11.81 cfs 1.128 af

Subcatchment C4S: 327+50 Runoff Area=8.047 ac 5.51% Impervious Runoff Depth=3.76"
Flow Length=869' Tc=20.2 min CN=78 Runoff=23.81 cfs 2.519 af

Subcatchment C5AS: 331+00 Runoff Area=21.245 ac 5.02% Impervious Runoff Depth=3.76"
Flow Length=423' Tc=10.2 min CN=78 Runoff=81.17 cfs 6.650 af

Subcatchment UDF6S: STA342+00 LEFT, LARGE Runoff Area=103,120 sf 27.33% Impervious Runoff Depth=4.49"
Tc=6.0 min CN=85 Runoff=12.21 cfs 0.886 af

Subcatchment UDF7S: STA342+50 LEFT, SMALL Runoff Area=28,267 sf 65.01% Impervious Runoff Depth=5.27"
Tc=6.0 min CN=92 Runoff=3.75 cfs 0.285 af

Subcatchment USF5: STA313+00 RIGHT Runoff Area=21,134 sf 27.59% Impervious Runoff Depth=4.49"
Tc=6.0 min CN=85 Runoff=2.50 cfs 0.182 af

Reach 7AR2: OVERLAND FLOW Avg. Flow Depth=0.10' Max Vel=2.42 fps Inflow=5.67 cfs 0.447 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=5.55 cfs 0.447 af

Reach 7R: OVERLAND FLOW Avg. Flow Depth=0.10' Max Vel=2.42 fps Inflow=5.67 cfs 0.447 af
n=0.035 L=200.0' S=0.0750 '/' Capacity=354.74 cfs Outflow=5.55 cfs 0.447 af

Reach 100R: POA STA311+50 Inflow=102.76 cfs 47.108 af
Outflow=102.76 cfs 47.108 af

Reach 101R: DITCH 309+90TOSTA311+50 Avg. Flow Depth=0.27' Max Vel=2.23 fps Inflow=7.75 cfs 0.596 af
n=0.035 L=170.0' S=0.0206 '/' Capacity=92.78 cfs Outflow=7.61 cfs 0.596 af

Reach 102R: OVERLAND STA309+90 Avg. Flow Depth=0.11' Max Vel=3.26 fps Inflow=7.78 cfs 0.596 af
n=0.035 L=60.0' S=0.1300 '/' Capacity=467.03 cfs Outflow=7.75 cfs 0.596 af

Reach 200R: POA STA314+00 Inflow=22.13 cfs 1.829 af
Outflow=22.13 cfs 1.829 af

Reach 201R: OVERLAND STA314+00 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 202R: OVERLAND STA314+00 Avg. Flow Depth=0.11' Max Vel=2.47 fps Inflow=5.88 cfs 0.552 af
n=0.035 L=325.0' S=0.0769 '/' Capacity=359.26 cfs Outflow=5.75 cfs 0.552 af

Reach 203R: DITCH STA317+00 Avg. Flow Depth=0.37' Max Vel=2.92 fps Inflow=5.90 cfs 0.552 af
n=0.035 L=120.0' S=0.0292 '/' Capacity=2,420.87 cfs Outflow=5.88 cfs 0.552 af

Reach 204R: DITCH STA318+00 Avg. Flow Depth=0.25' Max Vel=2.48 fps Inflow=3.12 cfs 0.246 af
n=0.035 L=475.0' S=0.0326 '/' Capacity=2,560.64 cfs Outflow=2.85 cfs 0.246 af

Reach 501: POA STA327+00 Inflow=57.00 cfs 25.454 af
Outflow=57.00 cfs 25.454 af

Reach 502R: DITCH STA327 Avg. Flow Depth=1.14' Max Vel=3.46 fps Inflow=42.35 cfs 23.456 af
n=0.035 L=150.0' S=0.0100 '/' Capacity=142.33 cfs Outflow=42.34 cfs 23.455 af

Reach 503R: DITCH STA329 Avg. Flow Depth=1.06' Max Vel=3.43 fps Inflow=37.29 cfs 22.316 af
n=0.035 L=270.0' S=0.0107 '/' Capacity=147.51 cfs Outflow=37.29 cfs 22.315 af

Reach 504R: DITCH STA332 Avg. Flow Depth=0.75' Max Vel=2.24 fps Inflow=15.47 cfs 1.221 af
n=0.035 L=300.0' S=0.0067 '/' Capacity=116.22 cfs Outflow=14.65 cfs 1.221 af

Reach 701R: POA STA340+00 Inflow=18.82 cfs 2.280 af
Outflow=18.82 cfs 2.280 af

Reach 750R: POA STA349+00 Inflow=6.83 cfs 0.448 af
Outflow=6.83 cfs 0.448 af

Reach C4R: DITCH STA327 TO STA313+00 Avg. Flow Depth=0.64' Max Vel=4.23 fps Inflow=14.53 cfs 1.785 af
n=0.030 L=1,010.0' S=0.0257 '/' Capacity=545.10 cfs Outflow=14.02 cfs 1.785 af

Reach C5AR1: L-M Avg. Flow Depth=0.21' Max Vel=0.21 fps Inflow=8.15 cfs 6.611 af
n=0.080 L=922.0' S=0.0011 '/' Capacity=108.51 cfs Outflow=7.95 cfs 6.597 af

Reach C5AR2: M-N Avg. Flow Depth=0.31' Max Vel=1.73 fps Inflow=7.95 cfs 6.597 af
n=0.030 L=137.0' S=0.0073 '/' Capacity=69.43 cfs Outflow=7.95 cfs 6.596 af

Reach C5AR3: N-O Avg. Flow Depth=0.55' Max Vel=8.68 fps Inflow=7.95 cfs 6.596 af
n=0.030 L=153.0' S=0.1830 '/' Capacity=38.66 cfs Outflow=7.95 cfs 6.596 af

Reach C5R: ROADSIDE DITCH Avg. Flow Depth=0.27' Max Vel=3.17 fps Inflow=5.56 cfs 1.133 af
n=0.035 L=160.0' S=0.0437 '/' Capacity=860.03 cfs Outflow=5.55 cfs 1.132 af

Pond 701P: (new Pond) Peak Elev=144.47' Storage=3,383 cf Inflow=18.82 cfs 2.280 af
Primary=16.93 cfs 2.280 af Secondary=0.00 cfs 0.000 af Outflow=16.93 cfs 2.280 af

```
Pond C2P: 313+00LEFT                     Peak Elev=114.60'  Storage=683,423 cf   Inflow=333.49 cfs  45.508 af
                        Primary=100.67 cfs  45.508 af   Secondary=0.00 cfs  0.000 af   Outflow=100.67 cfs  45.508 af

Pond C4P: 327+50                                 Peak Elev=146.02'  Storage=1 cf   Inflow=23.81 cfs  2.926 af
                           Primary=9.29 cfs  1.141 af   Secondary=14.53 cfs  1.785 af   Outflow=23.81 cfs  2.926 af

Pond C5AP: (new Pond)                       Peak Elev=184.15'  Storage=133,124 cf   Inflow=81.17 cfs  6.650 af
                               15.0"  Round Culvert  n=0.025  L=27.0'  S=0.0100 '/'   Outflow=8.15 cfs  6.611 af

Pond C5P: 331+00                           Peak Elev=147.18'  Storage=156,904 cf   Inflow=75.70 cfs  21.481 af
                        Primary=36.26 cfs  21.072 af   Secondary=10.02 cfs  0.407 af   Outflow=46.28 cfs  21.479 af

Pond UDF6P: STA342+00 LEFT UDF               Peak Elev=164.59'  Storage=16,259 cf   Inflow=12.21 cfs  0.886 af
                             Primary=3.07 cfs  0.836 af   Secondary=0.85 cfs  0.014 af   Outflow=3.91 cfs  0.850 af

Pond UDF7P: STA342+50 LEFT UDF                 Peak Elev=163.85'  Storage=3,318 cf   Inflow=3.75 cfs  0.285 af
                             Primary=1.85 cfs  0.273 af   Secondary=0.96 cfs  0.010 af   Outflow=2.82 cfs  0.283 af

Pond USF5P: STA313+00 RIGHT UDF                Peak Elev=116.88'  Storage=5,859 cf   Inflow=5.49 cfs  0.419 af
                             Primary=2.25 cfs  0.413 af   Secondary=0.00 cfs  0.000 af   Outflow=2.25 cfs  0.413 af

             Total Runoff Area = 251.806 ac   Runoff Volume = 79.503 af   Average Runoff Depth = 3.79"
                                            88.02% Pervious = 221.639 ac     11.98% Impervious = 30.167 ac
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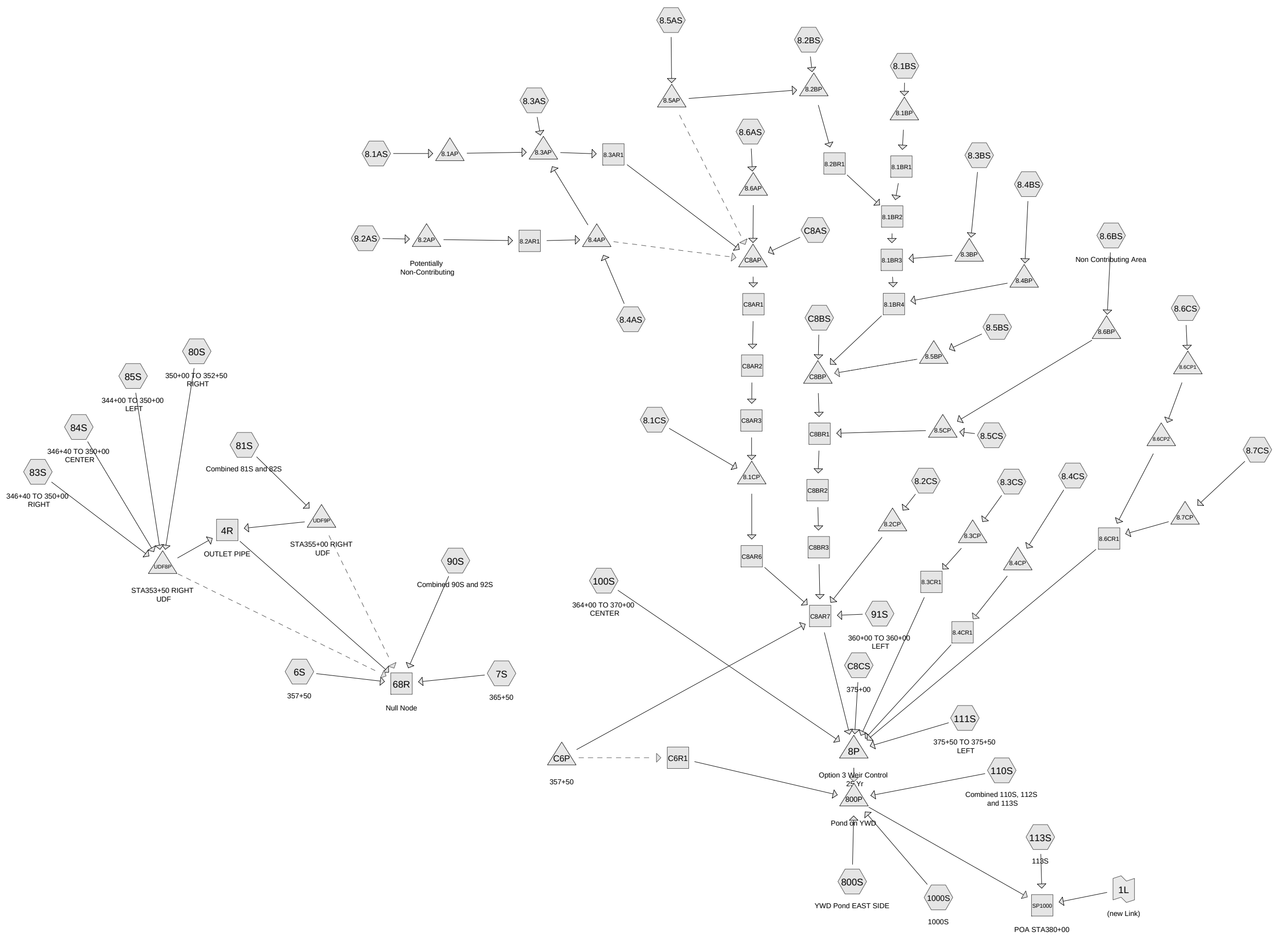
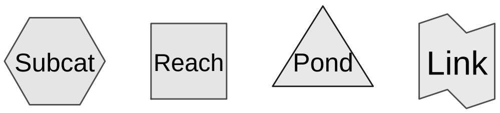
Mile 8.8, STA350+00 to STA380+00





Routing Diagram for 14181_8.8 POST_STA350+00-STA380+84_10-14-2016

Prepared by Sebago Technics, Printed 10/14/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.141	98	(7S, 8.1AS, 8.1BS, 8.1CS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 91S, 111S, C8AS, C8BS, C8CS)
0.440	80	>75% Grass cover, Good, HSG D (81S, 83S)
12.730	77	Brush, Fair, HSG D (6S, 7S, 8.1CS, C8AS)
27.512	73	Brush, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C8BS, C8CS)
2.366	98	PAVED (81S, 100S, 113S, 1000S)
1.605	98	PAVED CENTER (110S)
0.468	98	PAVED- 82S (81S)
1.757	98	PAVEMENT (6S)
1.179	98	Paved 346+50 - 350+00 (83S, 84S, 85S)
0.240	98	Paved 350+00 - 3352+50 (80S)
1.113	98	Paved 90S 354+35 - 359+60 (90S)
0.031	98	Paved 92S 360+00 to 360+00 (90S)
1.407	98	Pavement (800S)
75.253	79	Woods, Fair, HSG D (6S, 7S, 8.1CS, C8AS)
152.342	77	Woods, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C8BS, C8CS)
0.272	98	paved (83S)
295.856	**79**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.01 hrs, 5001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 357+50 Runoff Area=29.079 ac 6.04% Impervious Runoff Depth=1.48"
Flow Length=1,098' Tc=21.4 min CN=80 Runoff=32.66 cfs 3.585 af

Subcatchment 7S: 365+50 Runoff Area=5.717 ac 8.62% Impervious Runoff Depth=1.48"
Flow Length=489' Tc=6.0 min CN=80 Runoff=9.84 cfs 0.705 af

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=1.55"
Flow Length=430' Tc=28.4 min CN=81 Runoff=2.92 cfs 0.360 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=1.28"
Flow Length=265' Tc=35.1 min CN=77 Runoff=1.28 cfs 0.177 af

Subcatchment 8.1CS: Runoff Area=1,047,959 sf 3.84% Impervious Runoff Depth=1.41"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=20.37 cfs 2.831 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=1.35"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=1.15 cfs 0.145 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=1.28"
Flow Length=372' Tc=28.8 min CN=77 Runoff=1.82 cfs 0.231 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=1.35"
Flow Length=475' Tc=37.1 min CN=78 Runoff=1.85 cfs 0.263 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=1.48"
Flow Length=420' Tc=26.1 min CN=80 Runoff=2.21 cfs 0.264 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=1.35"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=0.83 cfs 0.131 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=1.28"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=2.07 cfs 0.476 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=1.48"
Flow Length=260' Tc=13.2 min CN=80 Runoff=2.23 cfs 0.201 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=1.28"
Flow Length=506' Tc=43.8 min CN=77 Runoff=1.36 cfs 0.211 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=1.28"
Flow Length=365' Tc=40.2 min CN=77 Runoff=1.98 cfs 0.295 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=1.28"
Flow Length=150' Tc=17.5 min CN=77 Runoff=3.10 cfs 0.319 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=1.35"
Flow Length=717' Tc=47.8 min CN=78 Runoff=1.98 cfs 0.321 af

Subcatchment 8.5CS:
Runoff Area=115,586 sf 14.02% Impervious Runoff Depth=1.41"
Flow Length=285' Tc=35.7 min CN=79 Runoff=2.26 cfs 0.312 af

Subcatchment 8.6AS:
Runoff Area=63,890 sf 15.73% Impervious Runoff Depth=1.48"
Flow Length=445' Tc=27.3 min CN=80 Runoff=1.48 cfs 0.181 af

Subcatchment 8.6BS: Non Contributing Area
Runoff Area=307,280 sf 17.19% Impervious Runoff Depth=1.48"
Flow Length=450' Tc=41.5 min CN=80 Runoff=5.86 cfs 0.870 af

Subcatchment 8.6CS:
Runoff Area=420,023 sf 1.26% Impervious Runoff Depth=1.28"
Flow Length=875' Tc=59.5 min CN=77 Runoff=5.55 cfs 1.032 af

Subcatchment 8.7CS:
Runoff Area=33,655 sf 0.00% Impervious Runoff Depth=1.22"
Flow Length=135' Slope=0.1030 '/' Tc=24.3 min CN=76 Runoff=0.66 cfs 0.079 af

Subcatchment 80S: 350+00 TO 352+50 RIGHT
Runoff Area=10,434 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=0.77 cfs 0.061 af

Subcatchment 81S: Combined 81S and 82S
Runoff Area=54,400 sf 89.15% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=96 Runoff=3.87 cfs 0.296 af

Subcatchment 83S: 346+40 TO 350+00 RIGHT
Runoff Area=40,574 sf 67.34% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=92 Runoff=2.60 cfs 0.190 af

Subcatchment 84S: 346+40 TO 350+00 CENTER
Runoff Area=17,680 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=1.30 cfs 0.104 af

Subcatchment 85S: 344+00 TO 350+00 LEFT
Runoff Area=18,205 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=1.34 cfs 0.107 af

Subcatchment 90S: Combined 90S and 92S
Runoff Area=49,844 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=3.80 cfs 0.292 af

Subcatchment 91S: 360+00 TO 360+00 LEFT
Runoff Area=1,433 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment 100S: 364+00 TO 370+00 CENTER
Runoff Area=31,359 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=2.39 cfs 0.184 af

Subcatchment 110S: Combined 110S, 112S and 113S
Runoff Area=69,921 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=5.33 cfs 0.410 af

Subcatchment 111S: 375+50 TO 375+50 LEFT
Runoff Area=867 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.07 cfs 0.005 af

Subcatchment 113S: 113S
Runoff Area=17,505 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=1.33 cfs 0.103 af

Subcatchment 800S: YWD Pond EAST SIDE
Runoff Area=1,262,903 sf 4.85% Impervious Runoff Depth=1.35"
Flow Length=1,350' Tc=47.7 min CN=78 Runoff=20.14 cfs 3.255 af

Subcatchment 1000S: 1000S Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=1.35"
Flow Length=862' Tc=24.7 min CN=78 Runoff=8.52 cfs 1.005 af

Subcatchment C8AS: Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=1.48"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=25.67 cfs 4.231 af

Subcatchment C8BS: Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=1.35"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=21.51 cfs 3.511 af

Subcatchment C8CS: 375+00 Runoff Area=3,245,079 sf 9.62% Impervious Runoff Depth=1.35"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=54.60 cfs 8.363 af

Reach 4R: OUTLET PIPE Avg. Flow Depth=0.47' Max Vel=8.27 fps Inflow=3.94 cfs 0.737 af
18.0" Round Pipe n=0.012 L=50.0' S=0.0260 '/' Capacity=18.35 cfs Outflow=3.94 cfs 0.737 af

Reach 8.1BR1: Avg. Flow Depth=0.06' Max Vel=0.40 fps Inflow=0.15 cfs 0.059 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=0.15 cfs 0.059 af

Reach 8.1BR2: Avg. Flow Depth=0.12' Max Vel=0.24 fps Inflow=0.59 cfs 0.220 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=0.45 cfs 0.220 af

Reach 8.1BR3: Avg. Flow Depth=0.21' Max Vel=1.51 fps Inflow=0.83 cfs 0.351 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=0.82 cfs 0.351 af

Reach 8.1BR4: Avg. Flow Depth=0.27' Max Vel=1.63 fps Inflow=2.14 cfs 0.556 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=2.14 cfs 0.556 af

Reach 8.2AR1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.00 cfs 0.000 af

Reach 8.2BR1: Avg. Flow Depth=0.16' Max Vel=0.82 fps Inflow=0.59 cfs 0.161 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=82.21 cfs Outflow=0.59 cfs 0.161 af

Reach 8.3AR1: Avg. Flow Depth=0.27' Max Vel=0.91 fps Inflow=1.48 cfs 0.165 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=1.24 cfs 0.165 af

Reach 8.3CR1: Avg. Flow Depth=0.06' Max Vel=0.40 fps Inflow=0.48 cfs 0.178 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=0.46 cfs 0.178 af

Reach 8.4CR1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.120 L=1,438.0' S=0.0178 '/' Capacity=48.77 cfs Outflow=0.00 cfs 0.000 af

Reach 8.6CR1: Avg. Flow Depth=0.18' Max Vel=1.30 fps Inflow=1.36 cfs 0.544 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=1.36 cfs 0.544 af

Reach 68R: Null Node Inflow=43.23 cfs 5.340 af
Outflow=43.23 cfs 5.340 af

Reach C6R1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=0.00 cfs 0.000 af

Reach C8AR1: Avg. Flow Depth=0.12' Max Vel=1.10 fps Inflow=4.57 cfs 4.555 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=4.57 cfs 4.555 af

Reach C8AR2: Avg. Flow Depth=0.42' Max Vel=0.94 fps Inflow=4.57 cfs 4.555 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=2,843.62 cfs Outflow=4.56 cfs 4.555 af

Reach C8AR3: Avg. Flow Depth=0.53' Max Vel=2.54 fps Inflow=4.56 cfs 4.555 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=4.56 cfs 4.555 af

Reach C8AR6: Avg. Flow Depth=0.46' Max Vel=1.52 fps Inflow=4.68 cfs 3.342 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=4.68 cfs 3.342 af

Reach C8AR7: Avg. Flow Depth=0.46' Max Vel=0.62 fps Inflow=7.79 cfs 7.505 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=7.70 cfs 7.504 af

Reach C8BR1: Avg. Flow Depth=0.16' Max Vel=2.77 fps Inflow=7.14 cfs 4.155 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=7.14 cfs 4.155 af

Reach C8BR2: Avg. Flow Depth=0.14' Max Vel=4.78 fps Inflow=7.14 cfs 4.155 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=7.14 cfs 4.155 af

Reach C8BR3: Avg. Flow Depth=0.05' Max Vel=1.46 fps Inflow=7.14 cfs 4.155 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=7.13 cfs 4.155 af

Reach SP1000: POA STA380+00 Inflow=127.63 cfs 206.914 af
Outflow=127.63 cfs 206.914 af

Pond 8.1AP: Peak Elev=207.72' Storage=15,668 cf Inflow=2.92 cfs 0.360 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.03' Storage=5,284 cf Inflow=1.28 cfs 0.177 af
Outflow=0.15 cfs 0.059 af

Pond 8.1CP: Peak Elev=158.11' Storage=190,518 cf Inflow=21.80 cfs 7.386 af
Outflow=4.68 cfs 3.342 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.31' Storage=6,319 cf Inflow=1.15 cfs 0.145 af
Outflow=0.00 cfs 0.000 af

Pond 8.2BP: Peak Elev=199.62' Storage=4,309 cf Inflow=1.82 cfs 0.234 af
Outflow=0.59 cfs 0.161 af

Pond 8.2CP: Peak Elev=182.20' Storage=11,450 cf Inflow=1.85 cfs 0.263 af
Outflow=0.00 cfs 0.000 af

Pond 8.3AP: Peak Elev=200.54' Storage=4,500 cf Inflow=2.21 cfs 0.264 af
Outflow=1.48 cfs 0.165 af

Pond 8.3BP: Peak Elev=201.61' Storage=72 cf Inflow=0.83 cfs 0.131 af
Outflow=0.83 cfs 0.131 af

Pond 8.3CP: Peak Elev=155.02' Storage=13,410 cf Inflow=2.07 cfs 0.476 af
Outflow=0.48 cfs 0.178 af

Pond 8.4AP: Peak Elev=207.46' Storage=8,776 cf Inflow=2.23 cfs 0.201 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.39' Storage=356 cf Inflow=1.36 cfs 0.211 af
Outflow=1.36 cfs 0.206 af

Pond 8.4CP: Peak Elev=161.45' Storage=12,860 cf Inflow=1.98 cfs 0.295 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.5AP: Peak Elev=205.80' Storage=13,744 cf Inflow=3.10 cfs 0.319 af
Primary=0.04 cfs 0.004 af Secondary=0.02 cfs 0.002 af Outflow=0.05 cfs 0.005 af

Pond 8.5BP: Peak Elev=167.95' Storage=10,451 cf Inflow=1.98 cfs 0.321 af
Primary=0.13 cfs 0.142 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.142 af

Pond 8.5CP: Peak Elev=159.52' Storage=13,603 cf Inflow=2.26 cfs 0.312 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.56' Storage=1,180 cf Inflow=1.48 cfs 0.181 af
Outflow=1.48 cfs 0.157 af

Pond 8.6BP: Peak Elev=156.74' Storage=37,874 cf Inflow=5.86 cfs 0.870 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.77' Storage=18,980 cf Inflow=5.55 cfs 1.032 af
Outflow=2.61 cfs 0.671 af

Pond 8.6CP2: Peak Elev=158.22' Storage=8,409 cf Inflow=2.61 cfs 0.671 af
Outflow=1.36 cfs 0.544 af

Pond 8.7CP: Peak Elev=157.49' Storage=3,427 cf Inflow=0.66 cfs 0.079 af
Outflow=0.00 cfs 0.000 af

Pond 8P: Option 3 Weir Control 25 Yr Peak Elev=121.86' Storage=1.890 af Inflow=54.94 cfs 16.779 af
Primary=30.90 cfs 16.778 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=30.90 cfs 16.778 af

Pond 800P: Pond on YWD Peak Elev=119.52' Storage=19,926 cf Inflow=51.79 cfs 21.448 af
Outflow=51.42 cfs 21.448 af

Pond C6P: 357+50 Peak Elev=0.00' Storage=0 cf
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af

Pond C8AP: Peak Elev=182.55' Storage=93,380 cf Inflow=27.34 cfs 4.555 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=4.57 cfs 4.555 af

Pond C8BP: Peak Elev=163.38' Storage=61,688 cf Inflow=23.63 cfs 4.209 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=7.14 cfs 4.155 af

Pond UDF8P: STA353+50 RIGHT UDF Peak Elev=146.97' Storage=6,262 cf Inflow=6.01 cfs 0.462 af
Primary=2.18 cfs 0.441 af Secondary=1.88 cfs 0.021 af Outflow=4.06 cfs 0.462 af

Pond UDF9P: STA355+00 RIGHT UDF Peak Elev=146.59' Storage=4,618 cf Inflow=3.87 cfs 0.296 af
Primary=1.78 cfs 0.296 af Secondary=0.00 cfs 0.000 af Outflow=1.78 cfs 0.296 af

Link 1L: (new Link) 02-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=88.26 cfs 185.363 af
Area= 2,130.640 ac 7.98% Imperv. Primary=88.26 cfs 185.363 af

Total Runoff Area = 295.856 ac Runoff Volume = 35.114 af Average Runoff Depth = 1.42"
90.68% Pervious = 268.277 ac 9.32% Impervious = 27.579 ac

Summary for Subcatchment 6S: 357+50

Runoff = 32.66 cfs @ 12.30 hrs, Volume= 3.585 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1.757	98	PAVEMENT
	24.062	79	Woods, Fair, HSG D
	3.260	77	Brush, Fair, HSG D
	29.079	80	Weighted Average
	27.322		93.96% Pervious Area
	1.757		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	31	0.0483	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	94	0.1277	1.79		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	31	0.1935	2.20		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.8	94	0.0851	2.04		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.0	63	0.0476	1.09		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.6	177	0.1412	1.88		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
1.1	129	0.0155	2.00		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
9.9	429	0.0023	0.72		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
0.1	50	0.0200	7.29	12.87	**Pipe Channel, I-J** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
21.4	1,098	Total			

Summary for Subcatchment 7S: 365+50

Runoff = 9.84 cfs @ 12.09 hrs, Volume= 0.705 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	0.493	98	
	4.352	79	Woods, Fair, HSG D
	0.872	77	Brush, Fair, HSG D
	5.717	80	Weighted Average
	5.224		91.38% Pervious Area
	0.493		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1190	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.2	26	0.2692	2.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.3	60	0.4000	3.16		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	15	0.1333	1.83		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.5	35	0.0571	1.19		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.2	58	0.0862	4.73		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
1.2	113	0.0088	1.51		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
0.5	161	0.0932	4.92		**Shallow Concentrated Flow, H-I** Unpaved Kv= 16.1 fps
6.0	489	Total			

Summary for Subcatchment 8.1AS:

Runoff = 2.92 cfs @ 12.40 hrs, Volume= 0.360 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,882	98	
	61,847	77	Woods, Good, HSG D
	32,725	73	Brush, Good, HSG D
	121,454	81	Weighted Average
	94,572		77.87% Pervious Area
	26,882		22.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	85	0.0120	0.06		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
3.8	170	0.0220	0.74		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.5	130	0.0080	1.44		**Shallow Concentrated Flow, C to D** Unpaved Kv= 16.1 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
28.4	430	Total			

Summary for Subcatchment 8.1BS:

Runoff = 1.28 cfs @ 12.52 hrs, Volume= 0.177 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,205	98	
	63,793	77	Woods, Good, HSG D
	7,195	73	Brush, Good, HSG D
	72,193	77	Weighted Average
	70,988		98.33% Pervious Area
	1,205		1.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	145	0.0140	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.6	60	0.0160	0.63		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
35.1	265	Total			

Summary for Subcatchment 8.1CS:

Runoff = 20.37 cfs @ 12.52 hrs, Volume= 2.831 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	40,216	98	
	850,939	79	Woods, Fair, HSG D
	156,804	77	Brush, Fair, HSG D
	1,047,959	79	Weighted Average
	1,007,743		96.16% Pervious Area
	40,216		3.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.7	125	0.0560	0.12		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	125	0.1440	1.90		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
14.3	899	0.0100	1.05	6.30	**Trap/Vee/Rect Channel Flow, C to D (reach 8AR2)** Bot.W=10.00' D=0.50' Z= 4.0 '/' Top.W=14.00' n= 0.080
3.8	647	0.0150	2.80	1,497.17	**Trap/Vee/Rect Channel Flow, D to E (Reach 8AR4)** Bot.W=255.00' D=2.00' Z= 4.8 & 7.3 '/' Top.W=279.20' n= 0.100
35.9	1,796	Total			

Summary for Subcatchment 8.2AS:

Runoff = 1.15 cfs @ 12.43 hrs, Volume= 0.145 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	5,384	98	
	30,146	77	Woods, Good, HSG D
	20,761	73	Brush, Good, HSG D
	56,291	78	Weighted Average
	50,907		90.44% Pervious Area
	5,384		9.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0200	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"

Summary for Subcatchment 8.2BS:

Runoff = 1.82 cfs @ 12.42 hrs, Volume= 0.231 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	4	98	
	91,507	77	Woods, Good, HSG D
	2,378	73	Brush, Good, HSG D
	93,889	77	Weighted Average
	93,885		100.00% Pervious Area
	4		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	112	0.0270	0.09		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.2	95	0.0740	1.36		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
7.1	165	0.0060	0.39		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
28.8	372	Total			

Summary for Subcatchment 8.2CS:

Runoff = 1.85 cfs @ 12.53 hrs, Volume= 0.263 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	12,392	98	
	59,368	77	Woods, Good, HSG D
	30,241	73	Brush, Good, HSG D
	102,001	78	Weighted Average
	89,609		87.85% Pervious Area
	12,392		12.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	90	0.0700	0.07		**Sheet Flow, A t oB** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.8	105	0.0380	0.97		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
14.8	280	0.0040	0.32		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
37.1	475	Total			

Summary for Subcatchment 8.3AS:

Runoff = 2.21 cfs @ 12.38 hrs, Volume= 0.264 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	15,142	98	
	58,308	77	Woods, Good, HSG D
	19,987	73	Brush, Good, HSG D
	93,437	80	Weighted Average
	78,295		83.79% Pervious Area
	15,142		16.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	150	0.0400	0.11		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
3.9	270	0.0520	1.14		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
26.1	420	Total			

Summary for Subcatchment 8.3BS:

Runoff = 0.83 cfs @ 12.67 hrs, Volume= 0.131 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	3,710	98	
	41,240	77	Woods, Good, HSG D
	5,720	73	Brush, Good, HSG D
	50,670	78	Weighted Average
	46,960		92.68% Pervious Area
	3,710		7.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.1	135	0.0220	0.05		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"

Summary for Subcatchment 8.3CS:

Runoff = 2.07 cfs @ 13.15 hrs, Volume= 0.476 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	0	98	
	169,677	77	Woods, Good, HSG D
	24,095	73	Brush, Good, HSG D
	193,772	77	Weighted Average
	193,772		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.9	150	0.0700	0.08		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.4	35	0.1100	1.66		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
1.4	70	0.0280	0.84		**Shallow Concentrated Flow, C t oD** Woodland Kv= 5.0 fps
0.4	35	0.1100	1.66		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
5.7	90	0.0110	0.26		**Shallow Concentrated Flow, E to F** Forest w/Heavy Litter Kv= 2.5 fps
1.1	85	0.0700	1.32		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
26.4	250	0.0040	0.16		**Shallow Concentrated Flow, G to H** Forest w/Heavy Litter Kv= 2.5 fps
6.0	133	0.0220	0.37		**Shallow Concentrated Flow, H to I** Forest w/Heavy Litter Kv= 2.5 fps
11.6	191	0.0030	0.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
83.9	1,039	Total			

Summary for Subcatchment 8.4AS:

Runoff = 2.23 cfs @ 12.19 hrs, Volume= 0.201 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	14,400	98	
	35,974	77	Woods, Good, HSG D
	20,821	73	Brush, Good, HSG D
	71,195	80	Weighted Average
	56,795		79.77% Pervious Area
	14,400		20.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	56	0.0540	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
0.7	94	0.0200	2.12		**Shallow Concentrated Flow, C to D** Grassed Waterway Kv= 15.0 fps
0.2	30	0.2700	2.60		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
2.2	30	0.0020	0.22		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
13.2	260	Total			

Summary for Subcatchment 8.4BS:

Runoff = 1.36 cfs @ 12.61 hrs, Volume= 0.211 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	642	98	
	84,672	77	Woods, Good, HSG D
	658	73	Brush, Good, HSG D
	85,972	77	Weighted Average
	85,330		99.25% Pervious Area
	642		0.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.8	60	0.0160	0.04		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
2.8	106	0.0660	0.64		**Shallow Concentrated Flow, B to C** Forest w/Heavy Litter Kv= 2.5 fps
6.7	170	0.0290	0.43		**Shallow Concentrated Flow, C to D** Forest w/Heavy Litter Kv= 2.5 fps
7.5	170	0.0230	0.38		**Shallow Concentrated Flow, D to E** Forest w/Heavy Litter Kv= 2.5 fps
43.8	506	Total			

Summary for Subcatchment 8.4CS:

Runoff = 1.98 cfs @ 12.59 hrs, Volume= 0.295 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	9,964	98	
	61,261	77	Woods, Good, HSG D
	48,988	73	Brush, Good, HSG D
	120,213	77	Weighted Average
	110,249		91.71% Pervious Area
	9,964		8.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.8	95	0.0100	0.06		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
4.1	145	0.0140	0.59		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
9.3	125	0.0020	0.22		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
40.2	365	Total			

Summary for Subcatchment 8.5AS:

Runoff = 3.10 cfs @ 12.25 hrs, Volume= 0.319 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	7,422	98	
	95,282	77	Woods, Good, HSG D
	27,137	73	Brush, Good, HSG D
	129,841	77	Weighted Average
	122,419		94.28% Pervious Area
	7,422		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	80	0.0250	0.08		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.3	70	0.0300	0.87		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	150	Total			

Summary for Subcatchment 8.5BS:

Runoff = 1.98 cfs @ 12.69 hrs, Volume= 0.321 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	4,759	98	
	111,701	77	Woods, Good, HSG D
	8,211	73	Brush, Good, HSG D
	124,671	78	Weighted Average
	119,912		96.18% Pervious Area
	4,759		3.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	65	0.0150	0.04		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
3.7	115	0.0430	0.52		**Shallow Concentrated Flow, B to C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	95	0.1360	0.92		**Shallow Concentrated Flow, C to D** Forest w/Heavy Litter Kv= 2.5 fps
9.4	240	0.0290	0.43		**Shallow Concentrated Flow, D t oE** Forest w/Heavy Litter Kv= 2.5 fps
1.1	80	0.0625	1.25		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
2.6	122	0.0240	0.77		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
47.8	717	Total			

Summary for Subcatchment 8.5CS:

Runoff = 2.26 cfs @ 12.50 hrs, Volume= 0.312 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	16,201	98	
	68,051	77	Woods, Good, HSG D
	31,334	73	Brush, Good, HSG D
	115,586	79	Weighted Average
	99,385		85.98% Pervious Area
	16,201		14.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	35	0.0140	0.03		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"
0.8	30	0.0600	0.61		**Shallow Concentrated Flow, B to C** Forest w/Heavy Litter Kv= 2.5 fps
1.4	70	0.0290	0.85		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
4.8	80	0.0125	0.28		**Shallow Concentrated Flow, C to D** Forest w/Heavy Litter Kv= 2.5 fps
10.4	70	0.0020	0.11		**Shallow Concentrated Flow, D to E** Forest w/Heavy Litter Kv= 2.5 fps
35.7	285	Total			

Summary for Subcatchment 8.6AS:

Runoff = 1.48 cfs @ 12.40 hrs, Volume= 0.181 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	10,048	98	
	49,320	77	Woods, Good, HSG D
	4,522	73	Brush, Good, HSG D
	63,890	80	Weighted Average
	53,842		84.27% Pervious Area
	10,048		15.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0100	0.05		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
2.7	140	0.0290	0.85		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
7.7	180	0.0060	0.39		**Shallow Concentrated Flow, C tO d** Woodland Kv= 5.0 fps
0.9	75	0.0800	1.41		**Shallow Concentrated Flow, D to E** Woodland Kv= 5.0 fps
27.3	445	Total			

Summary for Subcatchment 8.6BS: Non Contributing Area

Runoff = 5.86 cfs @ 12.59 hrs, Volume= 0.870 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	52,822	98	
	189,735	77	Woods, Good, HSG D
	64,723	73	Brush, Good, HSG D
	307,280	80	Weighted Average
	254,458		82.81% Pervious Area
	52,822		17.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
1.8	60	0.0125	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.7	95	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	90	0.0550	0.59		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
13.3	155	0.0060	0.19		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
41.5	450	Total			

Summary for Subcatchment 8.6CS:

Runoff = 5.55 cfs @ 12.83 hrs, Volume= 1.032 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	5,284	98	
	402,314	77	Woods, Good, HSG D
	12,425	73	Brush, Good, HSG D
	420,023	77	Weighted Average
	414,739		98.74% Pervious Area
	5,284		1.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.4	105	0.0190	0.08		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	60	0.0330	0.91		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
0.3	45	0.2900	2.69		**Shallow Concentrated Flow, C to D** Woodland Kv= 5.0 fps
9.0	195	0.0210	0.36		**Shallow Concentrated Flow, D to E** Forest w/Heavy Litter Kv= 2.5 fps
12.4	235	0.0040	0.32		**Shallow Concentrated Flow, E to F** Woodland Kv= 5.0 fps
14.3	235	0.0030	0.27		**Shallow Concentrated Flow, F to G** Woodland Kv= 5.0 fps
59.5	875	Total			

Summary for Subcatchment 8.7CS:

Runoff = 0.66 cfs @ 12.36 hrs, Volume= 0.079 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	0	98	
	21,110	77	Woods, Good, HSG D
	12,545	73	Brush, Good, HSG D
	33,655	76	Weighted Average
	33,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	135	0.1030	0.09		**Sheet Flow, A to B** Woods: Dense underbrush n= 0.800 P2= 3.30"

Summary for Subcatchment 80S: 350+00 TO 352+50 RIGHT

Runoff = 0.77 cfs @ 12.08 hrs, Volume= 0.061 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	10,434	98	Paved 350+00 - 3352+50
	10,434		100.00% Impervious Area

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

Summary for Subcatchment 81S: Combined 81S and 82S

Runoff = 3.87 cfs @ 12.08 hrs, Volume= 0.296 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	21,381	98	PAVED
*	6,742	98	PAVED
	5,900	80	>75% Grass cover, Good, HSG D
*	20,377	98	PAVED- 82S
	54,400	96	Weighted Average
	5,900		10.85% Pervious Area
	48,500		89.15% Impervious Area

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

Summary for Subcatchment 83S: 346+40 TO 350+00 RIGHT

Runoff = 2.60 cfs @ 12.09 hrs, Volume= 0.190 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	15,462	98	Paved 346+50 - 350+00
*	11,862	98	paved
	13,250	80	>75% Grass cover, Good, HSG D
	40,574	92	Weighted Average
	13,250		32.66% Pervious Area
	27,324		67.34% Impervious Area

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

Summary for Subcatchment 84S: 346+40 TO 350+00 CENTER

Runoff = 1.30 cfs @ 12.08 hrs, Volume= 0.104 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	17,680	98	Paved 346+50 - 350+00
	17,680		100.00% Impervious Area

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

Summary for Subcatchment 85S: 344+00 TO 350+00 LEFT

Runoff = 1.34 cfs @ 12.08 hrs, Volume= 0.107 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	18,205	98	Paved 346+50 - 350+00
	18,205		100.00% Impervious Area

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

Summary for Subcatchment 90S: Combined 90S and 92S

Runoff = 3.80 cfs @ 12.07 hrs, Volume= 0.292 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	48,484	98	Paved 90S 354+35 - 359+60
*	1,360	98	Paved 92S 360+00 to 360+00
	49,844	98	Weighted Average
	49,844		100.00% Impervious Area

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

Summary for Subcatchment 91S: 360+00 TO 360+00 LEFT

Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,433	98	
	1,433		100.00% Impervious Area

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

Summary for Subcatchment 100S: 364+00 TO 370+00 CENTER

Runoff = 2.39 cfs @ 12.07 hrs, Volume= 0.184 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	31,359	98	PAVED
	0	84	50-75% Grass cover, Fair, HSG D
	31,359	98	Weighted Average
	31,359		100.00% Impervious Area

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

Summary for Subcatchment 110S: Combined 110S, 112S and 113S

Runoff = 5.33 cfs @ 12.07 hrs, Volume= 0.410 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	69,921	98	PAVED CENTER
	0	84	50-75% Grass cover, Fair, HSG D
	69,921	98	Weighted Average
	69,921		100.00% Impervious Area

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

Summary for Subcatchment 111S: 375+50 TO 375+50 LEFT

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 0.005 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	867	98	
	867		100.00% Impervious Area

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

Summary for Subcatchment 113S: 113S

Runoff = 1.33 cfs @ 12.07 hrs, Volume= 0.103 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	17,505	98	PAVED
	17,505		100.00% Impervious Area

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

Summary for Subcatchment 800S: YWD Pond EAST SIDE

Runoff = 20.14 cfs @ 12.67 hrs, Volume= 3.255 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	61,279	98	Pavement
	79,827	73	Brush, Good, HSG D
	1,121,797	77	Woods, Good, HSG D
	1,262,903	78	Weighted Average
	1,201,624		95.15% Pervious Area
	61,279		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	300	0.0900	0.18		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
4.3	91	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.9	328	0.0640	6.39	44.70	**Channel Flow, C-D** Area= 7.0 sf Perim= 12.5' r= 0.56' n= 0.040 Winding stream, pools & shoals
4.9	168		0.57		**Lake or Reservoir, D-E** Mean Depth= 0.01'
0.4	28	0.0200	1.08		**Sheet Flow, E-F** Smooth surfaces n= 0.011 P2= 3.30"
7.2	244		0.57		**Lake or Reservoir, F-G** Mean Depth= 0.01'
2.1	191	0.0050	1.52	33.43	**Channel Flow, G-H** Area= 22.0 sf Perim= 50.0' r= 0.44' n= 0.040 Winding stream, pools & shoals
47.7	1,350	Total			

Summary for Subcatchment 1000S: 1000S

Runoff = 8.52 cfs @ 12.36 hrs, Volume= 1.005 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	26,097	98	PAVED
	36,572	73	Brush, Good, HSG D
	327,251	77	Woods, Good, HSG D
	389,920	78	Weighted Average
	363,823		93.31% Pervious Area
	26,097		6.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	244	0.1350	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	100	0.2700	2.60		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	144	0.2010	2.24		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.4	42	0.1480	1.92		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.4	61	0.0050	2.30	82.73	**Channel Flow, E-F** Area= 36.0 sf Perim= 44.0' r= 0.82' n= 0.040 Winding stream, pools & shoals
2.1	271	0.0050	2.15	25.77	**Channel Flow, F-G** Area= 12.0 sf Perim= 25.0' r= 0.48' n= 0.030 Stream, clean & straight
24.7	862	Total			

Summary for Subcatchment C8AS:

Runoff = 25.67 cfs @ 12.69 hrs, Volume= 4.231 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	88,039	98	
	1,189,371	79	Woods, Fair, HSG D
	217,732	77	Brush, Fair, HSG D
	1,495,142	80	Weighted Average
	1,407,103		94.11% Pervious Area
	88,039		5.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.1	167	0.0120	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	31	0.0968	1.56		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	250	0.0240	3.63	18.13	**Channel Flow, C-D** Area= 5.0 sf Perim= 10.0' r= 0.50' n= 0.040 Mountain streams
0.3	133	0.0977	7.25	29.02	**Channel Flow, D-E** Area= 4.0 sf Perim= 8.1' r= 0.49' n= 0.040 Mountain streams
0.0	40	0.0500	59.66	8,948.44	**Channel Flow, E-F** Area= 150.0 sf Perim= 12.0' r= 12.50' n= 0.030 Earth, grassed & winding
9.5	1,025		1.79		**Lake or Reservoir, F-G** Mean Depth= 0.10'
50.3	1,646	Total			

Summary for Subcatchment C8BS:

Runoff = 21.51 cfs @ 12.71 hrs, Volume= 3.511 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	96,194	98	
	1,023,625	77	Woods, Good, HSG D
	242,692	73	Brush, Good, HSG D
	1,362,511	78	Weighted Average
	1,266,317		92.94% Pervious Area
	96,194		7.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	90	0.0220	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"
2.9	211	0.0569	1.19		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.7	293	0.0034	0.29		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
6.3	153	0.0065	0.40		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
0.1	31	0.0050	3.64	6.44	**Pipe Channel, H-I** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.4	144	0.0347	5.81	58.13	**Channel Flow, I-J** Area= 10.0 sf Perim= 20.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	24	0.0050	3.64	6.44	**Pipe Channel, J-K** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.1	63	0.0635	7.86	39.32	**Channel Flow, K-L** Area= 5.0 sf Perim= 10.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	23	0.0050	3.64	6.44	**Pipe Channel, L-M** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.7	180	0.0194	4.35	23.90	**Channel Flow, M-N** Area= 5.5 sf Perim= 11.0' r= 0.50' n= 0.030 Earth, grassed & winding
0.1	41	0.0300	8.92	15.77	**Pipe Channel, N-O** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
1.4	115	0.0087	1.40		**Shallow Concentrated Flow, O-P** Grassed Waterway Kv= 15.0 fps
0.2	65	0.0154	6.39	11.30	**Pipe Channel, P-Q** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.015
0.5	171	0.0292	5.33	16.00	**Channel Flow, Q-R** Area= 3.0 sf Perim= 6.0' r= 0.50' n= 0.030 Earth, grassed & winding
48.3	1,604	Total			

Summary for Subcatchment C8CS: 375+00

Runoff = 54.60 cfs @ 12.60 hrs, Volume= 8.363 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (sf)	CN	Description
*	312,157	98	
	2,468,060	77	Woods, Good, HSG D
	464,862	73	Brush, Good, HSG D
	3,245,079	78	Weighted Average
	2,932,922		90.38% Pervious Area
	312,157		9.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	75	0.0450	0.15		**Sheet Flow, A to B** Grass: Dense n= 0.240 P2= 3.30"
5.3	313	0.0383	0.98		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
2.3	133	0.0376	0.97		**Shallow Concentrated Flow, G-H** Woodland Kv= 5.0 fps
5.2	538	0.0130	1.71		**Shallow Concentrated Flow, H-I** Grassed Waterway Kv= 15.0 fps
1.6	182	0.0166	1.93		**Shallow Concentrated Flow, I-J** Grassed Waterway Kv= 15.0 fps
2.2	119	0.0336	0.92		**Shallow Concentrated Flow, J-K** Woodland Kv= 5.0 fps
1.8	136	0.0662	1.29		**Shallow Concentrated Flow, K-L** Woodland Kv= 5.0 fps
4.3	197	0.0228	0.75		**Shallow Concentrated Flow, L-M** Woodland Kv= 5.0 fps
12.3	929	0.0070	1.25		**Shallow Concentrated Flow, M-N** Grassed Waterway Kv= 15.0 fps
43.1	2,622	Total			

Summary for Reach 4R: OUTLET PIPE

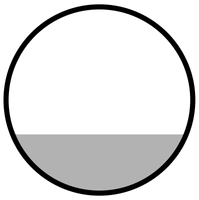
[52] Hint: Inlet/Outlet conditions not evaluated
[79] Warning: Submerged Pond UDF8P Primary device # 1 OUTLET by 0.09'
[79] Warning: Submerged Pond UDF9P Primary device # 1 INLET by 0.34'

Inflow Area = 3.244 ac, 86.45% Impervious, Inflow Depth = 2.73" for 02-YR event
Inflow = 3.94 cfs @ 12.21 hrs, Volume= 0.737 af
Outflow = 3.94 cfs @ 12.21 hrs, Volume= 0.737 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.27 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.86 fps, Avg. Travel Time= 0.3 min

Peak Storage= 24 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 18.35 cfs

18.0" Round Pipe
n= 0.012
Length= 50.0' Slope= 0.0260 '/'
Inlet Invert= 141.30', Outlet Invert= 140.00'



Summary for Reach 8.1BR1:

Inflow Area = 1.657 ac, 1.67% Impervious, Inflow Depth = 0.43" for 02-YR event
Inflow = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af
Outflow = 0.15 cfs @ 15.70 hrs, Volume= 0.059 af, Atten= 2%, Lag= 24.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.27 fps, Avg. Travel Time= 17.7 min

Peak Storage= 103 cf @ 15.50 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 100.71 cfs

6.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 5.0 '/' Top Width= 26.00'
Length= 286.0' Slope= 0.0500 '/'
Inlet Invert= 202.45', Outlet Invert= 188.16'

‡

Summary for Reach 8.1BR2:

Inflow Area = 6.793 ac, 2.92% Impervious, Inflow Depth = 0.39" for 02-YR event
Inflow = 0.59 cfs @ 13.16 hrs, Volume= 0.220 af
Outflow = 0.45 cfs @ 14.22 hrs, Volume= 0.220 af, Atten= 24%, Lag= 63.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 31.3 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 70.1 min

Peak Storage= 839 cf @ 13.70 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.50' Flow Area= 33.8 sf, Capacity= 36.13 cfs

15.00' x 1.50' deep channel, n= 0.100
Side Slope Z-value= 5.0 '/' Top Width= 30.00'
Length= 445.0' Slope= 0.0045 '/'
Inlet Invert= 187.00', Outlet Invert= 185.00'

‡

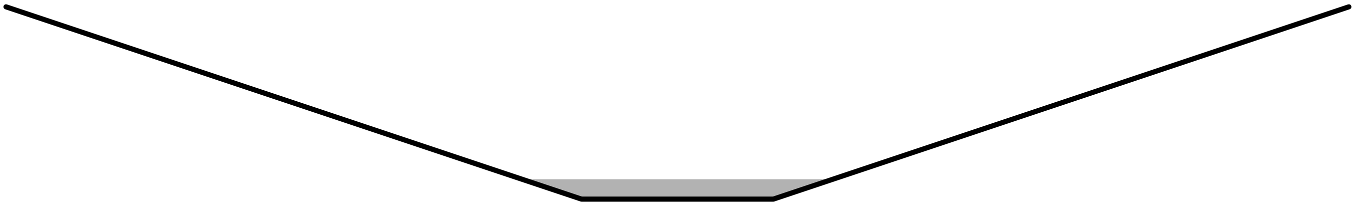
Summary for Reach 8.1BR3:

Inflow Area =	7.957 ac,	3.56% Impervious, Inflow Depth =	0.53"	for 02-YR event
Inflow =	0.83 cfs @	12.68 hrs, Volume=	0.351 af	
Outflow =	0.82 cfs @	12.79 hrs, Volume=	0.351 af, Atten= 1%, Lag= 6.6 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 9.2 min

Peak Storage= 203 cf @ 12.72 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 85.66 cfs

2.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 374.0' Slope= 0.0289 '/'
Inlet Invert= 183.79', Outlet Invert= 173.00'



Summary for Reach 8.1BR4:

Inflow Area =	9.930 ac,	3.00% Impervious, Inflow Depth =	0.67"	for 02-YR event
Inflow =	2.14 cfs @	12.71 hrs, Volume=	0.556 af	
Outflow =	2.14 cfs @	12.76 hrs, Volume=	0.556 af, Atten= 0%, Lag= 2.8 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.63 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 5.2 min

Peak Storage= 225 cf @ 12.73 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.50' Flow Area= 12.8 sf, Capacity= 53.25 cfs

4.00' x 1.50' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 171.0' Slope= 0.0213 '/'
Inlet Invert= 171.64', Outlet Invert= 168.00'

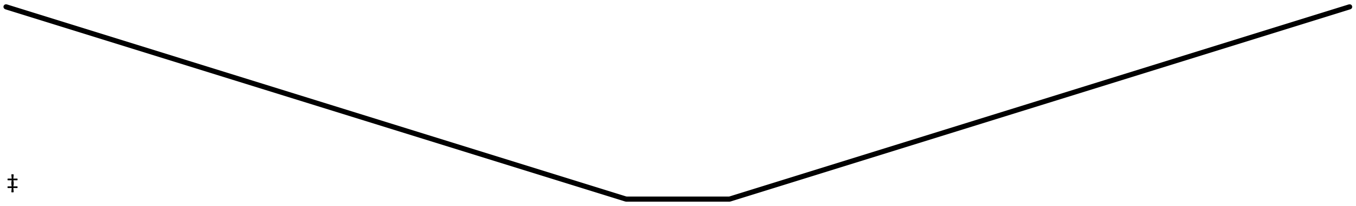
Summary for Reach 8.2AR1:

Inflow Area = 1.292 ac, 9.56% Impervious, Inflow Depth = 0.00" for 02-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 42.0 sf, Capacity= 82.07 cfs

2.00' x 3.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 330.0' Slope= 0.0061 '/'
Inlet Invert= 212.50', Outlet Invert= 210.50'



Summary for Reach 8.2BR1:

Inflow Area = 5.136 ac, 3.32% Impervious, Inflow Depth = 0.38" for 02-YR event
Inflow = 0.59 cfs @ 13.06 hrs, Volume= 0.161 af
Outflow = 0.59 cfs @ 13.16 hrs, Volume= 0.161 af, Atten= 0%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.82 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 7.4 min

Peak Storage= 120 cf @ 13.11 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 82.21 cfs

4.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 166.0' Slope= 0.0620 '/'
Inlet Invert= 198.45', Outlet Invert= 188.16'

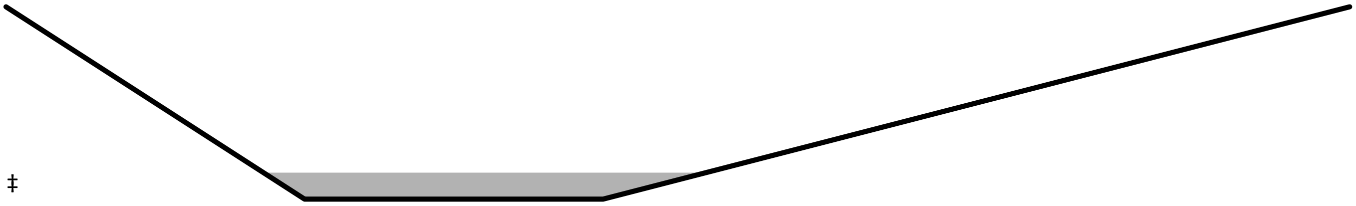
Summary for Reach 8.3AR1:

Inflow Area =	7.860 ac, 18.05% Impervious, Inflow Depth = 0.25" for 02-YR event		
Inflow =	1.48 cfs @ 12.66 hrs, Volume=	0.165 af	
Outflow =	1.24 cfs @ 12.82 hrs, Volume=	0.165 af, Atten= 16%, Lag= 9.8 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.91 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 10.3 min

Peak Storage= 314 cf @ 12.75 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 60.12 cfs

4.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 2.0 5.0 '/' Top Width= 18.00'
Length= 230.0' Slope= 0.0391 '/'
Inlet Invert= 194.00', Outlet Invert= 185.00'



Summary for Reach 8.3CR1:

```
Inflow Area =       4.448 ac,    0.00% Impervious,  Inflow Depth =   0.48"    for  02-YR event
Inflow      =        0.48 cfs @   15.61 hrs,  Volume=           0.178 af
Outflow     =        0.46 cfs @   16.19 hrs,  Volume=           0.178 af,  Atten= 5%,  Lag= 34.9 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 16.1 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 29.6 min

Peak Storage= 443 cf @ 15.92 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 68.10 cfs

20.00' x 1.00' deep channel, n= 0.120
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 384.0' Slope= 0.0495 '/'
Inlet Invert= 154.00', Outlet Invert= 135.00'

Summary for Reach 8.4CR1:

```
Inflow Area =       2.760 ac,    8.29% Impervious,  Inflow Depth =   0.00"    for  02-YR event
Inflow      =        0.00 cfs @    0.00 hrs,  Volume=           0.000 af
Outflow     =        0.00 cfs @    0.00 hrs,  Volume=           0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 48.77 cfs

5.00' x 2.00' deep channel, n= 0.120
Side Slope Z-value= 4.0 '/' Top Width= 21.00'
Length= 1,438.0' Slope= 0.0178 '/'
Inlet Invert= 160.60', Outlet Invert= 135.00'

Summary for Reach 8.6CR1:

```
Inflow Area =         10.415 ac,    1.16% Impervious,  Inflow Depth =   0.63"    for  02-YR event
Inflow       =           1.36 cfs @   14.80 hrs,  Volume=             0.544 af
Outflow      =           1.36 cfs @   14.98 hrs,  Volume=             0.544 af,  Atten= 0%,  Lag= 10.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 15.3 min

Peak Storage= 504 cf @ 14.87 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 30.58 cfs

5.00' x 1.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 482.0' Slope= 0.0560 '/'
Inlet Invert= 156.00', Outlet Invert= 129.00'

Summary for Reach 68R: Null Node

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow Area =         39.184 ac,  15.82% Impervious,  Inflow Depth =   1.64"    for  02-YR event
Inflow       =         43.23 cfs @   12.28 hrs,  Volume=             5.340 af
Outflow      =         43.23 cfs @   12.28 hrs,  Volume=             5.340 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Summary for Reach C6R1:

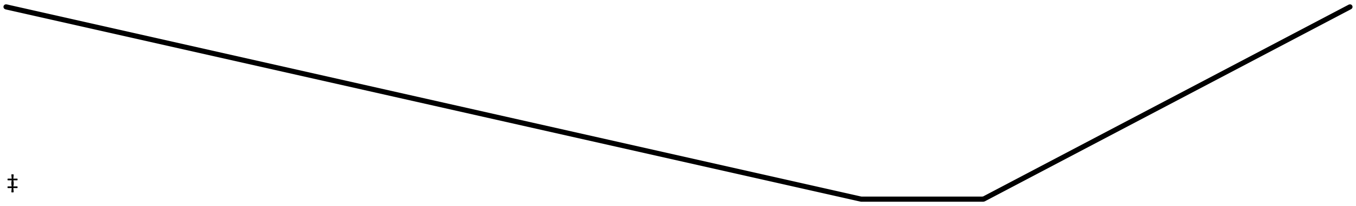
[79] Warning: Submerged Pond C6P Secondary device # 2 OUTLET by 2.13'

```
Inflow       =           0.00 cfs @    0.00 hrs,  Volume=             0.000 af
Outflow      =           0.00 cfs @    0.00 hrs,  Volume=             0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 189.62 cfs

2.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 7.0 3.0 '/' Top Width= 22.00'
Length= 338.0' Slope= 0.0414 '/'
Inlet Invert= 139.00', Outlet Invert= 125.00'



Summary for Reach C8AR1:

Inflow Area =	43.650 ac,	8.41% Impervious, Inflow Depth = 1.25"	for 02-YR event
Inflow =	4.57 cfs @	14.80 hrs, Volume=	4.555 af
Outflow =	4.57 cfs @	14.85 hrs, Volume=	4.555 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.10 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 1.9 min

Peak Storage= 447 cf @ 14.82 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 10.00' Flow Area= 680.0 sf, Capacity= 9,842.09 cfs

33.00' x 10.00' deep channel, n= 0.100
Side Slope Z-value= 3.0 4.0 '/' Top Width= 103.00'
Length= 107.5' Slope= 0.0794 '/'
Inlet Invert= 179.54', Outlet Invert= 171.00'

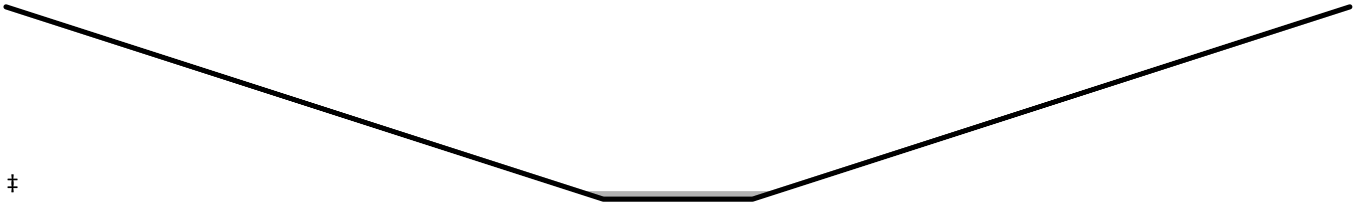
Summary for Reach C8AR2:

Inflow Area =	43.650 ac,	8.41% Impervious, Inflow Depth = 1.25"	for 02-YR event
Inflow =	4.57 cfs @	14.85 hrs, Volume=	4.555 af
Outflow =	4.56 cfs @	15.26 hrs, Volume=	4.555 af, Atten= 0%, Lag= 24.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 22.9 min

Peak Storage= 3,932 cf @ 15.02 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 10.00' Flow Area= 500.0 sf, Capacity= 2,843.62 cfs

10.00' x 10.00' deep channel, n= 0.080
Side Slope Z-value= 4.0 '/' Top Width= 90.00'
Length= 810.0' Slope= 0.0099 '/'
Inlet Invert= 170.00', Outlet Invert= 162.00'



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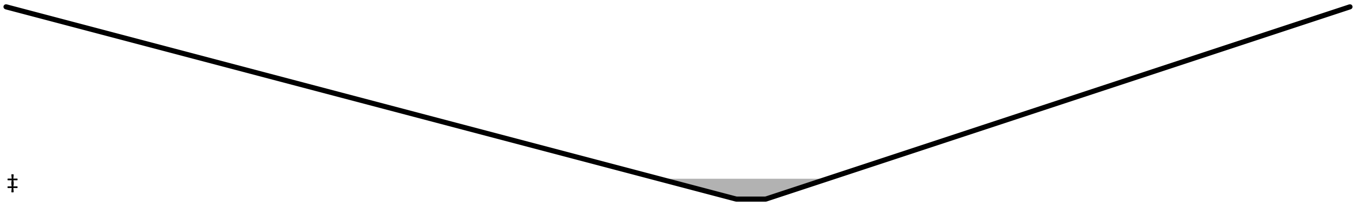
Summary for Reach C8AR3:

Inflow Area = 43.650 ac, 8.41% Impervious, Inflow Depth = 1.25" for 02-YR event
Inflow = 4.56 cfs @ 15.26 hrs, Volume= 4.555 af
Outflow = 4.56 cfs @ 15.26 hrs, Volume= 4.555 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 0.2 min

Peak Storage= 40 cf @ 15.26 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 5.00' Flow Area= 117.5 sf, Capacity= 1,210.27 cfs

1.00' x 5.00' deep channel, n= 0.080
Side Slope Z-value= 5.0 4.0 '/' Top Width= 46.00'
Length= 22.0' Slope= 0.0909 '/'
Inlet Invert= 161.00', Outlet Invert= 159.00'



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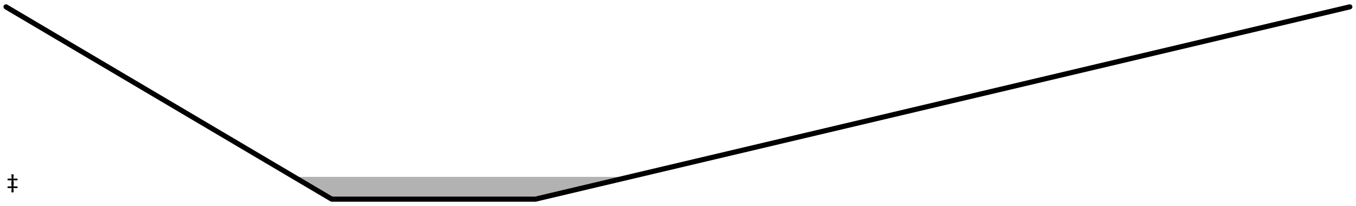
Summary for Reach C8AR6:

Inflow Area = 67.708 ac, 6.78% Impervious, Inflow Depth = 0.59" for 02-YR event
Inflow = 4.68 cfs @ 19.57 hrs, Volume= 3.342 af
Outflow = 4.68 cfs @ 19.83 hrs, Volume= 3.342 af, Atten= 0%, Lag= 16.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 18.6 min

Peak Storage= 2,533 cf @ 19.68 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 4.00' Flow Area= 76.0 sf, Capacity= 382.10 cfs

5.00' x 4.00' deep channel, n= 0.080
Side Slope Z-value= 2.0 5.0 '/' Top Width= 33.00'
Length= 822.0' Slope= 0.0254 '/'
Inlet Invert= 155.88', Outlet Invert= 135.00'



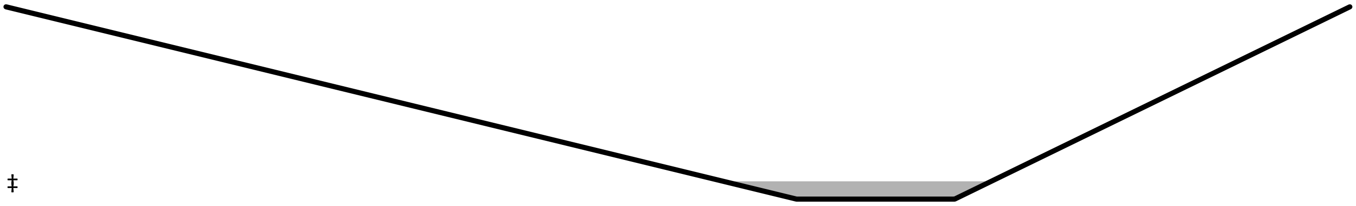
Summary for Reach C8AR7:

Inflow Area = 123.862 ac, 7.36% Impervious, Inflow Depth > 0.73" for 02-YR event
Inflow = 7.79 cfs @ 19.00 hrs, Volume= 7.505 af
Outflow = 7.70 cfs @ 19.68 hrs, Volume= 7.504 af, Atten= 1%, Lag= 41.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.62 fps, Min. Travel Time= 22.4 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 46.2 min

Peak Storage= 10,340 cf @ 19.31 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 5.00' Flow Area= 475.0 sf, Capacity= 1,134.27 cfs

20.00' x 5.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 20.0 10.0 '/' Top Width= 170.00'
Length= 831.0' Slope= 0.0042 '/'
Inlet Invert= 132.50', Outlet Invert= 129.00'



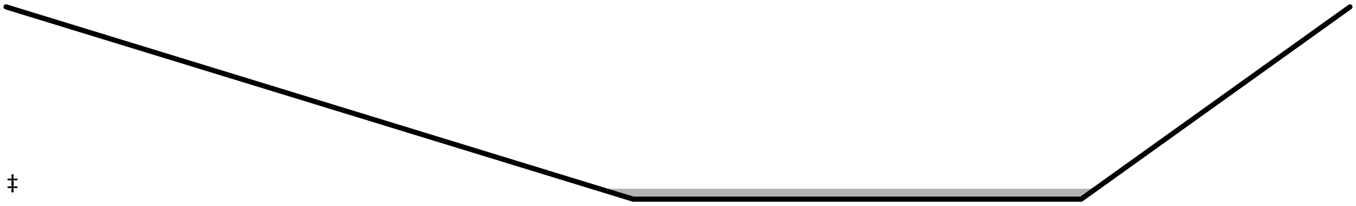
Summary for Reach C8BR1:

Inflow Area = 53.779 ac, 7.81% Impervious, Inflow Depth > 0.93" for 02-YR event
Inflow = 7.14 cfs @ 13.73 hrs, Volume= 4.155 af
Outflow = 7.14 cfs @ 13.76 hrs, Volume= 4.155 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.77 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 2.0 min

Peak Storage= 412 cf @ 13.74 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 3.00' Flow Area= 90.0 sf, Capacity= 1,356.35 cfs

15.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 3.0 '/' Top Width= 45.00'
Length= 160.0' Slope= 0.0375 '/'
Inlet Invert= 160.00', Outlet Invert= 154.00'



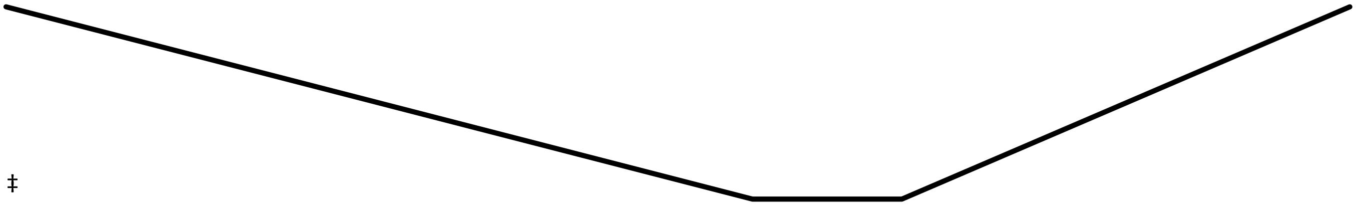
Summary for Reach C8BR2:

Inflow Area = 53.779 ac, 7.81% Impervious, Inflow Depth > 0.93" for 02-YR event
Inflow = 7.14 cfs @ 13.76 hrs, Volume= 4.155 af
Outflow = 7.14 cfs @ 13.76 hrs, Volume= 4.155 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.78 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.74 fps, Avg. Travel Time= 0.1 min

Peak Storage= 46 cf @ 13.76 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 10.00' Flow Area= 500.0 sf, Capacity= 26,509.48 cfs

10.00' x 10.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 5.0 3.0 '/' Top Width= 90.00'
Length= 31.0' Slope= 0.1210 '/'
Inlet Invert= 153.75', Outlet Invert= 150.00'



Summary for Reach C8BR3:

Inflow Area = 53.779 ac, 7.81% Impervious, Inflow Depth > 0.93" for 02-YR event
Inflow = 7.14 cfs @ 13.76 hrs, Volume= 4.155 af
Outflow = 7.13 cfs @ 14.11 hrs, Volume= 4.155 af, Atten= 0%, Lag= 20.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.46 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 9.0 min

Peak Storage= 3,846 cf @ 13.96 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 10.00' Flow Area= 1,650.0 sf, Capacity= 41,604.45 cfs

100.00' x 10.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 7.0 6.0 '/' Top Width= 230.00'
Length= 788.0' Slope= 0.0189 '/'
Inlet Invert= 149.89', Outlet Invert= 135.00'

‡

Summary for Reach SP1000: POA STA380+00

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,387.312 ac, 8.02% Impervious, Inflow Depth > 1.04" for 02-YR event
Inflow = 127.63 cfs @ 12.55 hrs, Volume= 206.914 af
Outflow = 127.63 cfs @ 12.55 hrs, Volume= 206.914 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Summary for Pond 8.1AP:

Inflow Area = 2.788 ac, 22.13% Impervious, Inflow Depth = 1.55" for 02-YR event
Inflow = 2.92 cfs @ 12.40 hrs, Volume= 0.360 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 207.72' @ 25.63 hrs Surf.Area= 11,025 sf Storage= 15,668 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	206.00'	64,483 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.00	7,624	339.0	0	0	7,624
207.00	9,226	361.0	8,412	8,412	8,898
208.00	11,778	413.0	10,476	18,888	12,125
209.00	14,330	449.0	13,033	31,922	14,631
210.00	16,588	464.0	15,445	47,367	15,813
211.00	17,650	499.0	17,116	64,483	18,538

Device	Routing	Invert	Outlet Devices
#1	Primary	210.00'	**22.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.1BP:

Inflow Area = 1.657 ac, 1.67% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 1.28 cfs @ 12.52 hrs, Volume= 0.177 af
Outflow = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af, Atten= 88%, Lag= 166.5 min
Primary = 0.15 cfs @ 15.29 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 203.03' @ 15.29 hrs Surf.Area= 5,186 sf Storage= 5,284 cf

Plug-Flow detention time= 372.5 min calculated for 0.059 af (34% of inflow)
Center-of-Mass det. time= 234.5 min (1,112.2 - 877.6)

Volume	Invert	Avail.Storage	Storage Description
#1	201.00'	11,928 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.00	400	0	0
202.00	2,390	1,395	1,395
203.00	5,085	3,738	5,133
204.00	8,505	6,795	11,928

Device	Routing	Invert	Outlet Devices
#1	Primary	203.00'	**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

Primary OutFlow Max=0.14 cfs @ 15.29 hrs HW=203.03' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 0.46 fps)

Summary for Pond 8.1CP:

Inflow Area = 67.708 ac, 6.78% Impervious, Inflow Depth = 1.31" for 02-YR event
Inflow = 21.80 cfs @ 12.53 hrs, Volume= 7.386 af
Outflow = 4.68 cfs @ 19.57 hrs, Volume= 3.342 af, Atten= 79%, Lag= 422.4 min
Primary = 4.68 cfs @ 19.57 hrs, Volume= 3.342 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 158.11' @ 19.57 hrs Surf.Area= 135,488 sf Storage= 190,518 cf

Plug-Flow detention time= 570.3 min calculated for 3.342 af (45% of inflow)
Center-of-Mass det. time= 321.5 min (1,380.7 - 1,059.3)

Volume	Invert	Avail.Storage	Storage Description
#1	156.40'	316,039 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.40	35,000	0	0
157.00	123,134	47,440	47,440
159.00	145,465	268,599	316,039

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**50.0' long x 25.0' 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

Primary OutFlow Max=4.65 cfs @ 19.57 hrs HW=158.11' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.65 cfs @ 0.87 fps)

Summary for Pond 8.2AP: Potentially Non-Contributing

Inflow Area = 1.292 ac, 9.56% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 1.15 cfs @ 12.43 hrs, Volume= 0.145 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 215.31' @ 25.64 hrs Surf.Area= 11,517 sf Storage= 6,319 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	214.00'	17,830 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
214.00	433	80.0	0	0	433
215.00	7,762	597.0	3,343	3,343	28,288
216.00	22,487	1,002.0	14,487	17,830	79,828

Device	Routing	Invert	Outlet Devices
#1	Primary	215.50'	**36.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=214.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.2BP:

Inflow Area = 5.136 ac, 3.32% Impervious, Inflow Depth = 0.55" for 02-YR event
Inflow = 1.82 cfs @ 12.42 hrs, Volume= 0.234 af
Outflow = 0.59 cfs @ 13.06 hrs, Volume= 0.161 af, Atten= 67%, Lag= 38.5 min
Primary = 0.59 cfs @ 13.06 hrs, Volume= 0.161 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 199.62' @ 13.06 hrs Surf.Area= 9,583 sf Storage= 4,309 cf

Plug-Flow detention time= 222.7 min calculated for 0.161 af (69% of inflow)
Center-of-Mass det. time= 111.3 min (991.9 - 880.6)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	28,064 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	200	0	0
199.00	2,250	613	613
200.00	13,986	8,118	8,731
201.00	24,680	19,333	28,064

Device	Routing	Invert	Outlet Devices
#1	Primary	199.50'	**5.0' long x 25.0' 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

Primary OutFlow Max=0.59 cfs @ 13.06 hrs HW=199.62' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 0.95 fps)

Summary for Pond 8.2CP:

```
Inflow Area =        2.342 ac, 12.15% Impervious, Inflow Depth =  1.35"   for 02-YR event
Inflow      =        1.85 cfs @  12.53 hrs, Volume=         0.263 af
Outflow     =        0.00 cfs @   0.00 hrs, Volume=         0.000 af, Atten= 100%, Lag= 0.0 min
Primary     =        0.00 cfs @   0.00 hrs, Volume=         0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 182.20' @ 26.14 hrs Surf.Area= 17,761 sf Storage= 11,450 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	181.00'	58,735 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
181.00	500	0	0
182.00	15,600	8,050	8,050
183.00	26,200	20,900	28,950
184.00	33,370	29,785	58,735

Device	Routing	Invert	Outlet Devices
#1	Primary	182.40'	**20.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.3AP:

```
Inflow Area =        7.860 ac, 18.05% Impervious, Inflow Depth =  0.40"   for 02-YR event
Inflow      =        2.21 cfs @  12.38 hrs, Volume=         0.264 af
Outflow     =        1.48 cfs @  12.66 hrs, Volume=         0.165 af, Atten= 33%, Lag= 16.6 min
Primary     =        1.48 cfs @  12.66 hrs, Volume=         0.165 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 200.54' @ 12.66 hrs Surf.Area= 3,413 sf Storage= 4,500 cf

Plug-Flow detention time= 191.9 min calculated for 0.164 af (62% of inflow)
Center-of-Mass det. time= 81.2 min (941.0 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	6,209 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
198.50	916	144.0	0	0	916
199.00	1,731	172.0	651	651	1,625
200.00	2,691	278.0	2,193	2,844	5,427
201.00	4,086	269.0	3,364	6,209	5,905

Device	Routing	Invert	Outlet Devices
#1	Primary	200.50'	**65.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.44 cfs @ 12.66 hrs HW=200.54' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 1.44 cfs @ 0.51 fps)

Summary for Pond 8.3BP:

Inflow Area = 1.163 ac, 7.32% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 0.83 cfs @ 12.67 hrs, Volume= 0.131 af
Outflow = 0.83 cfs @ 12.68 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.8 min
Primary = 0.83 cfs @ 12.68 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 201.61' @ 12.68 hrs Surf.Area= 5,736 sf Storage= 72 cf

Plug-Flow detention time= 1.5 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (885.2 - 883.8)

Volume	Invert	Avail.Storage	Storage Description
#1	201.60'	18,071 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.60	5,455	0	0
202.00	14,150	3,921	3,921
203.00	14,150	14,150	18,071

Device	Routing	Invert	Outlet Devices
#1	Primary	201.60'	**202.0' long x 50.0' 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

Primary OutFlow Max=0.80 cfs @ 12.68 hrs HW=201.61' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 0.30 fps)

Summary for Pond 8.3CP:

```
Inflow Area =       4.448 ac,   0.00% Impervious,  Inflow Depth =   1.28"    for  02-YR event
Inflow     =       2.07 cfs @   13.15 hrs,  Volume=          0.476 af
Outflow    =       0.48 cfs @   15.61 hrs,  Volume=          0.178 af,  Atten= 77%,  Lag= 147.7 min
Primary    =       0.48 cfs @   15.61 hrs,  Volume=          0.178 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 155.02' @ 15.61 hrs   Surf.Area= 20,021 sf   Storage= 13,410 cf

Plug-Flow detention time= 356.0 min calculated for 0.178 af (37% of inflow)
Center-of-Mass det. time= 211.7 min ( 1,134.7 - 922.9 )
```

Volume	Invert	Avail.Storage	Storage Description
#1	154.30'	34,473 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.30	17,065	0	0
155.00	19,950	12,955	12,955
156.00	23,085	21,518	34,473

Device	Routing	Invert	Outlet Devices
#1	Primary	155.00'	**50.0' long x 15.0' 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

```
Primary OutFlow  Max=0.46 cfs @ 15.61 hrs  HW=155.02'   (Free Discharge)
└─1=Broad-Crested Rectangular Weir  (Weir Controls 0.46 cfs @ 0.40 fps)
```

Summary for Pond 8.4AP:

```
Inflow Area =       2.927 ac,  15.52% Impervious,  Inflow Depth =   0.83"    for  02-YR event
Inflow     =       2.23 cfs @   12.19 hrs,  Volume=          0.201 af
Outflow    =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary    =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af
Secondary =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 207.46' @ 24.77 hrs   Surf.Area= 7,718 sf   Storage= 8,776 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	206.00'	54,709 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.00	4,077	240.0	0	0	4,077
207.00	6,895	338.0	5,425	5,425	8,594
208.00	8,749	385.0	7,804	13,228	11,322
209.00	12,565	552.0	10,600	23,828	23,783
210.00	16,428	882.0	14,453	38,281	61,448
211.00	16,428	882.0	16,428	54,709	62,330

Device	Routing	Invert	Outlet Devices
#1	Secondary	210.50'	**63.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63
#2	Primary	209.90'	**6.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=206.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.4BP:

Inflow Area = 1.974 ac, 0.75% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 1.36 cfs @ 12.61 hrs, Volume= 0.211 af
Outflow = 1.36 cfs @ 12.65 hrs, Volume= 0.206 af, Atten= 0%, Lag= 2.2 min
Primary = 1.36 cfs @ 12.65 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 182.39' @ 12.65 hrs Surf.Area= 1,584 sf Storage= 356 cf

Plug-Flow detention time= 21.5 min calculated for 0.206 af (97% of inflow)
Center-of-Mass det. time= 7.2 min (892.9 - 885.7)

Volume	Invert	Avail.Storage	Storage Description
#1	182.00'	6,770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
182.00	260	0	0
183.00	3,690	1,975	1,975
184.00	5,900	4,795	6,770

Device	Routing	Invert	Outlet Devices
#1	Primary	182.30'	**20.0' long x 50.0' 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

Primary OutFlow Max=1.35 cfs @ 12.65 hrs HW=182.39' (Free Discharge)
↑
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 1.35 cfs @ 0.79 fps)

Summary for Pond 8.4CP:

Inflow Area = 2.760 ac, 8.29% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 1.98 cfs @ 12.59 hrs, Volume= 0.295 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 161.45' @ 26.27 hrs Surf.Area= 37,975 sf Storage= 12,860 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	161.10'	81,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.10	34,950	0	0
162.00	42,670	34,929	34,929
163.00	50,000	46,335	81,264

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**30.0' long x 50.0' 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	Secondary	161.50'	**80.0' long x 50.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.10' (Free Discharge)
↑
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.10' (Free Discharge)
↑
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.5AP:

Inflow Area = 2.981 ac, 5.72% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 3.10 cfs @ 12.25 hrs, Volume= 0.319 af
Outflow = 0.05 cfs @ 24.14 hrs, Volume= 0.005 af, Atten= 98%, Lag= 713.3 min
Primary = 0.04 cfs @ 24.14 hrs, Volume= 0.004 af
Secondary = 0.02 cfs @ 24.14 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Peak Elev= 205.80' @ 24.14 hrs Surf.Area= 26,367 sf Storage= 13,744 cf

Plug-Flow detention time= 792.3 min calculated for 0.005 af (2% of inflow)
Center-of-Mass det. time= 591.7 min (1,453.1 - 861.3)

Volume	Invert	Avail.Storage	Storage Description
#1	205.20'	33,614 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
205.20	19,370	650.0	0	0	19,370
206.00	28,880	806.0	19,174	19,174	37,454
206.50	28,880	806.0	14,440	33,614	37,857

Device	Routing	Invert	Outlet Devices
#1	Primary	205.80'	**40.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Secondary	205.80'	**20.0' long x 25.0' 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

Primary OutFlow Max=0.02 cfs @ 24.14 hrs HW=205.80' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.15 fps)

Secondary OutFlow Max=0.01 cfs @ 24.14 hrs HW=205.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.16 fps)

Summary for Pond 8.5BP:

Inflow Area = 2.862 ac, 3.82% Impervious, Inflow Depth = 1.35" for 02-YR event
Inflow = 1.98 cfs @ 12.69 hrs, Volume= 0.321 af
Outflow = 0.13 cfs @ 18.02 hrs, Volume= 0.142 af, Atten= 93%, Lag= 319.7 min
Primary = 0.13 cfs @ 18.02 hrs, Volume= 0.142 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 167.95' @ 18.02 hrs Surf.Area= 17,593 sf Storage= 10,451 cf

Plug-Flow detention time= 651.7 min calculated for 0.142 af (44% of inflow)
Center-of-Mass det. time= 520.9 min (1,407.2 - 886.3)

Volume	Invert	Avail.Storage	Storage Description
#1	166.80'	33,637 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
166.80	2,000	0	0
167.00	3,313	531	531
168.00	18,361	10,837	11,368
169.00	26,176	22,269	33,637

Device	Routing	Invert	Outlet Devices
#1	Primary	167.75'	**12.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 167.75' / 167.50' S= 0.0078 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	168.00'	**27.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.13 cfs @ 18.02 hrs HW=167.95' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.13 cfs @ 1.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=166.80' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.5CP:

Inflow Area = 9.708 ac, 16.32% Impervious, Inflow Depth = 0.39" for 02-YR event
Inflow = 2.26 cfs @ 12.50 hrs, Volume= 0.312 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 159.52' @ 26.03 hrs Surf.Area= 18,139 sf Storage= 13,603 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	93,198 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	3,500	0	0
159.00	9,395	6,448	6,448
160.00	26,219	17,807	24,255
161.00	33,641	29,930	54,185
162.00	44,385	39,013	93,198

Device	Routing	Invert	Outlet Devices
#1	Primary	160.60'	**40.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.6AP:

```
Inflow Area =       1.467 ac, 15.73% Impervious, Inflow Depth =  1.48"   for 02-YR event
Inflow     =      1.48 cfs @  12.40 hrs, Volume=        0.181 af
Outflow    =      1.48 cfs @  12.42 hrs, Volume=        0.157 af, Atten= 0%, Lag= 1.0 min
Primary    =      1.48 cfs @  12.42 hrs, Volume=        0.157 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 198.56' @ 12.42 hrs Surf.Area= 2,848 sf Storage= 1,180 cf

Plug-Flow detention time= 85.4 min calculated for 0.157 af (87% of inflow)
Center-of-Mass det. time= 26.2 min (887.1 - 860.9)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	2,740 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
198.00	1,450	147.0	0	0	1,450
199.00	4,280	230.0	2,740	2,740	3,947

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**42.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.48 cfs @ 12.42 hrs HW=198.56' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.48 cfs @ 0.59 fps)

Summary for Pond 8.6BP:

```
Inflow Area =       7.054 ac, 17.19% Impervious, Inflow Depth =  1.48"   for 02-YR event
Inflow     =      5.86 cfs @  12.59 hrs, Volume=        0.870 af
Outflow    =      0.00 cfs @   0.00 hrs, Volume=        0.000 af, Atten= 100%, Lag= 0.0 min
Primary    =      0.00 cfs @   0.00 hrs, Volume=        0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 156.74' @ 26.39 hrs Surf.Area= 34,651 sf Storage= 37,874 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	155.00'	438,508 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.00	7,503	0	0
156.00	24,570	16,037	16,037
157.00	38,240	31,405	47,442
158.00	51,342	44,791	92,233
159.00	65,795	58,569	150,801
160.00	88,790	77,293	228,094
161.00	105,299	97,045	325,138
162.00	121,440	113,370	438,508

Device	Routing	Invert	Outlet Devices
#1	Primary	161.80'	**100.0' long x 25.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=155.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8.6CP1:

Inflow Area = 9.642 ac, 1.26% Impervious, Inflow Depth = 1.28" for 02-YR event
Inflow = 5.55 cfs @ 12.83 hrs, Volume= 1.032 af
Outflow = 2.61 cfs @ 13.62 hrs, Volume= 0.671 af, Atten= 53%, Lag= 47.4 min
Primary = 2.61 cfs @ 13.62 hrs, Volume= 0.671 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 160.77' @ 13.62 hrs Surf.Area= 46,686 sf Storage= 18,980 cf

Plug-Flow detention time= 216.4 min calculated for 0.671 af (65% of inflow)
Center-of-Mass det. time= 105.7 min (1,006.0 - 900.2)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	87,951 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	2,500	0	0
160.50	30,500	8,250	8,250
160.70	44,125	7,462	15,712
161.00	54,800	14,839	30,551
162.00	60,000	57,400	87,951

Device	Routing	Invert	Outlet Devices
#1	Primary	160.70'	**50.0' long x 50.0' 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

Primary OutFlow Max=2.59 cfs @ 13.62 hrs HW=160.77' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 2.59 cfs @ 0.72 fps)

Summary for Pond 8.6CP2:

```
Inflow Area =      9.642 ac,    1.26% Impervious,  Inflow Depth =   0.83"    for  02-YR event
Inflow     =       2.61 cfs @   13.62 hrs,  Volume=            0.671 af
Outflow    =       1.36 cfs @   14.80 hrs,  Volume=            0.544 af,  Atten= 48%,  Lag= 70.5 min
Primary    =       1.36 cfs @   14.80 hrs,  Volume=            0.544 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 158.22' @ 14.80 hrs Surf.Area= 13,736 sf Storage= 8,409 cf

Plug-Flow detention time= 172.2 min calculated for 0.544 af (81% of inflow)
Center-of-Mass det. time= 91.6 min (1,097.6 - 1,006.0)

Volume	Invert	Avail.Storage	Storage Description
#1	157.50'	41,223 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
157.50	9,290	0	0
158.00	12,800	5,523	5,523
159.00	17,100	14,950	20,473
160.00	24,400	20,750	41,223

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**5.0' long x 50.0' 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

Primary OutFlow Max=1.36 cfs @ 14.80 hrs HW=158.22' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 1.25 fps)

Summary for Pond 8.7CP:

```
Inflow Area =      0.773 ac,    0.00% Impervious,  Inflow Depth =   1.22"    for  02-YR event
Inflow     =       0.66 cfs @   12.36 hrs,  Volume=            0.079 af
Outflow    =       0.00 cfs @    0.00 hrs,  Volume=            0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary    =       0.00 cfs @    0.00 hrs,  Volume=            0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 157.49' @ 25.39 hrs Surf.Area= 5,978 sf Storage= 3,427 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	156.50'	16,653 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
156.50	1,500	0	0
157.00	3,217	1,179	1,179
158.00	8,865	6,041	7,220
159.00	10,000	9,433	16,653

Device	Routing	Invert	Outlet Devices
#1	Primary	157.60'	**40.0' long x 50.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=156.50' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: Option 3 Weir Control 25 Yr

Inflow Area = 216.721 ac, 8.01% Impervious, Inflow Depth > 0.93" for 02-YR event
Inflow = 54.94 cfs @ 12.60 hrs, Volume= 16.779 af
Outflow = 30.90 cfs @ 13.11 hrs, Volume= 16.778 af, Atten= 44%, Lag= 30.3 min
Primary = 30.90 cfs @ 13.11 hrs, Volume= 16.778 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 121.86' @ 13.11 hrs Surf.Area= 1.619 ac Storage= 1.890 af

Plug-Flow detention time= 32.7 min calculated for 16.775 af (100% of inflow)
Center-of-Mass det. time= 32.7 min (1,089.6 - 1,057.0)

Volume	Invert	Avail.Storage	Storage Description
#1	119.30'	35.870 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
119.30	0.002	45.0	0.000	0.000	0.002
120.00	0.344	600.0	0.087	0.087	0.656
121.00	1.056	1,314.7	0.668	0.755	3.156
122.00	1.726	1,928.6	1.377	2.132	6.794
123.00	2.480	2,755.9	2.092	4.224	13.874
124.00	3.363	2,842.9	2.910	7.134	14.766
125.00	4.356	3,500.4	3.849	10.983	22.386
126.00	5.236	3,807.1	4.789	15.772	26.481
127.00	6.360	4,208.5	5.789	21.561	32.360
128.00	7.120	4,476.8	6.736	28.298	36.618
129.00	8.035	5,000.0	7.573	35.870	45.676

Device	Routing	Invert	Outlet Devices
#1	Primary	119.31'	**36.0" Round Culvert** L= 199.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 119.31' / 118.28' S= 0.0052 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Tertiary	119.31'	**48.0" Round Culvert** L= 199.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 119.31' / 118.28' S= 0.0052 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#3	Device 2	123.00'	**90.0 deg x 6.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.50 (C= 3.13)
#4	Device 2	123.50'	**90.0 deg x 4.5' long Sharp-Crested Vee/Trap Weir X 2.00** Cv= 2.50 (C= 3.13)
#5	Secondary	128.50'	**200.0' long x 95.0' 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

Primary OutFlow Max=30.90 cfs @ 13.11 hrs HW=121.86' (Free Discharge)
└─**1=Culvert** (Barrel Controls 30.90 cfs @ 6.51 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.30' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.30' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  └─**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 800P: Pond on YWD

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.21'
[79] Warning: Submerged Pond 8P Tertiary device # 2 INLET by 0.21'

Inflow Area = 256.270 ac, 8.19% Impervious, Inflow Depth > 1.00" for 02-YR event
Inflow = 51.79 cfs @ 12.77 hrs, Volume= 21.448 af
Outflow = 51.42 cfs @ 12.84 hrs, Volume= 21.448 af, Atten= 1%, Lag= 3.9 min
Primary = 51.42 cfs @ 12.84 hrs, Volume= 21.448 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 119.52' @ 12.84 hrs Surf.Area= 25,518 sf Storage= 19,926 cf

Plug-Flow detention time= 9.6 min calculated for 21.444 af (100% of inflow)
Center-of-Mass det. time= 9.6 min (1,051.5 - 1,041.8)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	712,300 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
118.00	959	441.0	0	0	959
119.00	19,570	637.0	8,287	8,287	17,781
120.00	31,765	1,121.0	25,423	33,710	85,497
121.00	97,714	2,249.0	61,731	95,440	388,005
122.00	119,554	2,295.0	108,451	203,891	404,793
123.00	162,662	2,787.0	140,556	344,447	603,780
124.00	185,002	2,707.0	173,712	518,159	638,864
125.00	203,425	2,711.0	194,141	712,300	642,075

Device	Routing	Invert	Outlet Devices
#1	Primary	118.00'	**4.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	119.00'	**32.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=51.34 cfs @ 12.84 hrs HW=119.52' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 19.84 cfs @ 3.27 fps)
2=Broad-Crested Rectangular Weir (Weir Controls 31.51 cfs @ 1.90 fps)

Summary for Pond C6P: 357+50

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	137.00'	344,264 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
137.00	500	250.0	0	0	500
138.00	1,167	359.2	810	810	5,803
139.00	11,959	1,301.5	5,621	6,431	130,334
140.00	67,539	1,621.9	35,973	42,404	204,886
141.00	113,172	3,559.0	89,379	131,783	1,003,523
142.00	155,057	3,703.0	133,566	265,349	1,086,819
142.50	160,618	3,712.0	78,915	344,264	1,092,443

Device	Routing	Invert	Outlet Devices
#1	Primary	136.90'	**36.0" Round Culvert STA357+00** L= 225.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 136.90' / 136.56' S= 0.0015 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	139.22'	**18.0" Round Culvert STA365+00** L= 297.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 139.22' / 136.87' S= 0.0079 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Tertiary	140.50'	**2.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└─**1=Culvert STA357+00** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└─**2=Culvert STA365+00** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C8AP:

```
Inflow Area =       43.650 ac,    8.41% Impervious,  Inflow Depth =   1.25"    for  02-YR event
Inflow      =      27.34 cfs @   12.75 hrs,  Volume=             4.555 af
Outflow     =       4.57 cfs @   14.80 hrs,  Volume=             4.555 af,  Atten= 83%,  Lag= 123.4 min
Primary     =       4.57 cfs @   14.80 hrs,  Volume=             4.555 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 182.55' @ 14.80 hrs Surf.Area= 259,045 sf Storage= 93,380 cf

Plug-Flow detention time= 256.1 min calculated for 4.555 af (100% of inflow)
Center-of-Mass det. time= 256.0 min (1,141.3 - 885.2)

Volume	Invert	Avail.Storage	Storage Description
#1	181.50'	1,071,217 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
181.50	1,500	160.0	0	0	1,500
182.00	10,000	1,000.0	2,562	2,562	79,041
182.30	238,856	4,275.0	29,773	32,335	1,453,792
183.00	298,639	5,104.0	187,734	220,069	2,072,530
184.00	336,274	5,089.0	317,270	537,340	2,085,722
185.00	363,932	5,071.0	350,012	887,352	2,101,136
185.50	371,541	5,073.0	183,865	1,071,217	2,104,142

Device	Routing	Invert	Outlet Devices
#1	Primary	181.50'	**24.0" Round Culvert** L= 51.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0291 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf

Primary OutFlow Max=4.57 cfs @ 14.80 hrs HW=182.55' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.57 cfs @ 2.75 fps)

Summary for Pond C8BP:

```
Inflow Area =       44.071 ac,    5.93% Impervious,  Inflow Depth >   1.15"    for  02-YR event
Inflow      =      23.63 cfs @   12.71 hrs,  Volume=             4.209 af
Outflow     =       7.14 cfs @   13.73 hrs,  Volume=             4.155 af,  Atten= 70%,  Lag= 61.2 min
Primary     =       7.14 cfs @   13.73 hrs,  Volume=             4.155 af
```

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 163.38' @ 13.73 hrs Surf.Area= 67,705 sf Storage= 61,688 cf

Plug-Flow detention time= 122.1 min calculated for 4.154 af (99% of inflow)
Center-of-Mass det. time= 109.8 min (1,027.5 - 917.8)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	759,850 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	2,075	247.8	0	0	2,075
162.00	14,443	1,163.1	7,331	7,331	104,844
163.00	52,542	1,444.5	31,511	38,842	163,250
164.00	96,433	2,067.5	73,385	112,227	337,373
165.00	140,706	2,820.8	117,875	230,102	630,416
166.00	195,436	3,605.7	167,323	397,425	1,031,830
167.00	249,936	3,675.8	222,128	619,553	1,072,612
167.50	312,413	3,957.0	140,297	759,850	1,243,423

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**18.0" Round Culvert** L= 51.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0097 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.14 cfs @ 13.73 hrs HW=163.38' (Free Discharge)
↑**1=Culvert** (Inlet Controls 7.14 cfs @ 4.04 fps)

Summary for Pond UDF8P: STA353+50 RIGHT UDF

Inflow Area = 1.995 ac, 84.75% Impervious, Inflow Depth = 2.78" for 02-YR event
Inflow = 6.01 cfs @ 12.08 hrs, Volume= 0.462 af
Outflow = 4.06 cfs @ 12.17 hrs, Volume= 0.462 af, Atten= 33%, Lag= 5.1 min
Primary = 2.18 cfs @ 12.17 hrs, Volume= 0.441 af
Secondary = 1.88 cfs @ 12.17 hrs, Volume= 0.021 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 146.97' @ 12.17 hrs Surf.Area= 3,830 sf Storage= 6,262 cf

Plug-Flow detention time= 190.1 min calculated for 0.462 af (100% of inflow)
Center-of-Mass det. time= 190.2 min (962.8 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	10,824 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	2,650	0	0
146.00	3,115	2,883	2,883
147.00	3,850	3,483	6,365
148.00	5,068	4,459	10,824

Device	Routing	Invert	Outlet Devices
#1	Primary	142.15'	**15.0" Round Outlet Pipe** L= 94.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 142.15' / 141.68' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	142.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	142.65'	**1.4" Vert. Orifice at OCS** C= 0.600
#4	Device 1	146.20'	**1.2" x 1.2" Horiz. Catch Basin Grate X 49.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	146.90'	**35.0' 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

Primary OutFlow Max=2.18 cfs @ 12.17 hrs HW=146.97' (Free Discharge)
└─**1=Outlet Pipe** (Passes 2.18 cfs of 10.31 cfs potential flow)
  ├─**2=Header Pipe** (Passes 0.11 cfs of 3.36 cfs potential flow)
  │ └─**3=Orifice at OCS** (Orifice Controls 0.11 cfs @ 9.94 fps)
  └─**4=Catch Basin Grate** (Orifice Controls 2.07 cfs @ 4.23 fps)

Secondary OutFlow Max=1.86 cfs @ 12.17 hrs HW=146.97' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 1.86 cfs @ 0.72 fps)

Summary for Pond UDF9P: STA355+00 RIGHT UDF

Inflow Area = 1.249 ac, 89.15% Impervious, Inflow Depth = 2.85" for 02-YR event
Inflow = 3.87 cfs @ 12.08 hrs, Volume= 0.296 af
Outflow = 1.78 cfs @ 12.25 hrs, Volume= 0.296 af, Atten= 54%, Lag= 10.0 min
Primary = 1.78 cfs @ 12.25 hrs, Volume= 0.296 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 146.59' @ 12.25 hrs Surf.Area= 3,268 sf Storage= 4,618 cf

Plug-Flow detention time= 287.9 min calculated for 0.296 af (100% of inflow)
Center-of-Mass det. time= 288.1 min (1,061.2 - 773.2)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	10,439 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	2,621	0	0
146.00	2,956	2,789	2,789
147.00	3,486	3,221	6,010
148.00	5,373	4,430	10,439

Device	Routing	Invert	Outlet Devices
#1	Primary	141.43'	**18.0" Round Outlet Pipe** L= 17.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 141.43' / 141.00' S= 0.0253 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	142.65'	**8.0" Vert. Header Pipe** C= 0.600
#3	Device 2	142.65'	**1.0" Vert. Orifice at OCS** C= 0.600

#4	Device 1	146.00'	**1.2" W x 1.2" H Vert. Catch Basin Grate X 49.00** C= 0.600
#5	Secondary	146.75'	**20.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=1.78 cfs @ 12.25 hrs HW=146.59' (Free Discharge)
└1=**Outlet Pipe** (Passes 1.78 cfs of 17.86 cfs potential flow)
  ├2=**Header Pipe** (Passes 0.05 cfs of 3.19 cfs potential flow)
  │ └3=**Orifice at OCS** (Orifice Controls 0.05 cfs @ 9.50 fps)
  └4=**Catch Basin Grate** (Orifice Controls 1.73 cfs @ 3.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' (Free Discharge)
└5=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1L: (new Link)

Inflow Area = 2,130.640 ac, 7.98% Impervious, Inflow Depth > 1.04" for 02-YR event
Inflow = 88.26 cfs @ 12.40 hrs, Volume= 185.363 af
Primary = 88.26 cfs @ 12.40 hrs, Volume= 185.363 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

02-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.141	98	(7S, 8.1AS, 8.1BS, 8.1CS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 91S, 111S, C8AS, C8BS, C8CS)
0.440	80	>75% Grass cover, Good, HSG D (81S, 83S)
12.730	77	Brush, Fair, HSG D (6S, 7S, 8.1CS, C8AS)
27.512	73	Brush, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C8BS, C8CS)
2.366	98	PAVED (81S, 100S, 113S, 1000S)
1.605	98	PAVED CENTER (110S)
0.468	98	PAVED- 82S (81S)
1.757	98	PAVEMENT (6S)
1.179	98	Paved 346+50 - 350+00 (83S, 84S, 85S)
0.240	98	Paved 350+00 - 3352+50 (80S)
1.113	98	Paved 90S 354+35 - 359+60 (90S)
0.031	98	Paved 92S 360+00 to 360+00 (90S)
1.407	98	Pavement (800S)
75.253	79	Woods, Fair, HSG D (6S, 7S, 8.1CS, C8AS)
152.342	77	Woods, Good, HSG D (8.1AS, 8.1BS, 8.2AS, 8.2BS, 8.2CS, 8.3AS, 8.3BS, 8.3CS, 8.4AS, 8.4BS, 8.4CS, 8.5AS, 8.5BS, 8.5CS, 8.6AS, 8.6BS, 8.6CS, 8.7CS, 800S, 1000S, C8BS, C8CS)
0.272	98	paved (83S)
295.856	**79**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.01 hrs, 5001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 357+50 Runoff Area=29.079 ac 6.04% Impervious Runoff Depth=2.81"
Flow Length=1,098' Tc=21.4 min CN=80 Runoff=62.79 cfs 6.799 af

Subcatchment 7S: 365+50 Runoff Area=5.717 ac 8.62% Impervious Runoff Depth=2.81"
Flow Length=489' Tc=6.0 min CN=80 Runoff=18.81 cfs 1.337 af

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=2.90"
Flow Length=430' Tc=28.4 min CN=81 Runoff=5.50 cfs 0.673 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=2.54"
Flow Length=265' Tc=35.1 min CN=77 Runoff=2.58 cfs 0.351 af

Subcatchment 8.1CS: Runoff Area=1,047,959 sf 3.84% Impervious Runoff Depth=2.72"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=39.85 cfs 5.445 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=2.63"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=2.28 cfs 0.283 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=2.54"
Flow Length=372' Tc=28.8 min CN=77 Runoff=3.69 cfs 0.456 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=2.63"
Flow Length=475' Tc=37.1 min CN=78 Runoff=3.68 cfs 0.513 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=2.81"
Flow Length=420' Tc=26.1 min CN=80 Runoff=4.24 cfs 0.502 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=2.63"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=1.65 cfs 0.255 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=2.54"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=4.22 cfs 0.941 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=2.81"
Flow Length=260' Tc=13.2 min CN=80 Runoff=4.27 cfs 0.382 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=2.54"
Flow Length=506' Tc=43.8 min CN=77 Runoff=2.76 cfs 0.418 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=2.54"
Flow Length=365' Tc=40.2 min CN=77 Runoff=4.04 cfs 0.584 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=2.54"
Flow Length=150' Tc=17.5 min CN=77 Runoff=6.30 cfs 0.631 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=2.63"
Flow Length=717' Tc=47.8 min CN=78 Runoff=3.94 cfs 0.627 af

```
Subcatchment 8.5CS:                                   Runoff Area=115,586 sf   14.02% Impervious   Runoff Depth=2.72"
                                                      Flow Length=285'   Tc=35.7 min   CN=79   Runoff=4.41 cfs  0.601 af

Subcatchment 8.6AS:                                    Runoff Area=63,890 sf   15.73% Impervious   Runoff Depth=2.81"
                                                      Flow Length=445'   Tc=27.3 min   CN=80   Runoff=2.84 cfs  0.343 af

Subcatchment 8.6BS: Non Contributing Area             Runoff Area=307,280 sf   17.19% Impervious   Runoff Depth=2.81"
                                                     Flow Length=450'   Tc=41.5 min   CN=80   Runoff=11.23 cfs  1.649 af

Subcatchment 8.6CS:                                    Runoff Area=420,023 sf   1.26% Impervious   Runoff Depth=2.54"
                                                     Flow Length=875'   Tc=59.5 min   CN=77   Runoff=11.30 cfs  2.041 af

Subcatchment 8.7CS:                                     Runoff Area=33,655 sf   0.00% Impervious   Runoff Depth=2.45"
                                  Flow Length=135'   Slope=0.1030 '/'   Tc=24.3 min   CN=76   Runoff=1.38 cfs  0.158 af

Subcatchment 80S: 350+00 TO 352+50 RIGHT              Runoff Area=10,434 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=6.0 min   CN=98   Runoff=1.15 cfs  0.093 af

Subcatchment 81S: Combined 81S and 82S                 Runoff Area=54,400 sf   89.15% Impervious   Runoff Depth=4.43"
                                                                      Tc=6.0 min   CN=96   Runoff=5.88 cfs  0.461 af

Subcatchment 83S: 346+40 TO 350+00 RIGHT               Runoff Area=40,574 sf   67.34% Impervious   Runoff Depth=3.99"
                                                                      Tc=6.0 min   CN=92   Runoff=4.14 cfs  0.310 af

Subcatchment 84S: 346+40 TO 350+00 CENTER             Runoff Area=17,680 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=6.0 min   CN=98   Runoff=1.95 cfs  0.158 af

Subcatchment 85S: 344+00 TO 350+00 LEFT               Runoff Area=18,205 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=6.0 min   CN=98   Runoff=2.00 cfs  0.162 af

Subcatchment 90S: Combined 90S and 92S                Runoff Area=49,844 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=5.68 cfs  0.445 af

Subcatchment 91S: 360+00 TO 360+00 LEFT                Runoff Area=1,433 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=0.16 cfs  0.013 af

Subcatchment 100S: 364+00 TO 370+00 CENTER            Runoff Area=31,359 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=3.57 cfs  0.280 af

Subcatchment 110S: Combined 110S, 112S and 113S       Runoff Area=69,921 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=7.97 cfs  0.624 af

Subcatchment 111S: 375+50 TO 375+50 LEFT                 Runoff Area=867 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=0.10 cfs  0.008 af

Subcatchment 113S: 113S                               Runoff Area=17,505 sf   100.00% Impervious   Runoff Depth=4.66"
                                                                      Tc=5.0 min   CN=98   Runoff=2.00 cfs  0.156 af

Subcatchment 800S: YWD Pond EAST SIDE                Runoff Area=1,262,903 sf   4.85% Impervious   Runoff Depth=2.63"
                                                   Flow Length=1,350'   Tc=47.7 min   CN=78   Runoff=40.13 cfs  6.347 af
```

Subcatchment 1000S: 1000S
Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=2.63"
Flow Length=862' Tc=24.7 min CN=78 Runoff=16.97 cfs 1.960 af

Subcatchment C8AS:
Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=2.81"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=49.37 cfs 8.025 af

Subcatchment C8BS:
Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=2.63"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=42.84 cfs 6.848 af

Subcatchment C8CS: 375+00
Runoff Area=3,245,079 sf 9.62% Impervious Runoff Depth=2.63"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=108.88 cfs 16.309 af

Reach 4R: OUTLET PIPE
Avg. Flow Depth=0.51' Max Vel=8.59 fps Inflow=4.50 cfs 1.040 af
18.0" Round Pipe n=0.012 L=50.0' S=0.0260 '/' Capacity=18.35 cfs Outflow=4.50 cfs 1.040 af

Reach 8.1BR1:
Avg. Flow Depth=0.23' Max Vel=0.95 fps Inflow=1.67 cfs 0.233 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=1.58 cfs 0.233 af

Reach 8.1BR2:
Avg. Flow Depth=0.41' Max Vel=0.51 fps Inflow=4.06 cfs 0.823 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=3.57 cfs 0.823 af

Reach 8.1BR3:
Avg. Flow Depth=0.49' Max Vel=2.44 fps Inflow=4.19 cfs 1.078 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=4.17 cfs 1.078 af

Reach 8.1BR4:
Avg. Flow Depth=0.45' Max Vel=2.15 fps Inflow=5.10 cfs 1.490 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=5.10 cfs 1.490 af

Reach 8.2AR1:
Avg. Flow Depth=0.18' Max Vel=0.39 fps Inflow=0.20 cfs 0.082 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.20 cfs 0.082 af

Reach 8.2BR1:
Avg. Flow Depth=0.35' Max Vel=1.31 fps Inflow=2.52 cfs 0.590 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=82.21 cfs Outflow=2.51 cfs 0.590 af

Reach 8.3AR1:
Avg. Flow Depth=0.54' Max Vel=1.32 fps Inflow=4.24 cfs 0.402 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=4.16 cfs 0.402 af

Reach 8.3CR1:
Avg. Flow Depth=0.18' Max Vel=0.83 fps Inflow=3.40 cfs 0.644 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=3.20 cfs 0.644 af

Reach 8.4CR1:
Avg. Flow Depth=0.19' Max Vel=0.50 fps Inflow=0.74 cfs 0.247 af
n=0.120 L=1,438.0' S=0.0178 '/' Capacity=48.77 cfs Outflow=0.54 cfs 0.247 af

Reach 8.6CR1:
Avg. Flow Depth=0.47' Max Vel=2.23 fps Inflow=7.15 cfs 1.616 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=7.12 cfs 1.616 af

Reach 68R: Null Node
Inflow=80.67 cfs 9.765 af
Outflow=80.67 cfs 9.765 af

Reach C6R1:
Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=0.00 cfs 0.000 af

Reach C8AR1: Avg. Flow Depth=0.17' Max Vel=1.33 fps Inflow=7.79 cfs 8.856 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=7.79 cfs 8.856 af

Reach C8AR2: Avg. Flow Depth=0.56' Max Vel=1.12 fps Inflow=7.79 cfs 8.856 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=2,843.62 cfs Outflow=7.78 cfs 8.856 af

Reach C8AR3: Avg. Flow Depth=0.67' Max Vel=2.91 fps Inflow=7.78 cfs 8.856 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=7.78 cfs 8.856 af

Reach C8AR6: Avg. Flow Depth=0.77' Max Vel=2.00 fps Inflow=11.81 cfs 10.257 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=11.80 cfs 10.256 af

Reach C8AR7: Avg. Flow Depth=0.81' Max Vel=0.85 fps Inflow=22.19 cfs 19.163 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=22.10 cfs 19.161 af

Reach C8BR1: Avg. Flow Depth=0.20' Max Vel=3.15 fps Inflow=10.04 cfs 8.729 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=10.04 cfs 8.729 af

Reach C8BR2: Avg. Flow Depth=0.18' Max Vel=5.33 fps Inflow=10.04 cfs 8.729 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=10.04 cfs 8.729 af

Reach C8BR3: Avg. Flow Depth=0.07' Max Vel=1.46 fps Inflow=10.04 cfs 8.729 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=10.04 cfs 8.729 af

Reach SP1000: POA STA380+00 Inflow=214.50 cfs 380.256 af
Outflow=214.50 cfs 380.256 af

Pond 8.1AP: Peak Elev=208.82' Storage=29,322 cf Inflow=5.50 cfs 0.673 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.16' Storage=5,972 cf Inflow=2.58 cfs 0.351 af
Outflow=1.67 cfs 0.233 af

Pond 8.1CP: Peak Elev=158.20' Storage=202,960 cf Inflow=42.19 cfs 14.301 af
Outflow=11.81 cfs 10.257 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.52' Storage=8,977 cf Inflow=2.28 cfs 0.283 af
Outflow=0.20 cfs 0.082 af

Pond 8.2BP: Peak Elev=199.83' Storage=6,487 cf Inflow=3.69 cfs 0.664 af
Outflow=2.52 cfs 0.590 af

Pond 8.2CP: Peak Elev=182.44' Storage=15,857 cf Inflow=3.68 cfs 0.513 af
Outflow=0.38 cfs 0.165 af

Pond 8.3AP: Peak Elev=200.59' Storage=4,656 cf Inflow=4.24 cfs 0.502 af
Outflow=4.24 cfs 0.402 af

Pond 8.3BP: Peak Elev=201.62' Storage=116 cf Inflow=1.65 cfs 0.255 af
Outflow=1.65 cfs 0.255 af

Pond 8.3CP: Peak Elev=155.09' Storage=14,687 cf Inflow=4.22 cfs 0.941 af
Outflow=3.40 cfs 0.644 af

Pond 8.4AP: Peak Elev=208.70' Storage=20,224 cf Inflow=4.27 cfs 0.464 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.44' Storage=443 cf Inflow=2.76 cfs 0.418 af
Outflow=2.76 cfs 0.412 af

Pond 8.4CP: Peak Elev=161.52' Storage=15,371 cf Inflow=4.04 cfs 0.584 af
Primary=0.20 cfs 0.067 af Secondary=0.54 cfs 0.180 af Outflow=0.74 cfs 0.247 af

Pond 8.5AP: Peak Elev=205.84' Storage=14,710 cf Inflow=6.30 cfs 0.631 af
Primary=0.81 cfs 0.208 af Secondary=0.43 cfs 0.110 af Outflow=1.24 cfs 0.317 af

Pond 8.5BP: Peak Elev=168.08' Storage=12,805 cf Inflow=3.94 cfs 0.627 af
Primary=0.34 cfs 0.274 af Secondary=1.44 cfs 0.172 af Outflow=1.78 cfs 0.446 af

Pond 8.5CP: Peak Elev=160.07' Storage=26,158 cf Inflow=4.41 cfs 0.601 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.59' Storage=1,273 cf Inflow=2.84 cfs 0.343 af
Outflow=2.84 cfs 0.320 af

Pond 8.6BP: Peak Elev=157.58' Storage=71,843 cf Inflow=11.23 cfs 1.649 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.87' Storage=23,881 cf Inflow=11.30 cfs 2.041 af
Outflow=9.66 cfs 1.680 af

Pond 8.6CP2: Peak Elev=158.65' Storage=14,683 cf Inflow=9.66 cfs 1.680 af
Outflow=6.97 cfs 1.553 af

Pond 8.7CP: Peak Elev=157.61' Storage=4,201 cf Inflow=1.38 cfs 0.158 af
Outflow=0.19 cfs 0.063 af

Pond 8P: Option 3 Weir Control 25 Yr Peak Elev=123.18' Storage=4.677 af Inflow=111.13 cfs 38.265 af
Primary=49.61 cfs 38.171 af Secondary=0.00 cfs 0.000 af Tertiary=1.56 cfs 0.093 af Outflow=51.17 cfs 38.265 af

Pond 800P: Pond on YWD Peak Elev=119.84' Storage=28,913 cf Inflow=93.81 cfs 47.195 af
Outflow=93.15 cfs 47.195 af

Pond C6P: 357+50 Peak Elev=0.00' Storage=0 cf
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af

Pond C8AP: Peak Elev=182.94' Storage=201,463 cf Inflow=54.52 cfs 8.856 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=7.79 cfs 8.856 af

Pond C8BP: Peak Elev=164.49' Storage=163,981 cf Inflow=47.18 cfs 8.784 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=10.04 cfs 8.729 af

Pond UDF8P: STA353+50 RIGHT UDF Peak Elev=147.07' Storage=6,643 cf Inflow=9.24 cfs 0.723 af
Primary=2.31 cfs 0.608 af Secondary=6.66 cfs 0.115 af Outflow=8.97 cfs 0.723 af

Pond UDF9P: STA355+00 RIGHT UDF Peak Elev=146.88' Storage=5,608 cf Inflow=5.88 cfs 0.461 af
Primary=2.21 cfs 0.432 af Secondary=2.33 cfs 0.029 af Outflow=4.54 cfs 0.461 af

Link 1L: (new 10-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=174.80 cfs 332.905 af
Area= 2,130.640 ac 7.98% Imperv. Primary=174.80 cfs 332.905 af

Total Runoff Area = 295.856 ac Runoff Volume = 67.184 af Average Runoff Depth = 2.72"
90.68% Pervious = 268.277 ac 9.32% Impervious = 27.579 ac

Time span=0.00-50.00 hrs, dt=0.01 hrs, 5001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: 357+50 Runoff Area=29.079 ac 6.04% Impervious Runoff Depth=3.96"
Flow Length=1,098' Tc=21.4 min CN=80 Runoff=88.42 cfs 9.601 af

Subcatchment 7S: 365+50 Runoff Area=5.717 ac 8.62% Impervious Runoff Depth=3.96"
Flow Length=489' Tc=6.0 min CN=80 Runoff=26.43 cfs 1.888 af

Subcatchment 8.1AS: Runoff Area=121,454 sf 22.13% Impervious Runoff Depth=4.07"
Flow Length=430' Tc=28.4 min CN=81 Runoff=7.68 cfs 0.945 af

Subcatchment 8.1BS: Runoff Area=72,193 sf 1.67% Impervious Runoff Depth=3.65"
Flow Length=265' Tc=35.1 min CN=77 Runoff=3.73 cfs 0.505 af

Subcatchment 8.1CS: Runoff Area=1,047,959 sf 3.84% Impervious Runoff Depth=3.86"
Flow Length=1,796' Tc=35.9 min CN=79 Runoff=56.56 cfs 7.736 af

Subcatchment 8.2AS: Runoff Area=56,291 sf 9.56% Impervious Runoff Depth=3.76"
Flow Length=150' Slope=0.0200 '/' Tc=29.2 min CN=78 Runoff=3.25 cfs 0.404 af

Subcatchment 8.2BS: Runoff Area=93,889 sf 0.00% Impervious Runoff Depth=3.65"
Flow Length=372' Tc=28.8 min CN=77 Runoff=5.32 cfs 0.656 af

Subcatchment 8.2CS: Runoff Area=102,001 sf 12.15% Impervious Runoff Depth=3.76"
Flow Length=475' Tc=37.1 min CN=78 Runoff=5.27 cfs 0.733 af

Subcatchment 8.3AS: Runoff Area=93,437 sf 16.21% Impervious Runoff Depth=3.96"
Flow Length=420' Tc=26.1 min CN=80 Runoff=5.97 cfs 0.708 af

Subcatchment 8.3BS: Runoff Area=50,670 sf 7.32% Impervious Runoff Depth=3.76"
Flow Length=135' Slope=0.0220 '/' Tc=45.1 min CN=78 Runoff=2.37 cfs 0.364 af

Subcatchment 8.3CS: Runoff Area=193,772 sf 0.00% Impervious Runoff Depth=3.65"
Flow Length=1,039' Tc=83.9 min CN=77 Runoff=6.11 cfs 1.355 af

Subcatchment 8.4AS: Runoff Area=71,195 sf 20.23% Impervious Runoff Depth=3.96"
Flow Length=260' Tc=13.2 min CN=80 Runoff=6.01 cfs 0.540 af

Subcatchment 8.4BS: Runoff Area=85,972 sf 0.75% Impervious Runoff Depth=3.65"
Flow Length=506' Tc=43.8 min CN=77 Runoff=3.98 cfs 0.601 af

Subcatchment 8.4CS: Runoff Area=120,213 sf 8.29% Impervious Runoff Depth=3.65"
Flow Length=365' Tc=40.2 min CN=77 Runoff=5.82 cfs 0.840 af

Subcatchment 8.5AS: Runoff Area=129,841 sf 5.72% Impervious Runoff Depth=3.65"
Flow Length=150' Tc=17.5 min CN=77 Runoff=9.10 cfs 0.908 af

Subcatchment 8.5BS: Runoff Area=124,671 sf 3.82% Impervious Runoff Depth=3.76"
Flow Length=717' Tc=47.8 min CN=78 Runoff=5.64 cfs 0.896 af

Subcatchment 8.5CS: Runoff Area=115,586 sf 14.02% Impervious Runoff Depth=3.86"
Flow Length=285' Tc=35.7 min CN=79 Runoff=6.26 cfs 0.853 af

Subcatchment 8.6AS: Runoff Area=63,890 sf 15.73% Impervious Runoff Depth=3.96"
Flow Length=445' Tc=27.3 min CN=80 Runoff=4.00 cfs 0.484 af

Subcatchment 8.6BS: Non Contributing Area Runoff Area=307,280 sf 17.19% Impervious Runoff Depth=3.96"
Flow Length=450' Tc=41.5 min CN=80 Runoff=15.80 cfs 2.329 af

Subcatchment 8.6CS: Runoff Area=420,023 sf 1.26% Impervious Runoff Depth=3.65"
Flow Length=875' Tc=59.5 min CN=77 Runoff=16.31 cfs 2.936 af

Subcatchment 8.7CS: Runoff Area=33,655 sf 0.00% Impervious Runoff Depth=3.55"
Flow Length=135' Slope=0.1030 '/' Tc=24.3 min CN=76 Runoff=2.00 cfs 0.229 af

Subcatchment 80S: 350+00 TO 352+50 RIGHT Runoff Area=10,434 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=1.46 cfs 0.119 af

Subcatchment 81S: Combined 81S and 82S Runoff Area=54,400 sf 89.15% Impervious Runoff Depth=5.73"
Tc=6.0 min CN=96 Runoff=7.51 cfs 0.596 af

Subcatchment 83S: 346+40 TO 350+00 RIGHT Runoff Area=40,574 sf 67.34% Impervious Runoff Depth=5.27"
Tc=6.0 min CN=92 Runoff=5.38 cfs 0.409 af

Subcatchment 84S: 346+40 TO 350+00 CENTER Runoff Area=17,680 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=2.47 cfs 0.202 af

Subcatchment 85S: 344+00 TO 350+00 LEFT Runoff Area=18,205 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=2.54 cfs 0.208 af

Subcatchment 90S: Combined 90S and 92S Runoff Area=49,844 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=7.20 cfs 0.568 af

Subcatchment 91S: 360+00 TO 360+00 LEFT Runoff Area=1,433 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.21 cfs 0.016 af

Subcatchment 100S: 364+00 TO 370+00 CENTER Runoff Area=31,359 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=4.53 cfs 0.358 af

Subcatchment 110S: Combined 110S, 112S and 113S Runoff Area=69,921 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=10.11 cfs 0.797 af

Subcatchment 111S: 375+50 TO 375+50 LEFT Runoff Area=867 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=0.13 cfs 0.010 af

Subcatchment 113S: 113S Runoff Area=17,505 sf 100.00% Impervious Runoff Depth=5.96"
Tc=5.0 min CN=98 Runoff=2.53 cfs 0.200 af

Subcatchment 800S: YWD Pond EAST SIDE Runoff Area=1,262,903 sf 4.85% Impervious Runoff Depth=3.76"
Flow Length=1,350' Tc=47.7 min CN=78 Runoff=57.37 cfs 9.075 af

Subcatchment 1000S: 1000S Runoff Area=389,920 sf 6.69% Impervious Runoff Depth=3.76"
Flow Length=862' Tc=24.7 min CN=78 Runoff=24.29 cfs 2.802 af

Subcatchment C8AS: Runoff Area=1,495,142 sf 5.89% Impervious Runoff Depth=3.96"
Flow Length=1,646' Tc=50.3 min CN=80 Runoff=69.55 cfs 11.333 af

Subcatchment C8BS: Runoff Area=1,362,511 sf 7.06% Impervious Runoff Depth=3.76"
Flow Length=1,604' Tc=48.3 min CN=78 Runoff=61.30 cfs 9.791 af

Subcatchment C8CS: 375+00 Runoff Area=3,245,079 sf 9.62% Impervious Runoff Depth=3.76"
Flow Length=2,622' Tc=43.1 min CN=78 Runoff=155.74 cfs 23.318 af

Reach 4R: OUTLET PIPE Avg. Flow Depth=0.52' Max Vel=8.67 fps Inflow=4.66 cfs 1.267 af
18.0" Round Pipe n=0.012 L=50.0' S=0.0260 '/' Capacity=18.35 cfs Outflow=4.66 cfs 1.267 af

Reach 8.1BR1: Avg. Flow Depth=0.35' Max Vel=1.19 fps Inflow=3.32 cfs 0.387 af
n=0.120 L=286.0' S=0.0500 '/' Capacity=100.71 cfs Outflow=3.24 cfs 0.387 af

Reach 8.1BR2: Avg. Flow Depth=0.67' Max Vel=0.68 fps Inflow=9.26 cfs 1.359 af
n=0.100 L=445.0' S=0.0045 '/' Capacity=36.13 cfs Outflow=8.33 cfs 1.359 af

Reach 8.1BR3: Avg. Flow Depth=0.75' Max Vel=3.06 fps Inflow=9.71 cfs 1.723 af
n=0.050 L=374.0' S=0.0289 '/' Capacity=85.66 cfs Outflow=9.68 cfs 1.723 af

Reach 8.1BR4: Avg. Flow Depth=0.70' Max Vel=2.76 fps Inflow=11.82 cfs 2.318 af
n=0.050 L=171.0' S=0.0213 '/' Capacity=53.25 cfs Outflow=11.81 cfs 2.318 af

Reach 8.2AR1: Avg. Flow Depth=0.41' Max Vel=0.61 fps Inflow=1.01 cfs 0.204 af
n=0.080 L=330.0' S=0.0061 '/' Capacity=82.07 cfs Outflow=0.90 cfs 0.204 af

Reach 8.2BR1: Avg. Flow Depth=0.57' Max Vel=1.70 fps Inflow=6.04 cfs 0.972 af
n=0.120 L=166.0' S=0.0620 '/' Capacity=82.21 cfs Outflow=6.03 cfs 0.972 af

Reach 8.3AR1: Avg. Flow Depth=0.65' Max Vel=1.46 fps Inflow=5.96 cfs 0.608 af
n=0.120 L=230.0' S=0.0391 '/' Capacity=60.12 cfs Outflow=5.91 cfs 0.608 af

Reach 8.3CR1: Avg. Flow Depth=0.25' Max Vel=1.02 fps Inflow=5.87 cfs 1.057 af
n=0.120 L=384.0' S=0.0495 '/' Capacity=68.10 cfs Outflow=5.74 cfs 1.057 af

Reach 8.4CR1: Avg. Flow Depth=0.38' Max Vel=0.75 fps Inflow=3.23 cfs 0.504 af
n=0.120 L=1,438.0' S=0.0178 '/' Capacity=48.77 cfs Outflow=1.87 cfs 0.504 af

Reach 8.6CR1: Avg. Flow Depth=0.64' Max Vel=2.65 fps Inflow=12.79 cfs 2.583 af
n=0.080 L=482.0' S=0.0560 '/' Capacity=30.58 cfs Outflow=12.75 cfs 2.583 af

Reach 68R: Null Node Inflow=112.15 cfs 13.591 af
Outflow=112.15 cfs 13.591 af

Reach C6R1: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.040 L=338.0' S=0.0414 '/' Capacity=189.62 cfs Outflow=0.00 cfs 0.000 af

Reach C8AR1: Avg. Flow Depth=0.21' Max Vel=1.47 fps Inflow=10.46 cfs 12.608 af
n=0.100 L=107.5' S=0.0794 '/' Capacity=9,842.09 cfs Outflow=10.46 cfs 12.608 af

Reach C8AR2: Avg. Flow Depth=0.67' Max Vel=1.24 fps Inflow=10.46 cfs 12.608 af
n=0.080 L=810.0' S=0.0099 '/' Capacity=2,843.62 cfs Outflow=10.45 cfs 12.608 af

Reach C8AR3: Avg. Flow Depth=0.76' Max Vel=3.13 fps Inflow=10.45 cfs 12.608 af
n=0.080 L=22.0' S=0.0909 '/' Capacity=1,210.27 cfs Outflow=10.45 cfs 12.608 af

Reach C8AR6: Avg. Flow Depth=1.03' Max Vel=2.35 fps Inflow=20.92 cfs 16.299 af
n=0.080 L=822.0' S=0.0254 '/' Capacity=382.10 cfs Outflow=20.82 cfs 16.299 af

Reach C8AR7: Avg. Flow Depth=0.99' Max Vel=0.94 fps Inflow=33.16 cfs 29.469 af
n=0.080 L=831.0' S=0.0042 '/' Capacity=1,134.27 cfs Outflow=32.45 cfs 29.466 af

Reach C8BR1: Avg. Flow Depth=0.22' Max Vel=3.33 fps Inflow=11.71 cfs 12.769 af
n=0.030 L=160.0' S=0.0375 '/' Capacity=1,356.35 cfs Outflow=11.71 cfs 12.769 af

Reach C8BR2: Avg. Flow Depth=0.20' Max Vel=5.56 fps Inflow=11.71 cfs 12.769 af
n=0.030 L=31.0' S=0.1210 '/' Capacity=26,509.48 cfs Outflow=11.71 cfs 12.769 af

Reach C8BR3: Avg. Flow Depth=0.08' Max Vel=1.46 fps Inflow=11.71 cfs 12.769 af
n=0.030 L=788.0' S=0.0189 '/' Capacity=41,604.45 cfs Outflow=11.71 cfs 12.769 af

Reach SP1000: POA STA380+00 Inflow=425.50 cfs 599.185 af
Outflow=425.50 cfs 599.185 af

Pond 8.1AP: Peak Elev=209.62' Storage=41,157 cf Inflow=7.68 cfs 0.945 af
Outflow=0.00 cfs 0.000 af

Pond 8.1BP: Peak Elev=203.25' Storage=6,500 cf Inflow=3.73 cfs 0.505 af
Outflow=3.32 cfs 0.387 af

Pond 8.1CP: Peak Elev=158.29' Storage=215,455 cf Inflow=59.57 cfs 20.344 af
Outflow=20.92 cfs 16.299 af

Pond 8.2AP: Potentially Non-Contributing Peak Elev=215.55' Storage=9,479 cf Inflow=3.25 cfs 0.404 af
Outflow=1.01 cfs 0.204 af

Pond 8.2BP: Peak Elev=200.08' Storage=9,953 cf Inflow=8.35 cfs 1.045 af
Outflow=6.04 cfs 0.972 af

Pond 8.2CP: Peak Elev=182.50' Storage=17,137 cf Inflow=5.27 cfs 0.733 af
Outflow=1.65 cfs 0.385 af

Pond 8.3AP: Peak Elev=200.61' Storage=4,736 cf Inflow=5.97 cfs 0.708 af
Outflow=5.96 cfs 0.608 af

Pond 8.3BP: Peak Elev=201.63' Storage=152 cf Inflow=2.37 cfs 0.364 af
Outflow=2.36 cfs 0.364 af

Pond 8.3CP: Peak Elev=155.12' Storage=15,455 cf Inflow=6.11 cfs 1.355 af
Outflow=5.87 cfs 1.057 af

Pond 8.4AP: Peak Elev=209.62' Storage=32,380 cf Inflow=6.01 cfs 0.743 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 8.4BP: Peak Elev=182.48' Storage=513 cf Inflow=3.98 cfs 0.601 af
Outflow=3.97 cfs 0.596 af

Pond 8.4CP: Peak Elev=161.55' Storage=16,552 cf Inflow=5.82 cfs 0.840 af
Primary=0.88 cfs 0.137 af Secondary=2.35 cfs 0.366 af Outflow=3.23 cfs 0.504 af

Pond 8.5AP: Peak Elev=205.90' Storage=16,425 cf Inflow=9.10 cfs 0.908 af
Primary=3.35 cfs 0.389 af Secondary=1.76 cfs 0.205 af Outflow=5.11 cfs 0.594 af

Pond 8.5BP: Peak Elev=168.15' Storage=14,151 cf Inflow=5.64 cfs 0.896 af
Primary=0.49 cfs 0.317 af Secondary=3.79 cfs 0.398 af Outflow=4.28 cfs 0.715 af

Pond 8.5CP: Peak Elev=160.46' Storage=37,167 cf Inflow=6.26 cfs 0.853 af
Outflow=0.00 cfs 0.000 af

Pond 8.6AP: Peak Elev=198.61' Storage=1,343 cf Inflow=4.00 cfs 0.484 af
Outflow=4.00 cfs 0.461 af

Pond 8.6BP: Peak Elev=158.18' Storage=101,450 cf Inflow=15.80 cfs 2.329 af
Outflow=0.00 cfs 0.000 af

Pond 8.6CP1: Peak Elev=160.93' Storage=27,012 cf Inflow=16.31 cfs 2.936 af
Outflow=15.20 cfs 2.576 af

Pond 8.6CP2: Peak Elev=158.96' Storage=19,821 cf Inflow=15.20 cfs 2.576 af
Outflow=12.41 cfs 2.449 af

Pond 8.7CP: Peak Elev=157.65' Storage=4,447 cf Inflow=2.00 cfs 0.229 af
Outflow=1.13 cfs 0.134 af

Pond 8P: Option 3 Weir Control 25 Yr Peak Elev=123.97' Storage=7.018 af Inflow=160.07 cfs 57.296 af
Primary=56.25 cfs 51.958 af Secondary=0.00 cfs 0.000 af Tertiary=31.23 cfs 5.337 af Outflow=87.48 cfs 57.295 af

Pond 800P: Pond on YWD Peak Elev=120.10' Storage=37,227 cf Inflow=132.37 cfs 69.969 af
Outflow=131.68 cfs 69.969 af

Pond C6P: 357+50 Peak Elev=0.00' Storage=0 cf
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af

Pond C8AP: Peak Elev=183.26' Storage=299,608 cf Inflow=78.05 cfs 12.608 af
24.0" Round Culvert n=0.025 L=51.5' S=0.0291 '/' Outflow=10.46 cfs 12.608 af

Pond C8BP: Peak Elev=165.29' Storage=273,119 cf Inflow=69.86 cfs 12.824 af
18.0" Round Culvert n=0.013 L=51.5' S=0.0097 '/' Outflow=11.71 cfs 12.769 af

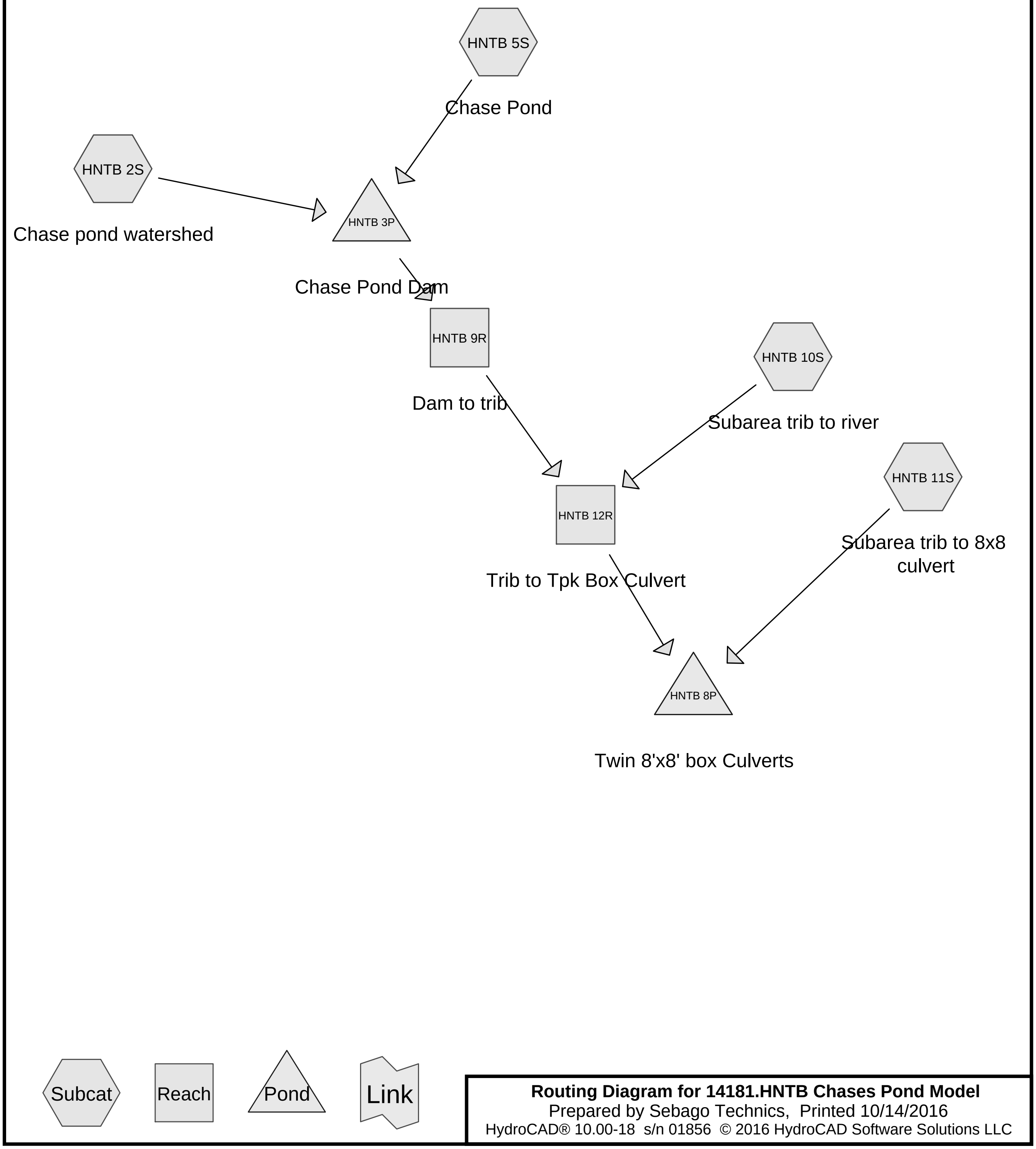
Pond UDF8P: STA353+50 RIGHT UDF Peak Elev=147.11' Storage=6,808 cf Inflow=11.84 cfs 0.937 af
Primary=2.36 cfs 0.741 af Secondary=9.24 cfs 0.196 af Outflow=11.60 cfs 0.937 af

Pond UDF9P: STA355+00 RIGHT UDF Peak Elev=146.96' Storage=5,865 cf Inflow=7.51 cfs 0.596 af
Primary=2.30 cfs 0.525 af Secondary=4.53 cfs 0.071 af Outflow=6.83 cfs 0.596 af

Link 1L: (new 25-YR Primary Outflow Imported from 14181.HNTB Chases Pond Model~Pond 8P.hce Inflow=360.51 cfs 529.017 af
Area= 2,130.640 ac 7.98% Imperv. Primary=360.51 cfs 529.017 af

Total Runoff Area = 295.856 ac Runoff Volume = 95.313 af Average Runoff Depth = 3.87"
90.68% Pervious = 268.277 ac 9.32% Impervious = 27.579 ac

Link Report (HNTB) Chases Pond Model



Routing Diagram for 14181.HNTB Chases Pond Model
Prepared by Sebago Technics, Printed 10/14/2016
HydroCAD® 10.00-18 s/n 01856 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
31.180	77	2 acre lots, 12% imp, HSG C (HNTB 10S)
170.000	98	Pond (HNTB 5S)
12.460	76	Woods/grass comb., Fair, HSG C (HNTB 11S)
1,917.000	84	Woods/grass comb., Fair, HSG D (HNTB 2S)
2,130.640	**85**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HNTB 10S: Subarea trib to river Runoff Area=31.180 ac 12.00% Impervious Runoff Depth=1.28"
Flow Length=2,350' Tc=23.3 min CN=77 Runoff=28.76 cfs 3.336 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert Runoff Area=12.460 ac 0.00% Impervious Runoff Depth=1.22"
Flow Length=725' Tc=18.6 min CN=76 Runoff=11.93 cfs 1.269 af

Subcatchment HNTB 2S: Chase pond watershed Runoff Area=1,917.000 ac 0.00% Impervious Runoff Depth=1.77"
Tc=25.0 min CN=84 Runoff=2,427.21 cfs 282.184 af

Subcatchment HNTB 5S: Chase Pond Runoff Area=170.000 ac 100.00% Impervious Runoff Depth=3.07"
Tc=21.2 min CN=98 Runoff=361.61 cfs 43.451 af

Reach HNTB 12R: Trib to Tpk Box Culvert Avg. Flow Depth=2.80' Max Vel=5.01 fps Inflow=79.18 cfs 182.069 af
n=0.035 L=950.0' S=0.0103 '/' Capacity=599.53 cfs Outflow=78.69 cfs 181.594 af

Reach HNTB 9R: Dam to trib Avg. Flow Depth=0.92' Max Vel=5.89 fps Inflow=53.37 cfs 178.949 af
n=0.035 L=530.0' S=0.0283 '/' Capacity=1,955.10 cfs Outflow=53.37 cfs 178.734 af

Pond HNTB 3P: Chase Pond Dam Peak Elev=157.46' Storage=258.115 af Inflow=2,769.27 cfs 325.635 af
Outflow=53.37 cfs 178.949 af

Pond HNTB 8P: Twin 8'x8' box Culverts Inflow=88.29 cfs 182.863 af
Primary=88.29 cfs 182.863 af

Total Runoff Area = 2,130.640 ac Runoff Volume = 330.240 af Average Runoff Depth = 1.86"
91.85% Pervious = 1,956.898 ac 8.15% Impervious = 173.742 ac

Summary for Subcatchment HNTB 10S: Subarea trib to river

Runoff = 28.76 cfs @ 12.34 hrs, Volume= 3.336 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (ac)	CN	Description
31.180	77	2 acre lots, 12% imp, HSG C
27.438		88.00% Pervious Area
3.742		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	100	0.0162	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
11.1	2,000	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.2	250	0.0400	3.50	10.51	**Channel Flow,** Area= 3.0 sf Perim= 4.0' r= 0.75' n= 0.070 Sluggish weedy reaches w/pools
23.3	2,350	Total			

Summary for Subcatchment HNTB 11S: Subarea trib to 8x8 culvert

Runoff = 11.93 cfs @ 12.27 hrs, Volume= 1.269 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

Area (ac)	CN	Description
12.460	76	Woods/grass comb., Fair, HSG C
12.460		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0150	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
7.2	625	0.0848	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.6	725	Total			

Summary for Subcatchment HNTB 2S: Chase pond watershed

Runoff = 2,427.21 cfs @ 12.35 hrs, Volume= 282.184 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	1,917.000	84	Woods/grass comb., Fair, HSG D
	1,917.000		100.00% Pervious Area

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

Summary for Subcatchment HNTB 5S: Chase Pond

Runoff = 361.61 cfs @ 12.28 hrs, Volume= 43.451 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 02-YR Rainfall=3.30"

	Area (ac)	CN	Description
*	170.000	98	Pond
	170.000		100.00% Impervious Area

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

Summary for Reach HNTB 12R: Trib to Tpk Box Culvert

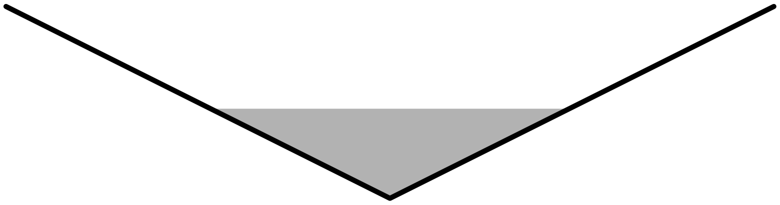
[62] Hint: Exceeded Reach HNTB 9R OUTLET depth by 1.91' @ 12.40 hrs

Inflow Area = 2,118.180 ac, 8.20% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 79.18 cfs @ 12.35 hrs, Volume= 182.069 af
Outflow = 78.69 cfs @ 12.45 hrs, Volume= 181.594 af, Atten= 1%, Lag= 5.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.01 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 4.19 fps, Avg. Travel Time= 3.8 min

Peak Storage= 14,919 cf @ 12.40 hrs
Average Depth at Peak Storage= 2.80'
Bank-Full Depth= 6.00' Flow Area= 72.0 sf, Capacity= 599.53 cfs

0.00' x 6.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 24.00'
Length= 950.0' Slope= 0.0103 '/'
Inlet Invert= 130.00', Outlet Invert= 120.20'



Summary for Reach HNTB 9R: Dam to trib

[81] Warning: Exceeded Pond HNTB 3P by 2.20' @ 0.00 hrs

Inflow Area = 2,087.000 ac, 8.15% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af
Outflow = 53.37 cfs @ 23.99 hrs, Volume= 178.734 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.89 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 5.30 fps, Avg. Travel Time= 1.7 min

Peak Storage= 4,804 cf @ 23.97 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,955.10 cfs

8.00' x 6.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 32.00'
Length= 530.0' Slope= 0.0283 '/'
Inlet Invert= 145.00', Outlet Invert= 130.00'

Summary for Pond HNTB 3P: Chase Pond Dam

Inflow Area = 2,087.000 ac, 8.15% Impervious, Inflow Depth = 1.87" for 02-YR event
Inflow = 2,769.27 cfs @ 12.34 hrs, Volume= 325.635 af
Outflow = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af, Atten= 98%, Lag= 696.7 min
Primary = 53.37 cfs @ 23.95 hrs, Volume= 178.949 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 157.46' @ 23.95 hrs Surf.Area= 136.327 ac Storage= 258.115 af

Plug-Flow detention time= 1,039.0 min calculated for 178.770 af (55% of inflow)
Center-of-Mass det. time= 925.6 min (1,761.2 - 835.6)

Volume	Invert	Avail.Storage	Storage Description
#1	142.80'	859.250 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
142.80	0.000	0.000	0.000
154.00	1.000	5.600	5.600
155.00	25.000	13.000	18.600
156.70	135.500	136.425	155.025
157.00	136.000	40.725	195.750
157.70	136.500	95.375	291.125
158.00	137.000	41.025	332.150
159.00	138.000	137.500	469.650
160.00	139.000	138.500	608.150
161.80	140.000	251.100	859.250

Device	Routing	Invert	Outlet Devices
#1	Primary	142.80'	**18.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600
#2	Primary	157.70'	**90.0 deg x 35.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.50 (C= 3.13)
#3	Primary	161.80'	**300.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=53.37 cfs @ 23.95 hrs HW=157.46' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 53.37 cfs @ 17.79 fps)
—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond HNTB 8P: Twin 8'x8' box Culverts

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,130.640 ac, 8.15% Impervious, Inflow Depth > 1.03" for 02-YR event
Inflow = 88.29 cfs @ 12.41 hrs, Volume= 182.863 af
Primary = 88.29 cfs @ 12.41 hrs, Volume= 182.863 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.05 hrs

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
31.180	77	2 acre lots, 12% imp, HSG C (HNTB 10S)
170.000	98	Pond (HNTB 5S)
12.460	76	Woods/grass comb., Fair, HSG C (HNTB 11S)
1,917.000	84	Woods/grass comb., Fair, HSG D (HNTB 2S)
2,130.640	**85**	**TOTAL AREA**

Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HNTB 10S: Subarea trib to river Runoff Area=31.180 ac 12.00% Impervious Runoff Depth=2.54"
Flow Length=2,350' Tc=23.3 min CN=77 Runoff=58.39 cfs 6.599 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert Runoff Area=12.460 ac 0.00% Impervious Runoff Depth=2.45"
Flow Length=725' Tc=18.6 min CN=76 Runoff=24.74 cfs 2.547 af

Subcatchment HNTB 2S: Chase pond watershed Runoff Area=1,917.000 ac 0.00% Impervious Runoff Depth=3.18"
Tc=25.0 min CN=84 Runoff=4,354.15 cfs 507.858 af

Subcatchment HNTB 5S: Chase Pond Runoff Area=170.000 ac 100.00% Impervious Runoff Depth=4.66"
Tc=21.2 min CN=98 Runoff=540.85 cfs 66.064 af

Reach HNTB 12R: Trib to Tpk Box Culvert Avg. Flow Depth=3.77' Max Vel=6.11 fps Inflow=173.30 cfs 327.635 af
n=0.035 L=950.0' S=0.0103 '/' Capacity=599.53 cfs Outflow=173.30 cfs 327.189 af

Reach HNTB 9R: Dam to trib Avg. Flow Depth=1.76' Max Vel=8.42 fps Inflow=171.01 cfs 321.223 af
n=0.035 L=530.0' S=0.0283 '/' Capacity=1,955.10 cfs Outflow=171.01 cfs 321.036 af

Pond HNTB 3P: Chase Pond Dam Peak Elev=158.71' Storage=429.472 af Inflow=4,871.07 cfs 573.922 af
Outflow=171.01 cfs 321.223 af

Pond HNTB 8P: Twin 8'x8' box Culverts Inflow=174.19 cfs 329.736 af
Primary=174.19 cfs 329.736 af

Total Runoff Area = 2,130.640 ac Runoff Volume = 583.068 af Average Runoff Depth = 3.28"
91.85% Pervious = 1,956.898 ac 8.15% Impervious = 173.742 ac

Time span=0.00-50.00 hrs, dt=0.05 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HNTB 10S: Subarea trib to river Runoff Area=31.180 ac 12.00% Impervious Runoff Depth=3.65"
Flow Length=2,350' Tc=23.3 min CN=77 Runoff=84.31 cfs 9.495 af

Subcatchment HNTB 11S: Subarea trib to 8x8 culvert Runoff Area=12.460 ac 0.00% Impervious Runoff Depth=3.55"
Flow Length=725' Tc=18.6 min CN=76 Runoff=35.97 cfs 3.690 af

Subcatchment HNTB 2S: Chase pond watershed Runoff Area=1,917.000 ac 0.00% Impervious Runoff Depth=4.38"
Tc=25.0 min CN=84 Runoff=5,953.24 cfs 700.347 af

Subcatchment HNTB 5S: Chase Pond Runoff Area=170.000 ac 100.00% Impervious Runoff Depth=5.96"
Tc=21.2 min CN=98 Runoff=685.99 cfs 84.457 af

Reach HNTB 12R: Trib to Tpk Box Culvert Avg. Flow Depth=4.94' Max Vel=7.32 fps Inflow=357.78 cfs 522.494 af
n=0.035 L=950.0' S=0.0103 '/' Capacity=599.53 cfs Outflow=357.77 cfs 522.078 af

Reach HNTB 9R: Dam to trib Avg. Flow Depth=2.59' Max Vel=10.34 fps Inflow=352.95 cfs 513.173 af
n=0.035 L=530.0' S=0.0283 '/' Capacity=1,955.10 cfs Outflow=352.94 cfs 512.999 af

Pond HNTB 3P: Chase Pond Dam Peak Elev=159.57' Storage=548.305 af Inflow=6,611.85 cfs 784.803 af
Outflow=352.95 cfs 513.173 af

Pond HNTB 8P: Twin 8'x8' box Culverts Inflow=359.62 cfs 525.767 af
Primary=359.62 cfs 525.767 af

Total Runoff Area = 2,130.640 ac Runoff Volume = 797.988 af Average Runoff Depth = 4.49"
91.85% Pervious = 1,956.898 ac 8.15% Impervious = 173.742 ac

Appendix 4

Highway Closed Drainage System Calculations

Appendix 5

Inspection, Maintenance and Housekeeping Plan

INSPECTION, MAINTENANCE AND HOUSEKEEPING PLAN

York Toll Plaza
York, ME

Introduction

The Maine Turnpike Authority (MTA) will be responsible for maintaining the stormwater management system for the new toll plaza administrative building and associated administrative access driveway and parking. During construction, the site contractor shall be the responsible party for inspecting and maintaining the stormwater management system.

The following plan outlines the anticipated inspection, maintenance, and housekeeping procedures for the stormwater management devices proposed for the toll plaza administrative facilities. The “After Construction” includes recommendations for the administrative lot and access driveway as well the portions of the highway drainage/treatment system.

The procedures outlined in the Inspection, Maintenance, and Housekeeping Plan is provided as an overview of the anticipated practices to be used on this site. In some instances, additional measures may be required due to unexpected conditions. For additional details on any of the erosion and sedimentation control measures or stormwater management devices to be utilized on this project, refer to the most recently revised edition of the “Maine Erosion and Sedimentation Control BMP” manual and/or the “Stormwater Management for Maine: Best Management Practices” manual as published by the MDEP.

Administrative Building, Access Drive, Parking Lot

After Construction

1. **Inspection:** After construction, the owner shall annually inspect the BMPs, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

2. **Maintenance, and repair:** If a BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner shall take corrective actions to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall record the deficiency and corrective action(s) taken. The following is a list of permanent erosion control and stormwater management measures and the inspection, maintenance, and housekeeping tasks to be performed after construction.

   A. Vegetated Areas:
      - Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems.
      - Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. Ditches, Swales, and Other Open Channels:
      - Inspect ditches, swales and other open stormwater channels in the spring, in the late fall, and after heavy rains to remove any obstructions to flow. Remove accumulated sediments and debris, remove woody vegetative growth that could obstruct flow, and repair any erosion of the ditch lining.
      - Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity.
      - Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable.
      - If the ditch has a riprap lining, replace riprap in areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged.

   C. Culverts:
      - Inspect culverts in the spring, in the late fall, and after heavy rains to remove any obstructions to flow.
      - Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit.
      - Inspect and repair any erosion damage at the culvert's inlet and outlet.

D. Level Lip Spreaders and Ditch Turnouts:

- The level spreader pool should be inspected after significant rainfall events for sediment accumulation and debris that may reduce its capacity. Sediment and debris buildup should be removed once the volume of the pool has been reduced by 25%.
- The level lip must be constructed so that runoff flows slowly over the lip to a sheet flow through the receiving buffer. Repair or reconstruction of the level lip is required when flow from the spreader becomes channelized.
- Do not store snow removed from the street and/or parking lot within the area of a level spreader.

E. Forested / Meadow Buffers

- Inspect and repair any eroded areas within the buffer.
- Reestablish vegetation within the buffer destroyed by post construction activities.

F. Underdrained Grass Filter

- The inlet and outlet of the BMP shall be checked periodically to ensure that flow structures are not blocked by debris. Inspections should be conducted monthly during wet weather conditions from March to November.
- Debris and sediment buildup shall be removed from the forebay and basin upon reaching a 6-inch accumulation within the forebay and 2 inches within the basin, but not less than annually.
- Mowing of grass may be conducted semiannually to a height of no less than 6-inches, with hand held trimmers or push mowers
- Grass filters shall be inspected annually for erosion, destabilization of sideslopes, embankment settling and other signs of structural failure. Corrective action should be taken immediately upon identification of problems.
- Rototill top of filter bed when ponding exceeds 48 hours
- Replace top several inches of filter material when ponding exceeds 72 hours

G. Winter Sanding:

- Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring.
- Accumulations on pavement may be removed by pavement sweeping.
- Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader or other acceptable method.

H. Catch Basins:

- Inspect and, if required, clean-out catch basins at least once a year, preferably in early spring.
- Clean out must include the removal and legal disposal of accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins.

Highway Closed Drainage System

After Construction

1. **Inspection:** After construction, the owner shall annually inspect the BMPs, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

2. **Maintenance, and repair:** If a BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner shall take corrective actions to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall record the deficiency and corrective action(s) taken. The following is a list of permanent erosion control and stormwater management measures and the inspection, maintenance, and housekeeping tasks to be performed after construction.

   I. Vegetated Areas:
   - Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems.
   - Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   J. Ditches, Swales and Other Open Channels:
   - Inspect ditches, swales, and other open stormwater channels in the spring, in the late fall, and after heavy rains to remove any obstructions to the flow. Remove accumulated sediments and debris, remove woody vegetative growth that could obstruct flow and repair any erosion of the ditch lining.
   - Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity.
   - Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable.
   - Replace riprap in areas where any underlying filter fabric or underlying gravel is showing through the stone or where stones have dislodged.

   K. Underdrained Grass Filter
   - The inlet and outlet of the BMP shall be checked periodically to ensure that flow structures are not blocked by debris. Inspections should be conducted monthly during wet weather conditions from March to November.
   - Debris and sediment buildup shall be removed from the forebay and basin upon reaching a 6-inch accumulation within the forebay and 2 inches within the basin, but not less than annually.
   - Mowing of grass may be conducted semiannually to a height of no less than 6-inches, with hand held trimmers or push mowers

- Grass filters shall be inspected annually for erosion, destabilization of sideslopes, embankment settling and other signs of structural failure. Corrective action should be taken immediately upon identification of problems.
- Rototill top of filter bed when ponding exceeds 48 hours
- Replace top several inches of filter material when ponding exceeds 72 hours

L. Catch Basins:

- Inspect and, if required, clean-out catch basins at least once a year, preferably in early spring.
- Clean out must include the removal and legal disposal of accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins.

M. Culverts:

- Inspect culverts in the spring, in the late fall, and after heavy rains to remove any obstructions to flow.
- Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit.
- Inspect and repair any erosion damage at the culvert's inlet and outlet.
- Inspect embankment for erosion, settling, and structural failure.

Attachments

Attachment 1 –	Sample Stormwater Inspection and Maintenance Form Administrative Building, access driveway and Parking Lot
Attachment 2 –	Sample Stormwater Inspection and Maintenance Form Highway Closed Drainage System

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Sample Stormwater Inspection and Maintenance Form

York Toll Plaza; York, ME
Administrative Building, Access Driveway, and Parking Lot
Attachment 1

This log is intended to accompany the stormwater Inspection, Maintenance and Housekeeping Plan for the Administrative Building, Access Driveway, and Parking Lot. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

Item	Maintenance Required & Frequency	Date Completed	Maintenance Personnel	Comments
Vegetated Areas	Inspect Slopes			
	Replant Bare Areas			
	Check after Major Storms			
Ditches and Swales	Inspect after major rainfall event producing greater than 3" of rain in 2 hours.			
	Repair erosion or damage immediately.			
Level Lip Spreaders	Inspect after significant rainfall			
	Remove sediment if pool volume reduced by 25%			
	Repair the riprap if flow become channelized			
Winter Sanding	Clean annually (Spring)			
	Remove sand and sediment from roadway shoulders			
Underdrained Grass Filter	Inspect inlets/outlets to ensure no blockage from debris			
	Inspect sideslopes annually for erosion, destabilization, and embankment settling.			
Stormtech	Follow manufacturer's recommendations			
Catch Basins and Culverts	Remove accumulated sediment and debris			
	Sump depth			

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Sample Stormwater Inspection and Maintenance Form

York Toll Plaza; York, ME
Highway Closed Drainage System
Attachment 2

This log is intended to accompany the stormwater Inspection, Maintenance and Housekeeping Plan for the Highway Closed Drainage System. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

Item	Maintenance Required & Frequency	Date Completed	Maintenance Personnel	Comments
Vegetated Areas	Inspect Slopes			
	Replant Bare Areas			
	Check after Major Storms			
Ditches and Swales	Inspect after major rainfall event producing greater than 3" of rain in 2 hours.			
	Repair erosion or damage immediately.			
Underdrained Grass Filter	Inspect inlets/outlets to ensure no blockage from debris			
	Inspect sideslopes annually for erosion, destabilization, and embankment settling.			
Catch Basins and Culverts	Remove accumulated sediment and debris			
	Sump depth			

Date:10/17/2016

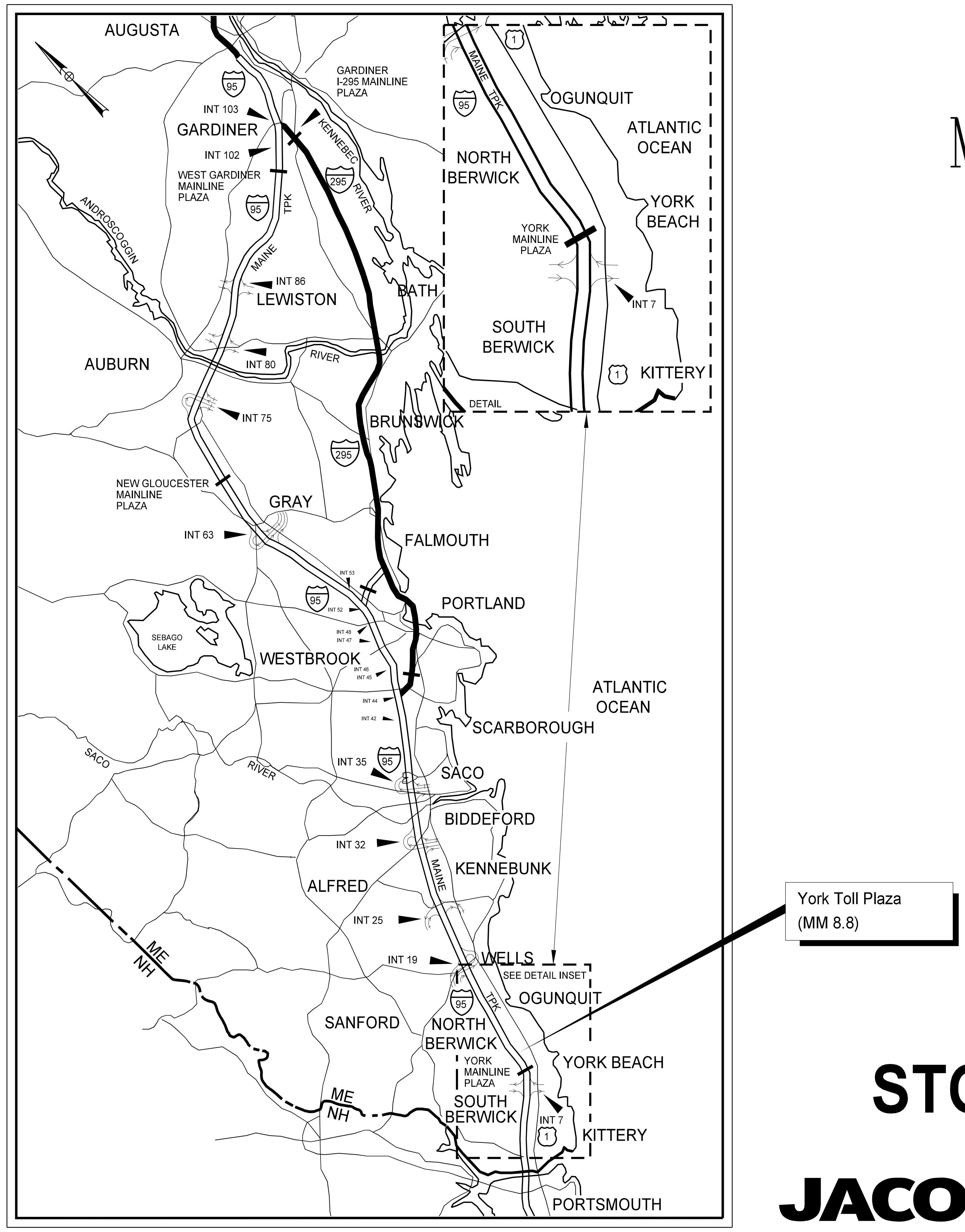
MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MAINE TURNPIKE AUTHORITY

DANIEL E. WATHEN, CHAIR
ROBERT D. STONE, VICE CHAIR
MICHAEL J. CIANCHETTE, MEMBER
BRYAN P. CUTCHEN, MEMBER
JOHN E. DORITY, MEMBER
FREEMAN R. GOODRICH, MEMBER
KAREN S. DOYLE, MEMBER EX-OFFICIO

S. PETER MILLS, EXECUTIVE DIRECTOR



LOCATION MAP

YORK TOLL PLAZA
MM 7.0 to MM 9.5
CONTRACT 2017.09

STORMWATER MANAGEMENT PLAN
APPENDIX 1

JACOBS

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	PRE-WATERSHED PLAN of YORK TOLL PLAZA REPLACEMENT PROJECT
3	PRE-WATERSHED PLAN of YORK TOLL PLAZA REPLACEMENT PROJECT
4	POST-WATERSHED PLAN of YORK TOLL PLAZA REPLACEMENT PROJECT
5	POST-WATERSHED PLAN of YORK TOLL PLAZA REPLACEMENT PROJECT
6	WATERSHED PLAN of CHASES POND & CAPE NEDDICK RIVER
7-28	STORMWATER TREATMENT PLANS
29	ACCESS ROAD BUFFER/TREATMENT PLAN
30-34	STORMWATER PONDS
-	ACCESS ROAD GRADING AND DRAINAGE PLANS
-	ADMINISTRATIVE BUILDING GRADING PLAN
-	ADMINISTRATIVE BUILDING DRAINAGE PLAN
-	DETAILS

SEBAGO TECHNICS
CIVIL ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE

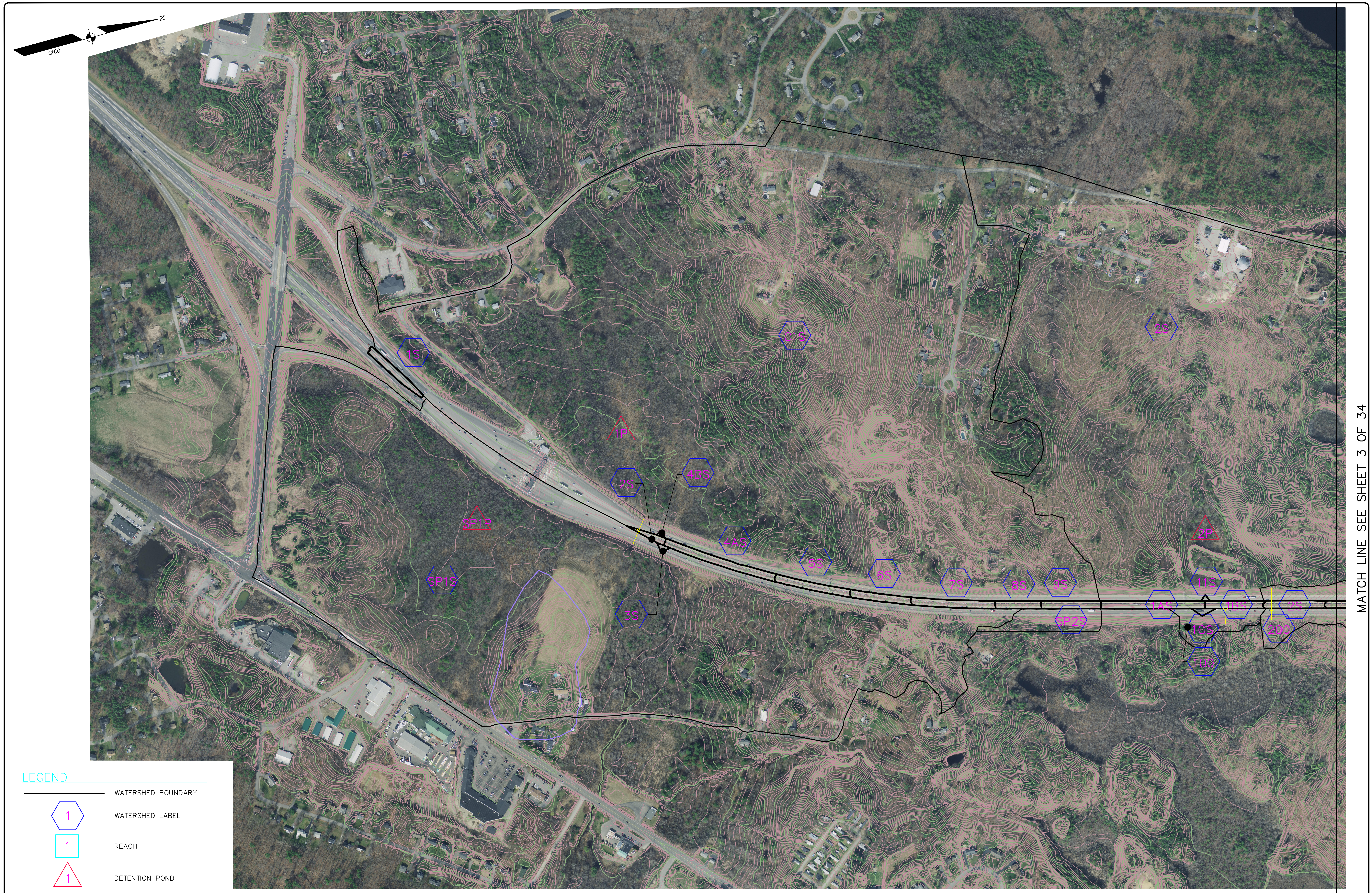
Daniel L Riley
DANIEL L. RILEY, SR. PROJECT MANAGER

DANIEL L RILEY No. 9967

10/17/2016
DATE

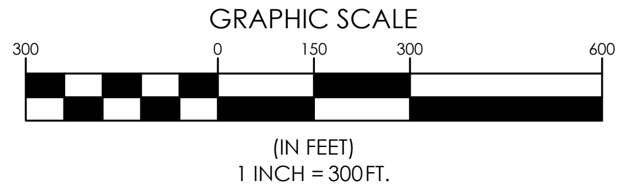
PERMITTING PLANS
10/17/2016

Filename: ...\MSTA\001_SWMP_Title_01.dgn



LEGEND

▬	WATERSHED BOUNDARY
⬡ 1	WATERSHED LABEL
□ 1	REACH
△ 1	DETENTION POND
▬	HYDROLOGIC SOIL GROUP A
▬	HYDROLOGIC SOIL GROUP B
▬	HYDROLOGIC SOIL GROUP C
▬	HYDROLOGIC SOIL GROUP D



(IN FEET)
1 INCH = 300 FT.

DANIEL L. RILEY

DANIEL L RILEY
10-17-2016

DESIGNED	CHECKED
DLR	PDO

REV:	BY:	DATE:	STATUS:
A	GJH	10-17-16	ISSUED FOR PERMIT APPLICATION

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Tel. 207-200-2100

250 Goddard Rd.
Suite B
Lewiston, ME 04240
Tel. 207-783-5656

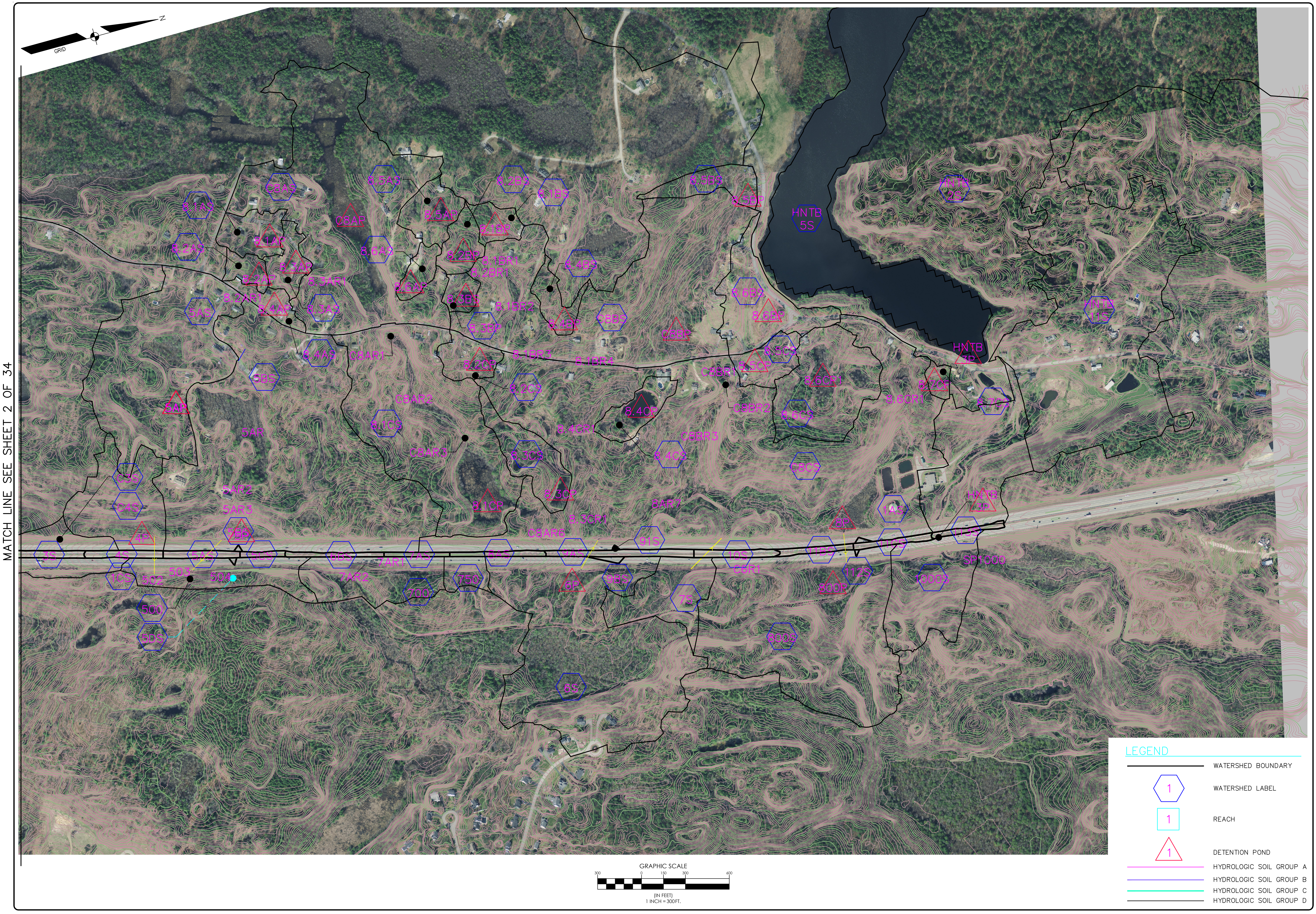
PRE WATERSHED PLAN
OF:
YORK TOLL PLAZA
REPLACEMENT PROJECT

FOR:
MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, ME 04102

PROJECT NO.	SCALE
14181	1" = 300'

SHEET 2 OF 34

14181.watershed PRE_2016-10-17.dwg, TAB:PRE1 (22X34)



DANIEL L. RILEY

STATE OF MAINE
DANIEL L. RILEY
No. 9967
LICENSED
PROFESSIONAL ENGINEER
10-17-2016

DESIGNED	CHECKED
DLR	PDO

REV:	BY:	DATE:	STATUS:
A	GJH	10-17-16	ISSUED FOR PERMIT APPLICATION

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Tel. 207-783-5656

PRE WATERSHED PLAN

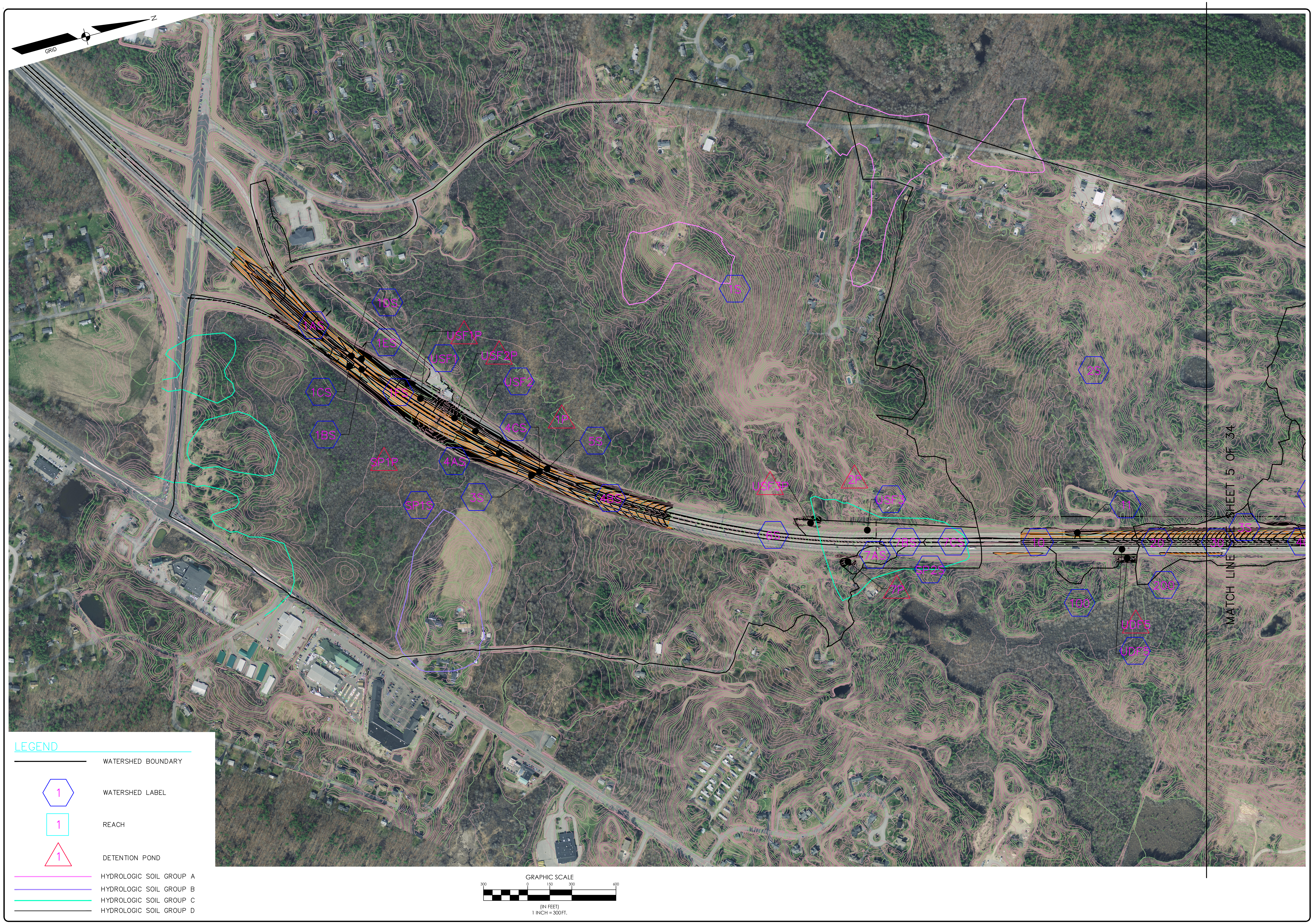
OF:
YORK TOLL PLAZA REPLACEMENT PROJECT

FOR:
MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, ME 04102

PROJECT NO.	SCALE
14181	1" = 300'

SHEET 3 OF 34

14181.watershed PRE_2016-10-17.dwg, TAB:PRE2 (22X34)



DANIEL L. RILEY

STATE OF MAINE
DANIEL
L
RILEY
No. 9967
LICENSED
PROFESSIONAL ENGINEER
10-17-2016

DESIGNED	CHECKED
DLR	PDO

REV:	BY:	DATE:	STATUS:
A	GJH	10-17-16	ISSUED FOR PERMIT APPLICATION

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Lewiston, ME 04240
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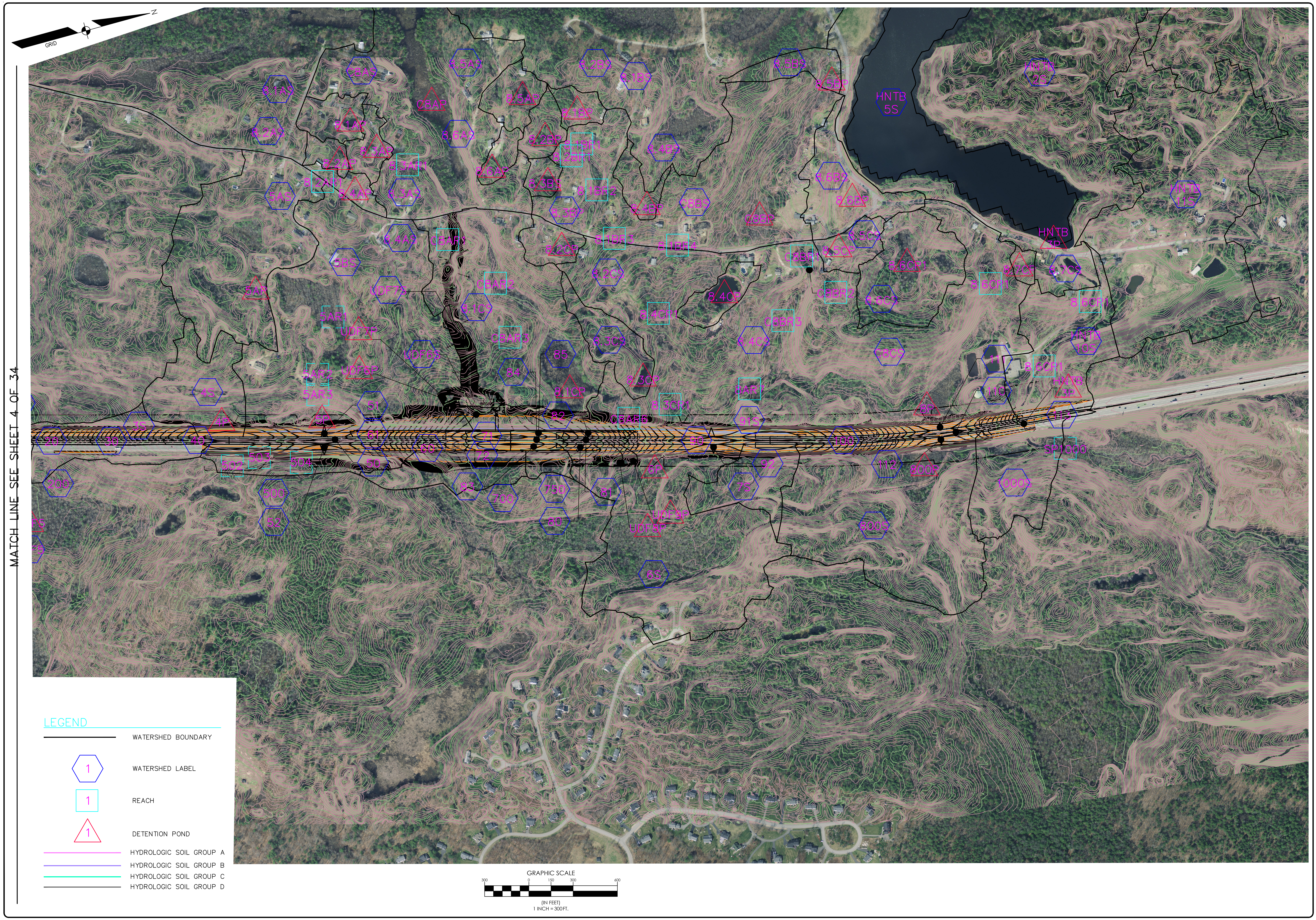
POST WATERSHED PLAN
OF:
YORK TOLL PLAZA
REPLACEMENT PROJECT

FOR:
MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, ME 04102

PROJECT NO.	SCALE
14181	1" = 300'

SHEET 4 OF 34

14181.watershed POST_2016-10-14.dwg, TAB:POST1 (22X34)



LEGEND

―	WATERSHED BOUNDARY
⬡ 1	WATERSHED LABEL
☐ 1	REACH
△ 1	DETENTION POND
―	HYDROLOGIC SOIL GROUP A
―	HYDROLOGIC SOIL GROUP B
―	HYDROLOGIC SOIL GROUP C
―	HYDROLOGIC SOIL GROUP D

DANIEL L. RILEY

STATE OF MAINE
DANIEL L. RILEY
No. 9967
10-17-2016

DESIGNED	CHECKED
DLR	PDO

REV:	BY:	DATE:	STATUS:
A	GJH	10-17-16	ISSUED FOR PERMIT APPLICATION

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Tel. 207-783-5656

POST WATERSHED PLAN

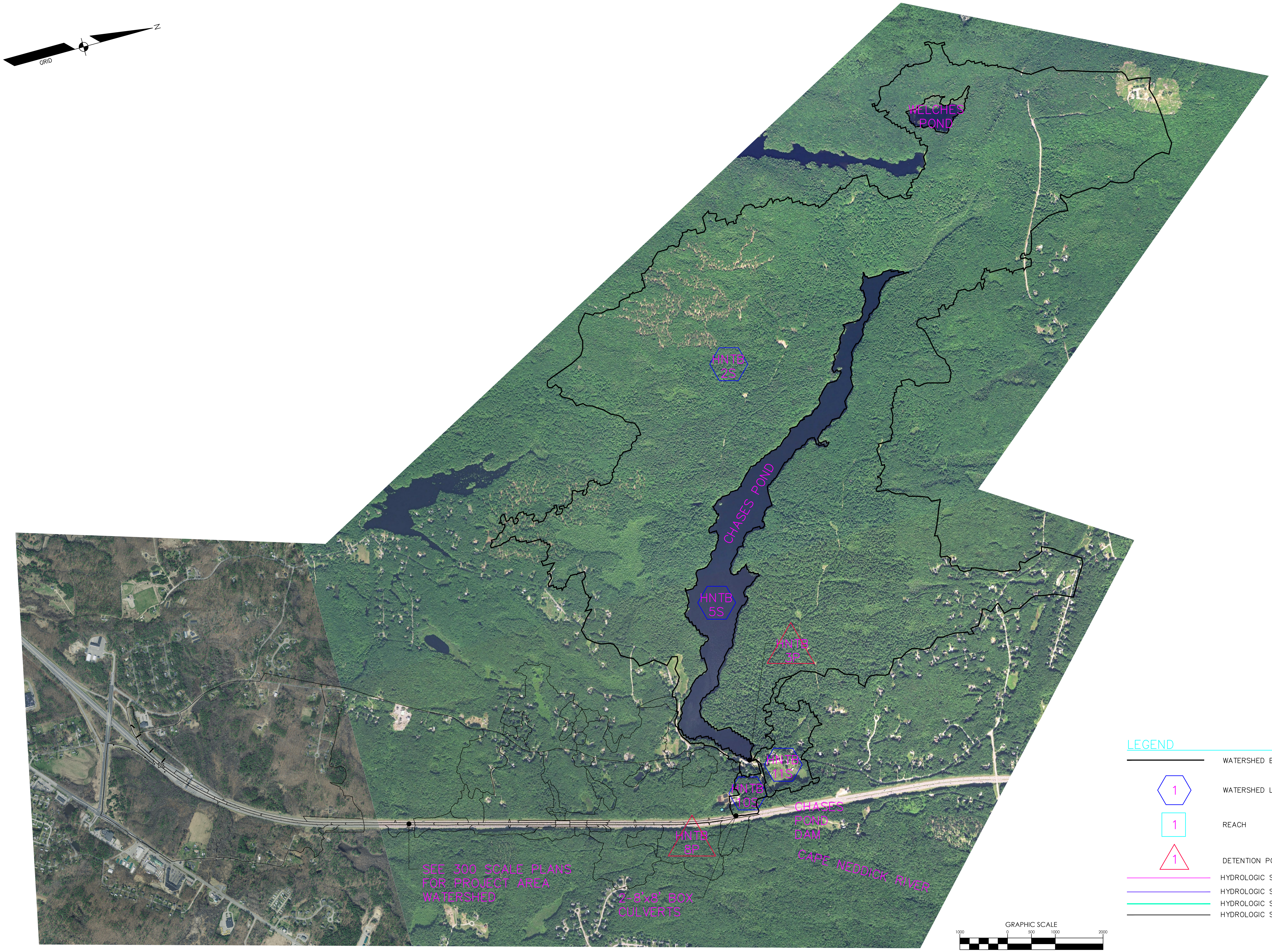
OF:
YORK TOLL PLAZA REPLACEMENT PROJECT

FOR:
MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, ME 04102

PROJECT NO.	SCALE
14181	1" = 300'

SHEET 5 OF 34

14181.watershed POST_2016-10-14.dwg, TAB:POST2 (22X34)



LEGEND

▬	WATERSHED BOUNDARY
⬡ 1	WATERSHED LABEL
▢ 1	REACH
△ 1	DETENTION POND
▬	HYDROLOGIC SOIL GROUP A
▬	HYDROLOGIC SOIL GROUP B
▬	HYDROLOGIC SOIL GROUP C
▬	HYDROLOGIC SOIL GROUP D

GRAPHIC SCALE

1000 0 500 1000 2000

(IN FEET)
1 INCH =1000FT.

DANIEL L. RILEY

STATE OF MAINE
DANIEL L. RILEY
No. 9037
LICENSED
PROFESSIONAL ENGINEER

10-17-2016

DESIGNED	CHECKED
DLR	PDO

REV:	BY:	DATE:	STATUS:
A	GJH	10-17-16	ISSUED FOR PERMIT APPLICATION

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Lewiston, ME 04240
Tel. 207-783-5656

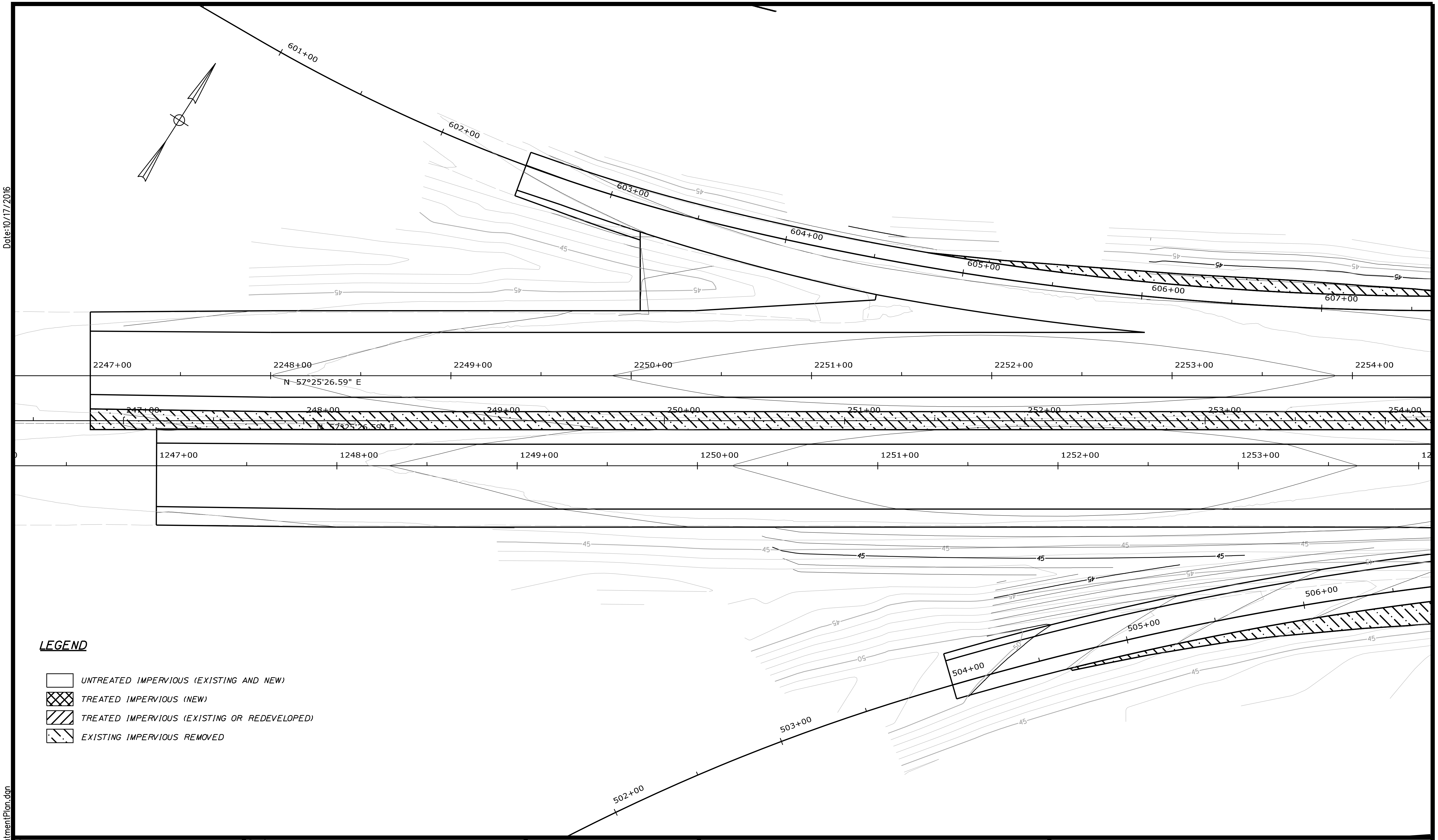
WATERSHED PLAN
OF:
CHASES POND AND CAPE NEDDICK RIVER
FOR:
MAINE TURNPIKE AUTHORITY
2360 CONGRESS STREET
PORTLAND, ME 04102

PROJECT NO.	SCALE
14181	1" = 1000'

SHEET 6 OF 34

14181.watershed POST_2016-10-14.dwg, TAB:CHASES POND WS (22x34)

Date:10/17/2016



LEGEND

- ☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)
- ▩ TREATED IMPERVIOUS (NEW)
- ▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
- ▧ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 1

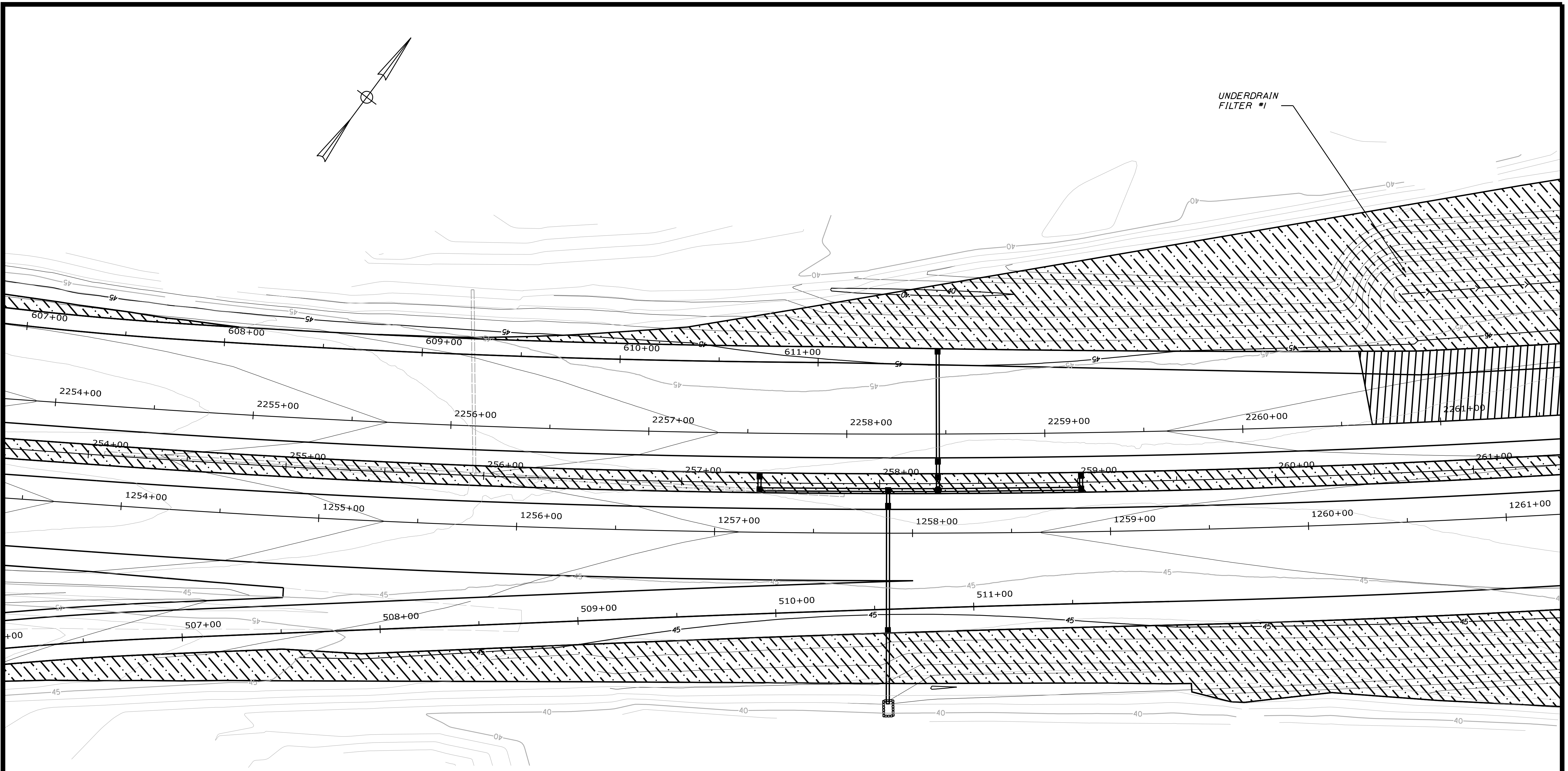
SHEET NUMBER: 7

CONTRACT:2017.09

7 OF 34

Filename: ...\MSTA101_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*

▩ *TREATED IMPERVIOUS (NEW)*

▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*

⛆ *EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 2

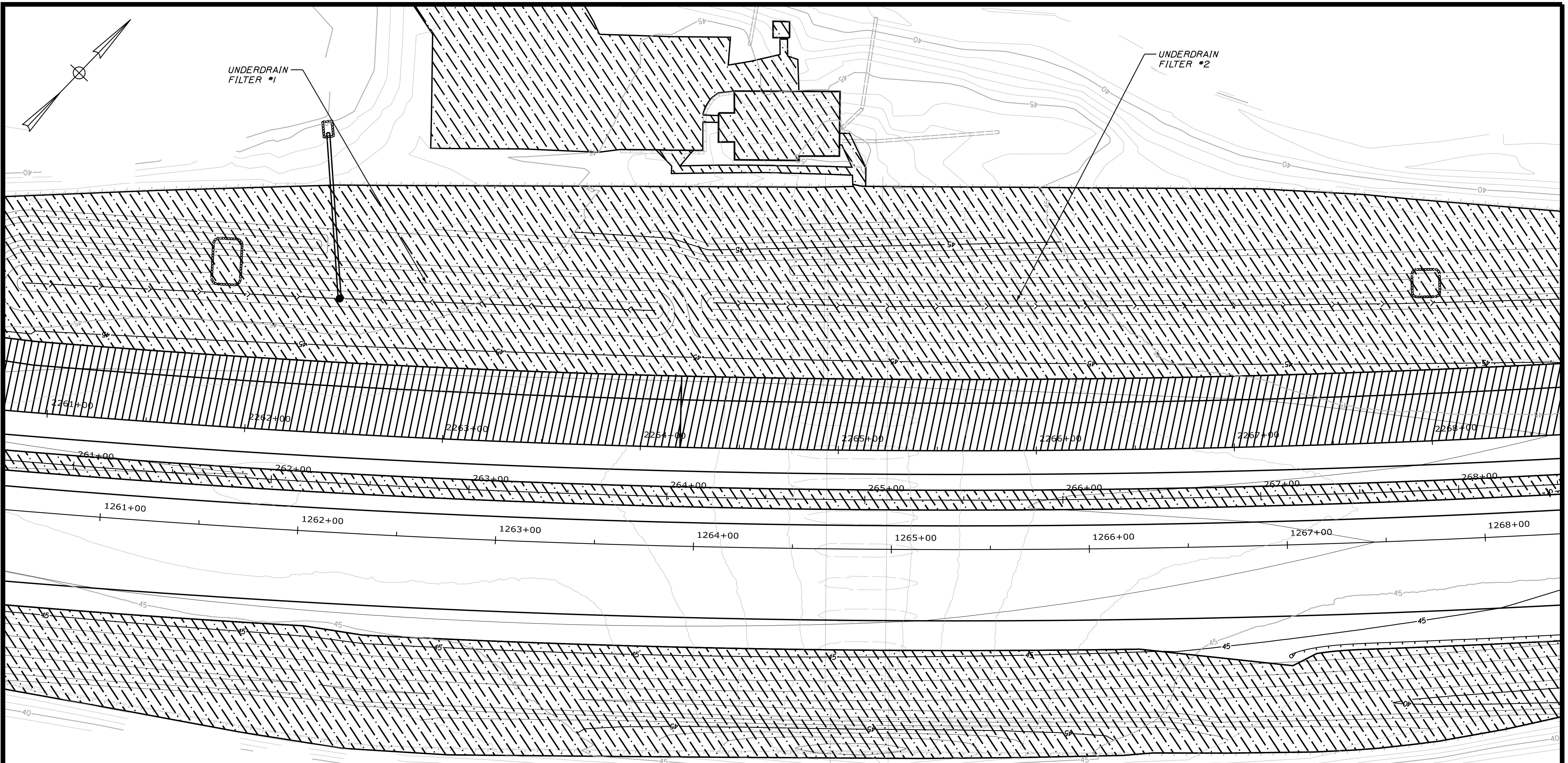
SHEET NUMBER: 8

CONTRACT: 2017.09

8 OF 34

Filename: ...\MSTA\102_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐	UNTREATED IMPERVIOUS (EXISTING AND NEW)
▩	TREATED IMPERVIOUS (NEW)
▨	TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
⛝	EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:
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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 3

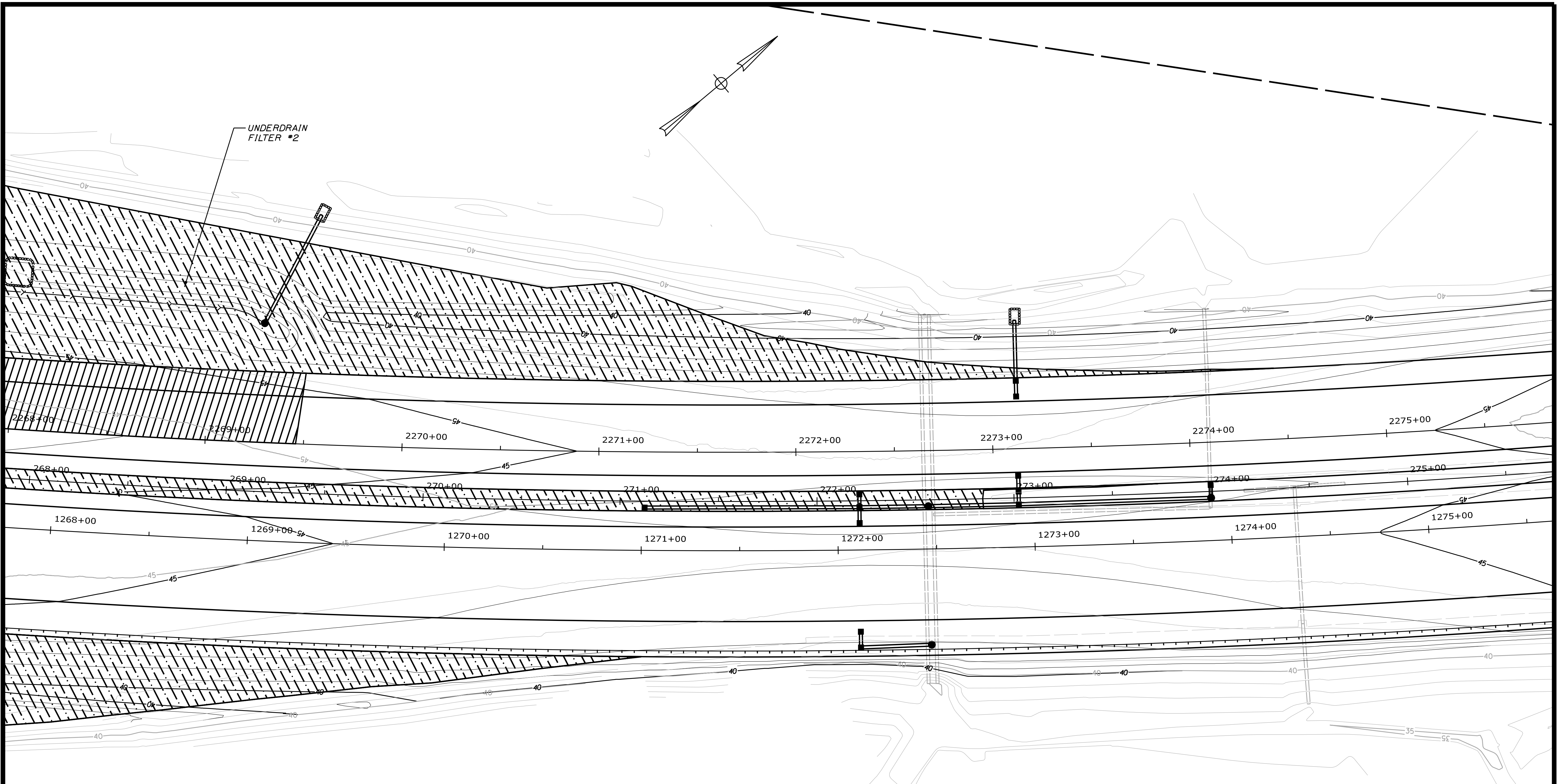
SHEET NUMBER: 9

CONTRACT: 2017.09

9 OF 34

Filename: ...\MSTA103_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

- ☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)
- ▩ TREATED IMPERVIOUS (NEW)
- ▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
- ⊠ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 4

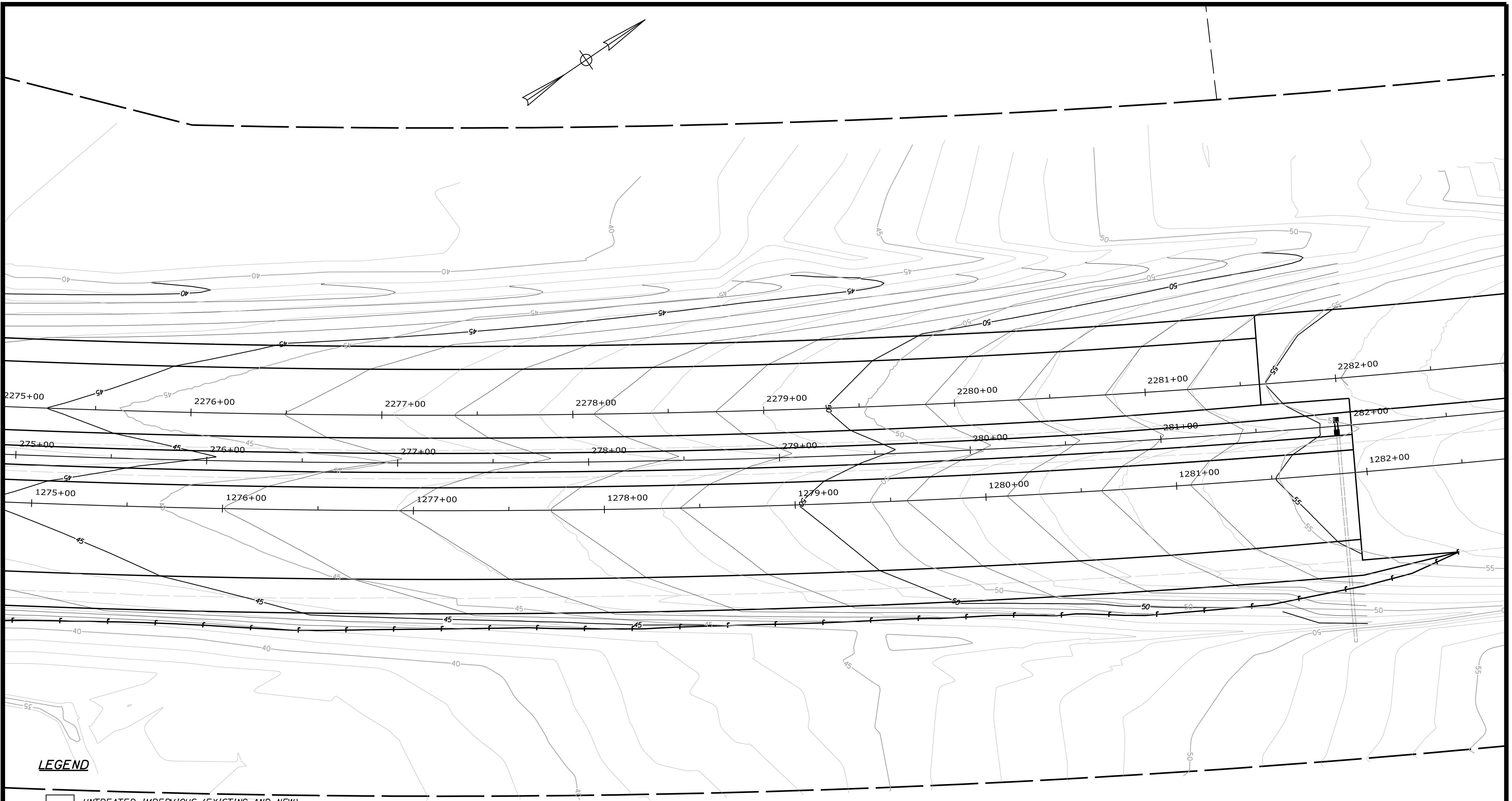
SHEET NUMBER: 10

CONTRACT: 2017.09

10 OF 34

Filename: ...\MSTA\104_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐	*UNTREATED IMPERVIOUS (EXISTING AND NEW)*
▩	*TREATED IMPERVIOUS (NEW)*
▨	*TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*
⋱	*EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 5

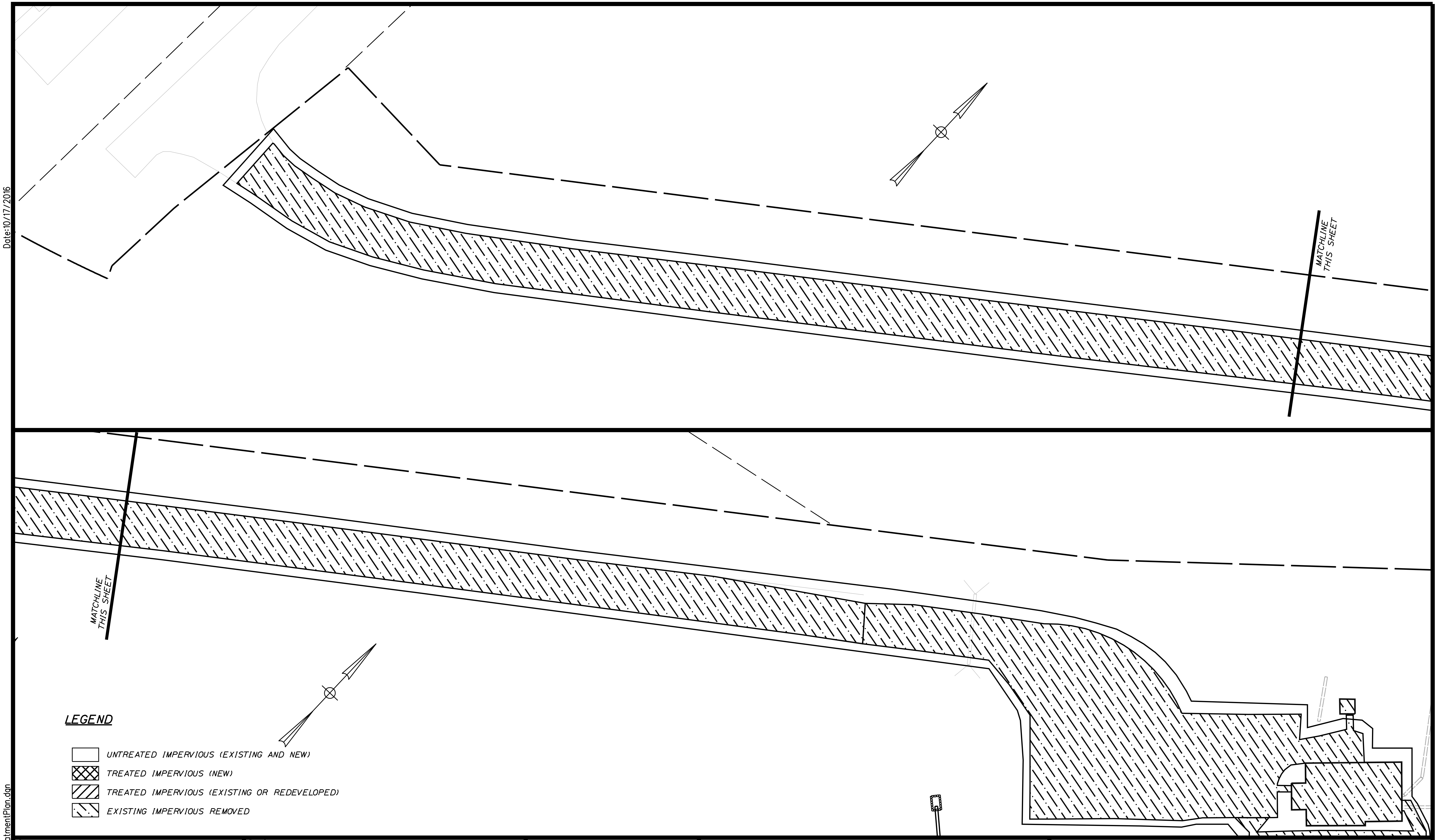
SHEET NUMBER: 11

CONTRACT: 2017.09

11 OF 34

Filename: ...\MSTA105_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

- ☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*
- ▩ *TREATED IMPERVIOUS (NEW)*
- ▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*
- ▧ *EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50
Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT 6

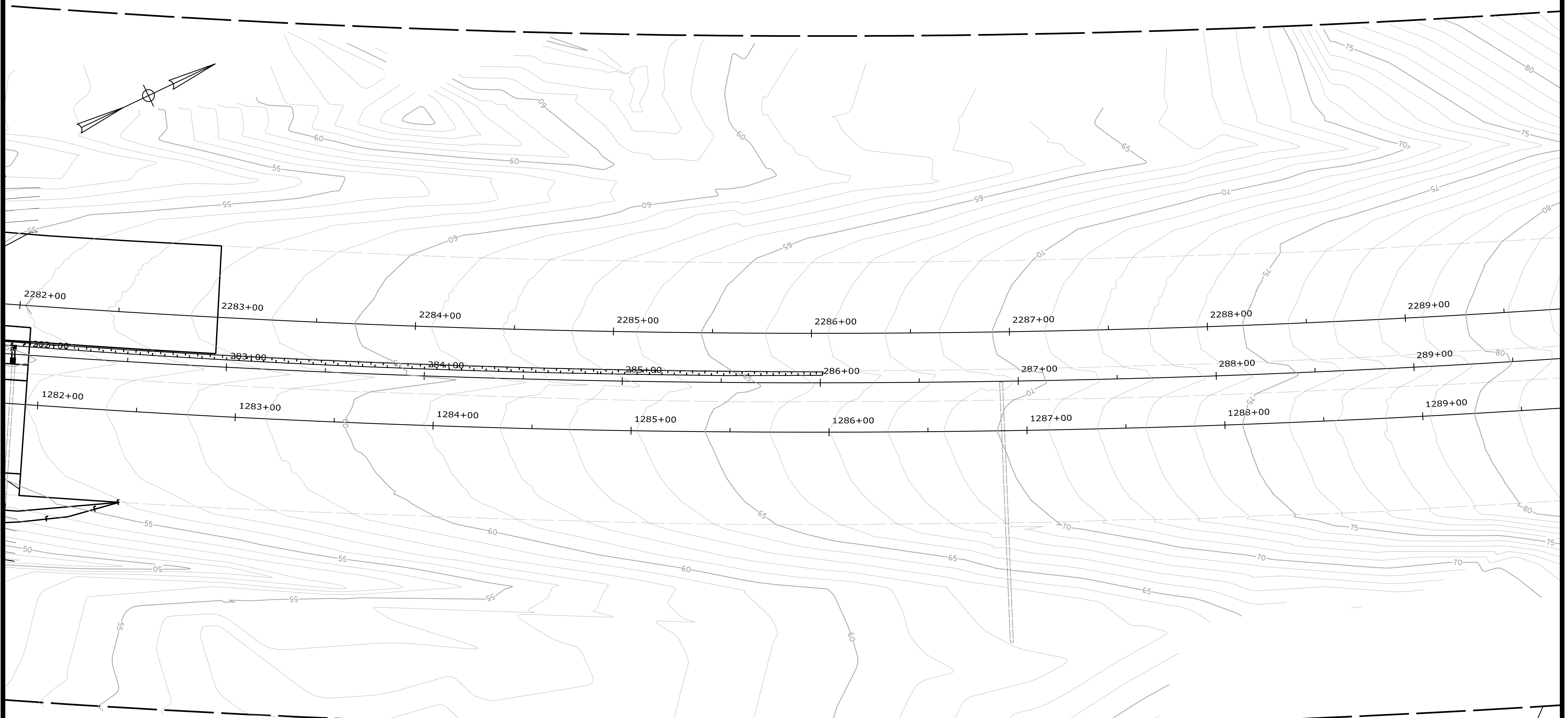
SHEET NUMBER: 12

CONTRACT: 2017.09

12 OF 34

Filename: ...\MSTA\106_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐	UNTREATED IMPERVIOUS (EXISTING AND NEW)
▩	TREATED IMPERVIOUS (NEW)
▨	TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
⧅	EXISTING IMPERVIOUS REMOVED

Filename: ...\MSTA\107_TreatmentPlan.dgn

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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SOUTH PORTLAND, ME 04106
TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

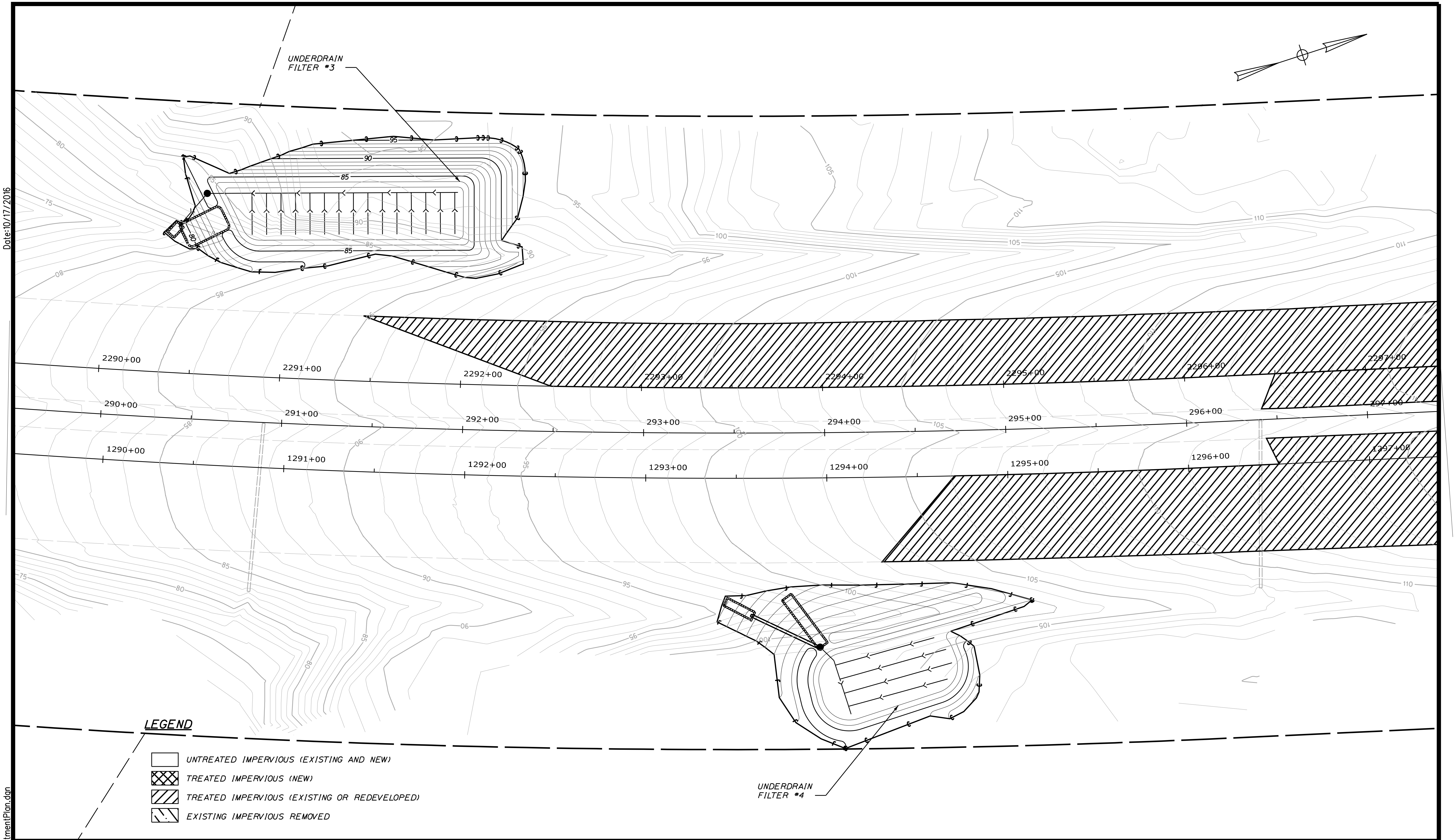
STORMWATER TREATMENT PLAN 7

SHEET NUMBER: 13

CONTRACT: 2017.09

13 OF 34

Date:10/17/2016



LEGEND

☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)

▩ TREATED IMPERVIOUS (NEW)

▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)

⧅ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:
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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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SUITE 1A
SOUTH PORTLAND, ME 04106
TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

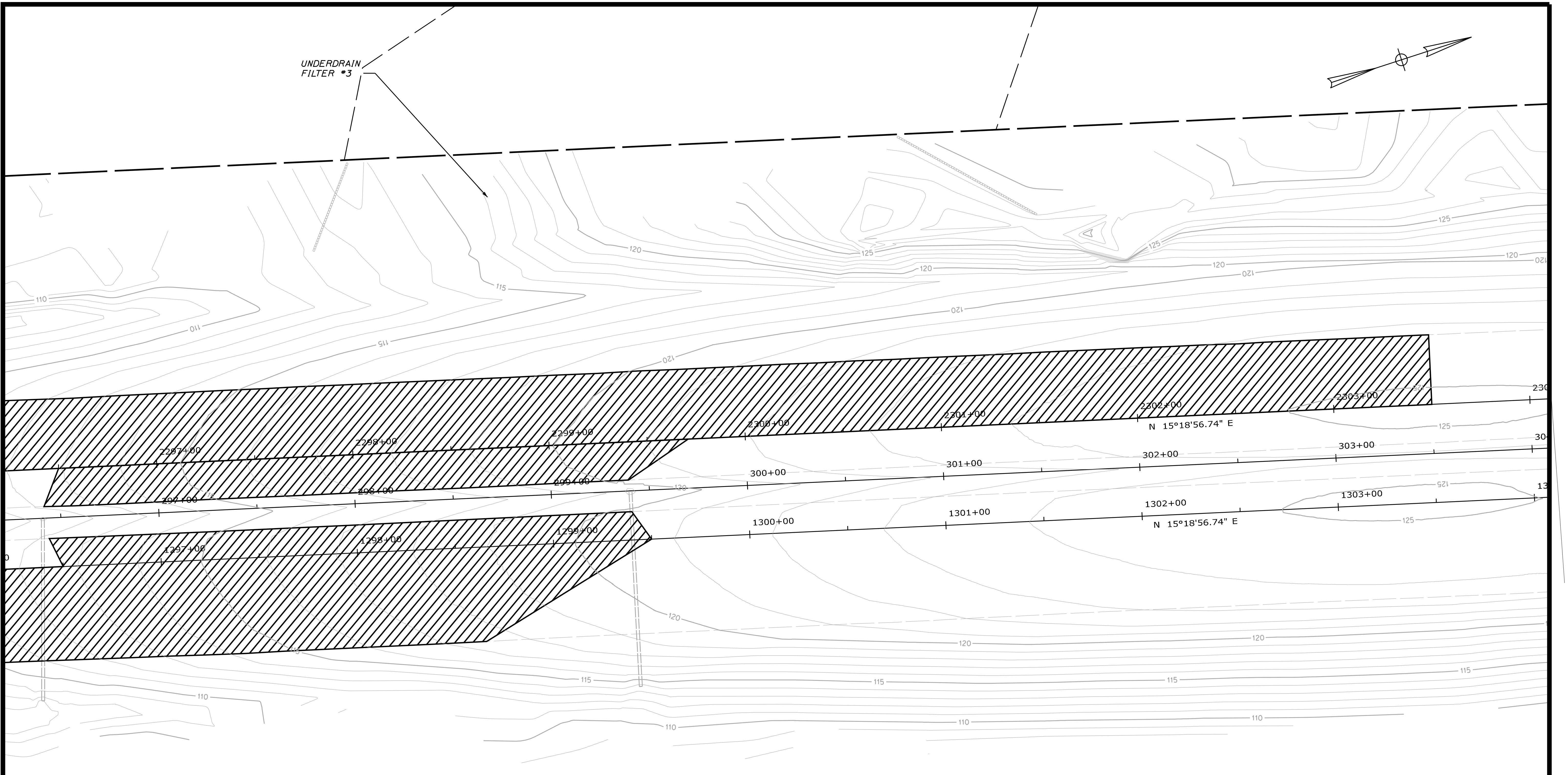
STORMWATER TREATMENT PLAN 8

SHEET NUMBER: 14

CONTRACT: 2017.09

14 OF 34

Filename: ...\MSTA108_TreatmentPlan.dgn



LEGEND

☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)
▩ TREATED IMPERVIOUS (NEW)
▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
▧ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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SOUTH PORTLAND, ME 04106
TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

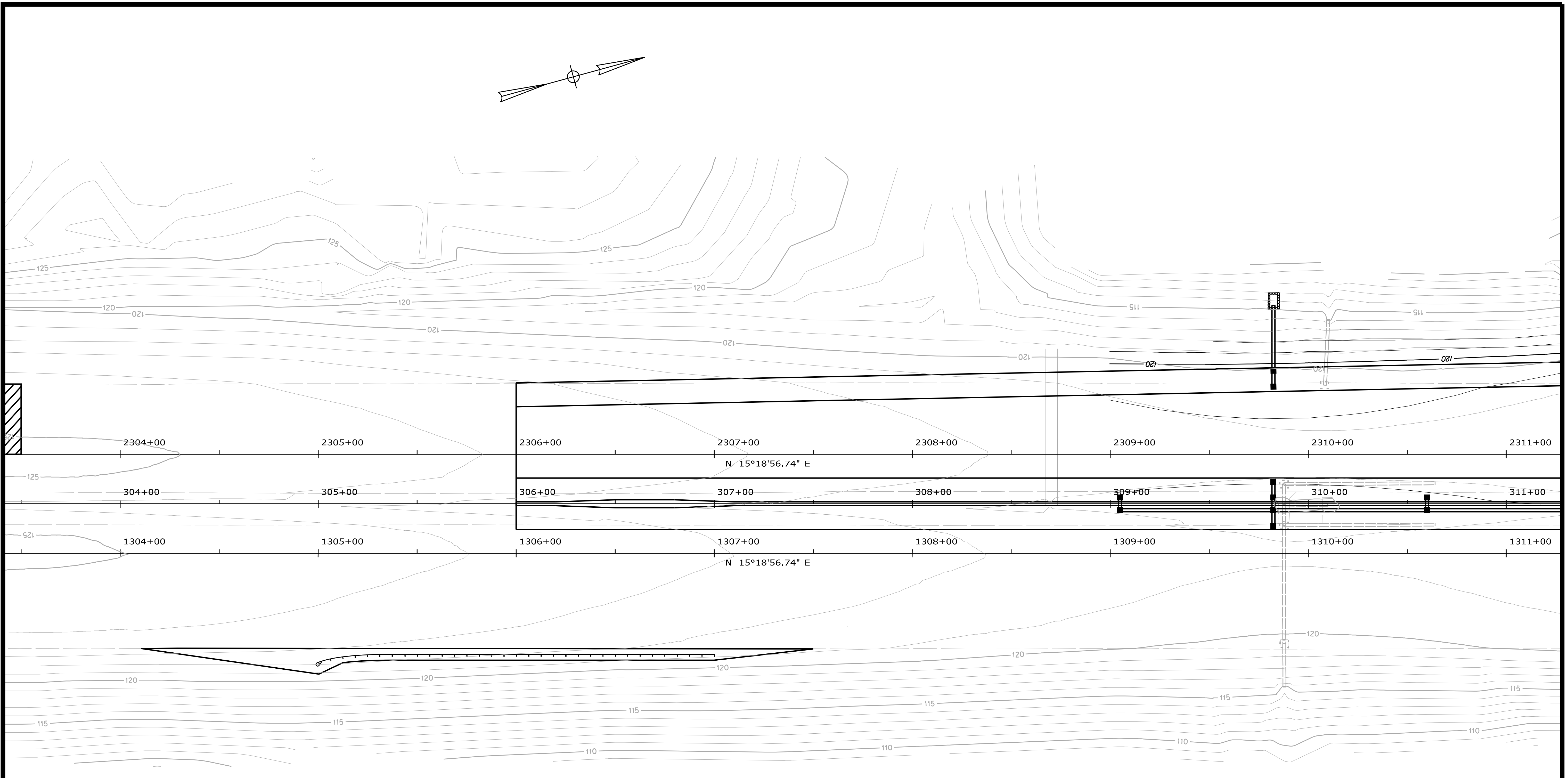
MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 8A

SHEET NUMBER: 15
CONTRACT: 2017.09
15 OF 34

Date:10/17/2016



LEGEND

☐	UNTREATED IMPERVIOUS (EXISTING AND NEW)
▩	TREATED IMPERVIOUS (NEW)
▨	TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
⛝	EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

Filename: ...\MSTA110_TreatmentPlan.dgn

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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75 JOHN ROBERTS ROAD,
SUITE 1A
SOUTH PORTLAND, ME 04106
TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

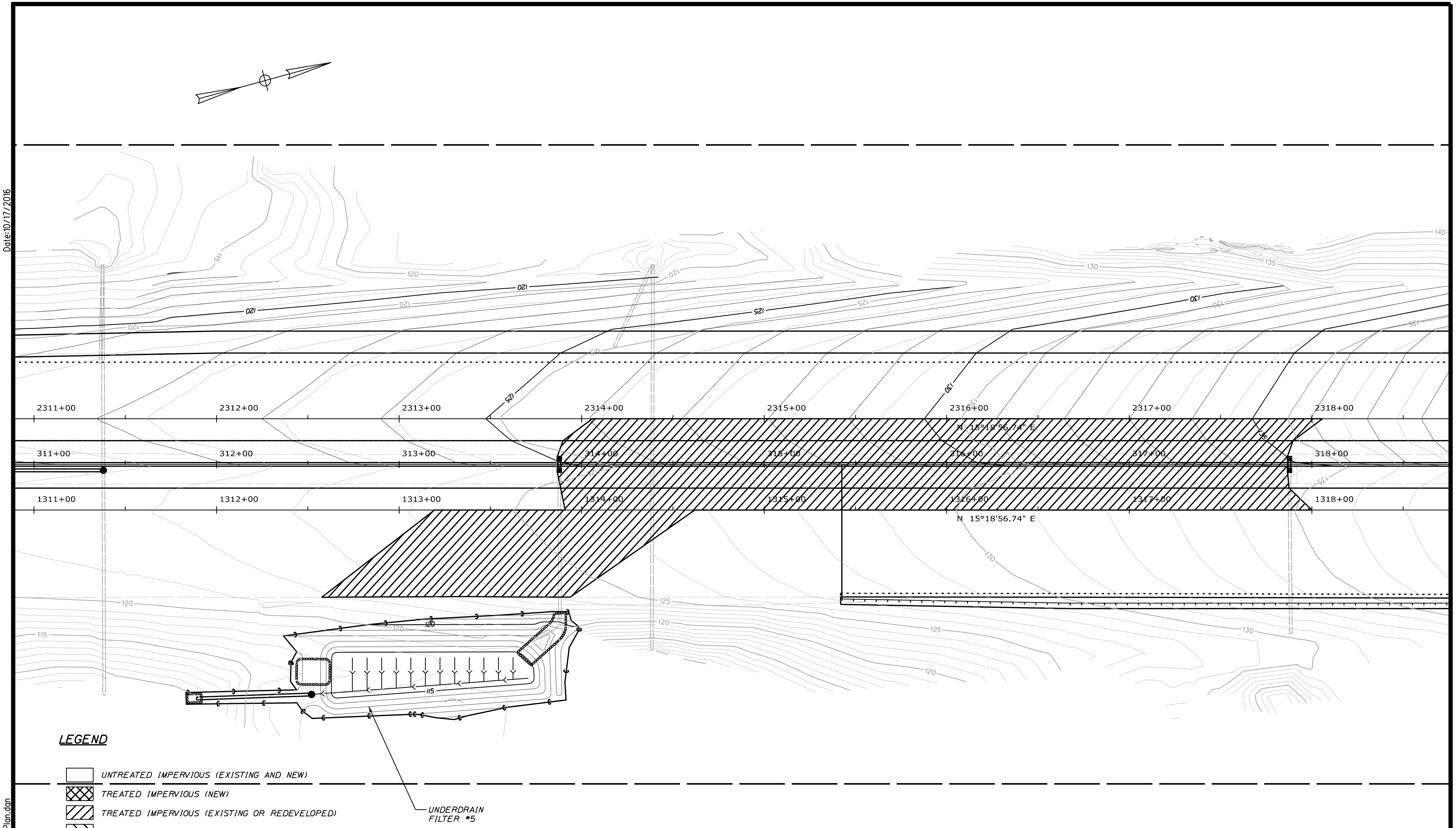
STORMWATER TREATMENT PLAN 9

SHEET NUMBER: 16

CONTRACT: 2017.09

16 OF 34

Date:10/17/2016



LEGEND

☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*

▩ *TREATED IMPERVIOUS (NEW)*

▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*

▧ *EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

Designed by:

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CONSULTANT PROJECT MANAGER: S. SAWYER, P.E.

	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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SOUTH PORTLAND, ME 04106
TEL (207) 200-2100

MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 10

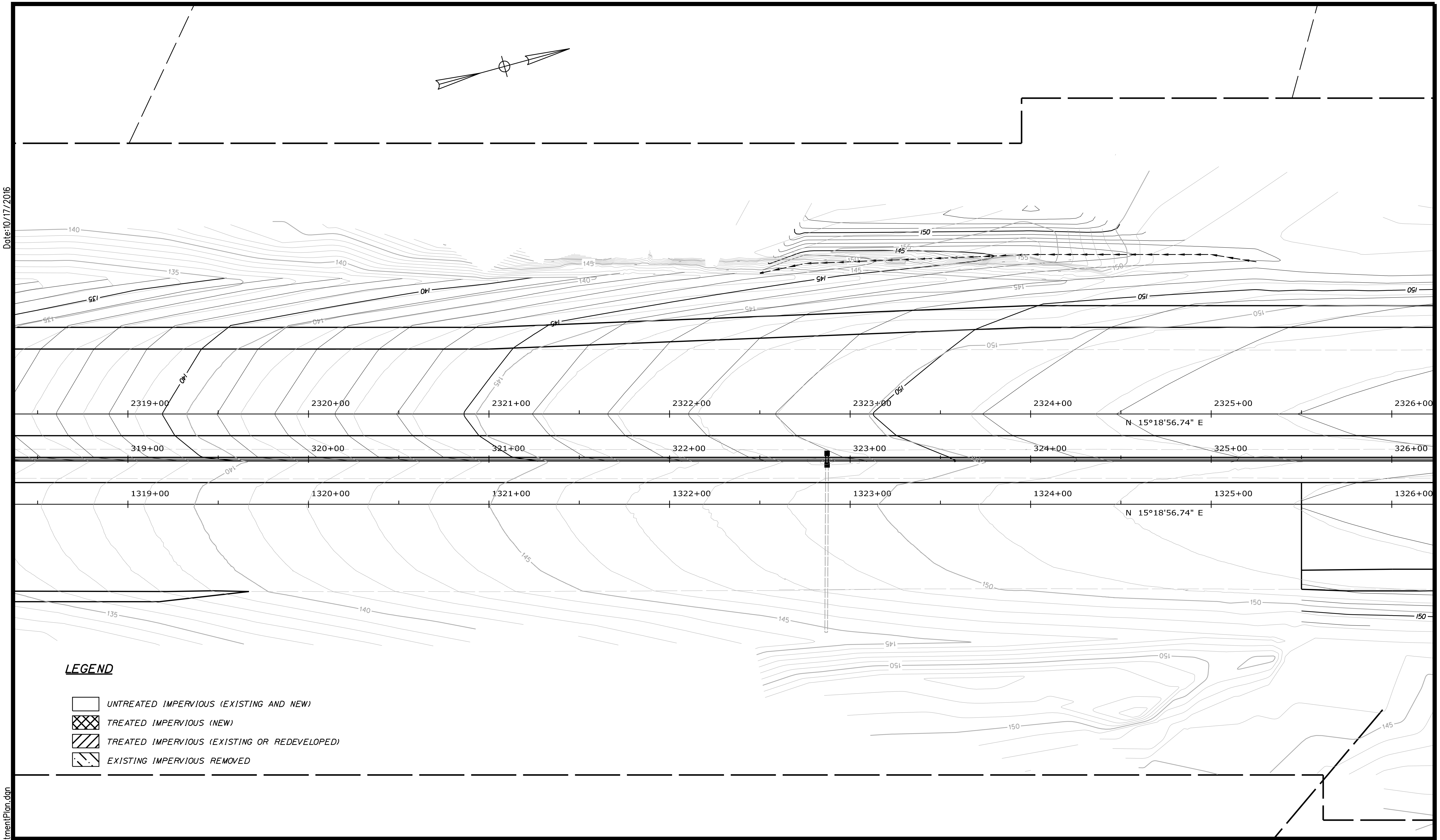
SHEET NUMBER: 17

CONTRACT: 2017.09

17 OF 34

Filename: ...\MSTA\111_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

- ☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*
- ▩ *TREATED IMPERVIOUS (NEW)*
- ▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*
- ⋱ *EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
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Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 11

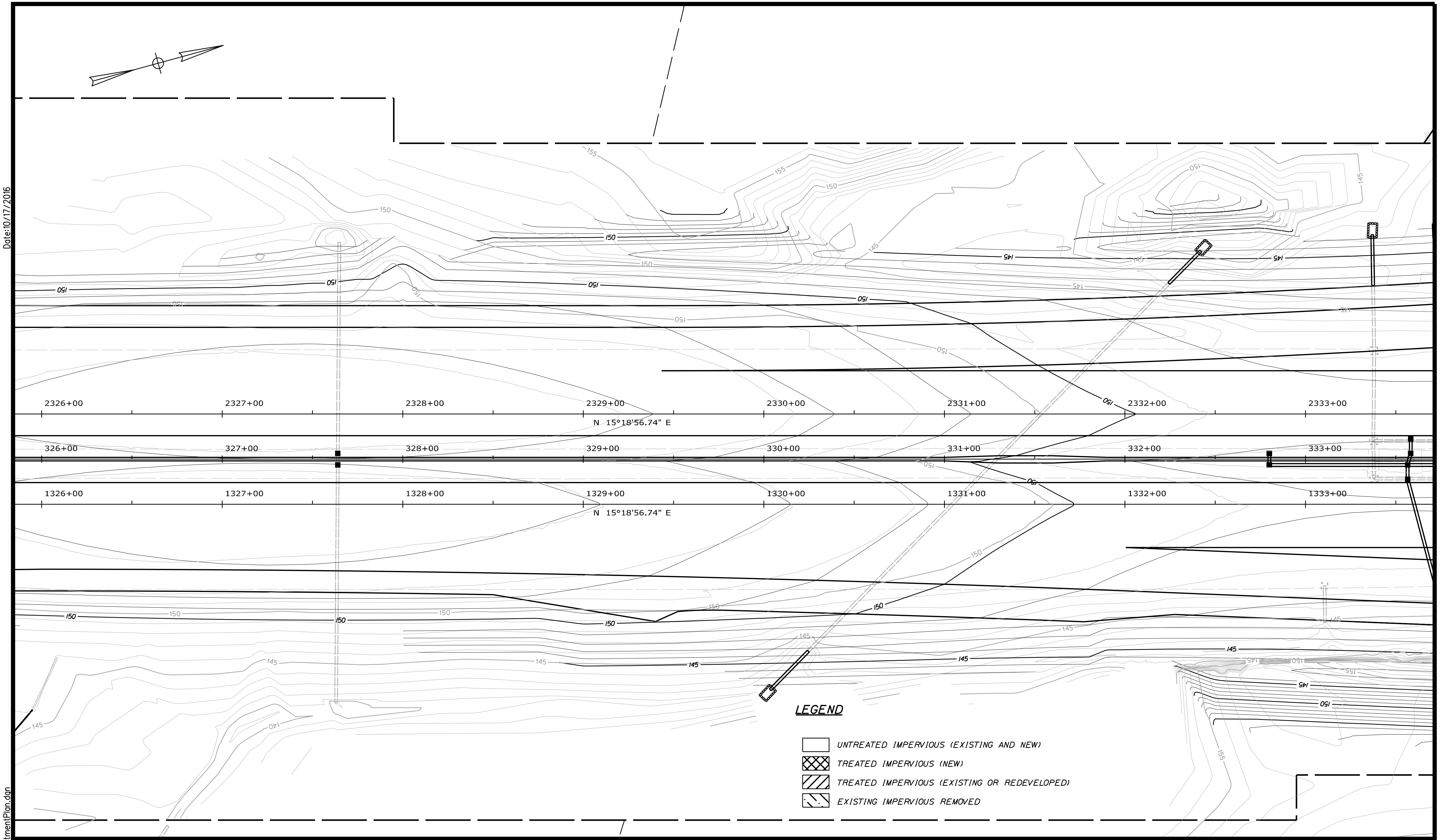
SHEET NUMBER: 18

CONTRACT: 2017.09

18 OF 34

Filename: ...\MSTA112_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)

▩ TREATED IMPERVIOUS (NEW)

▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)

⧅ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 12

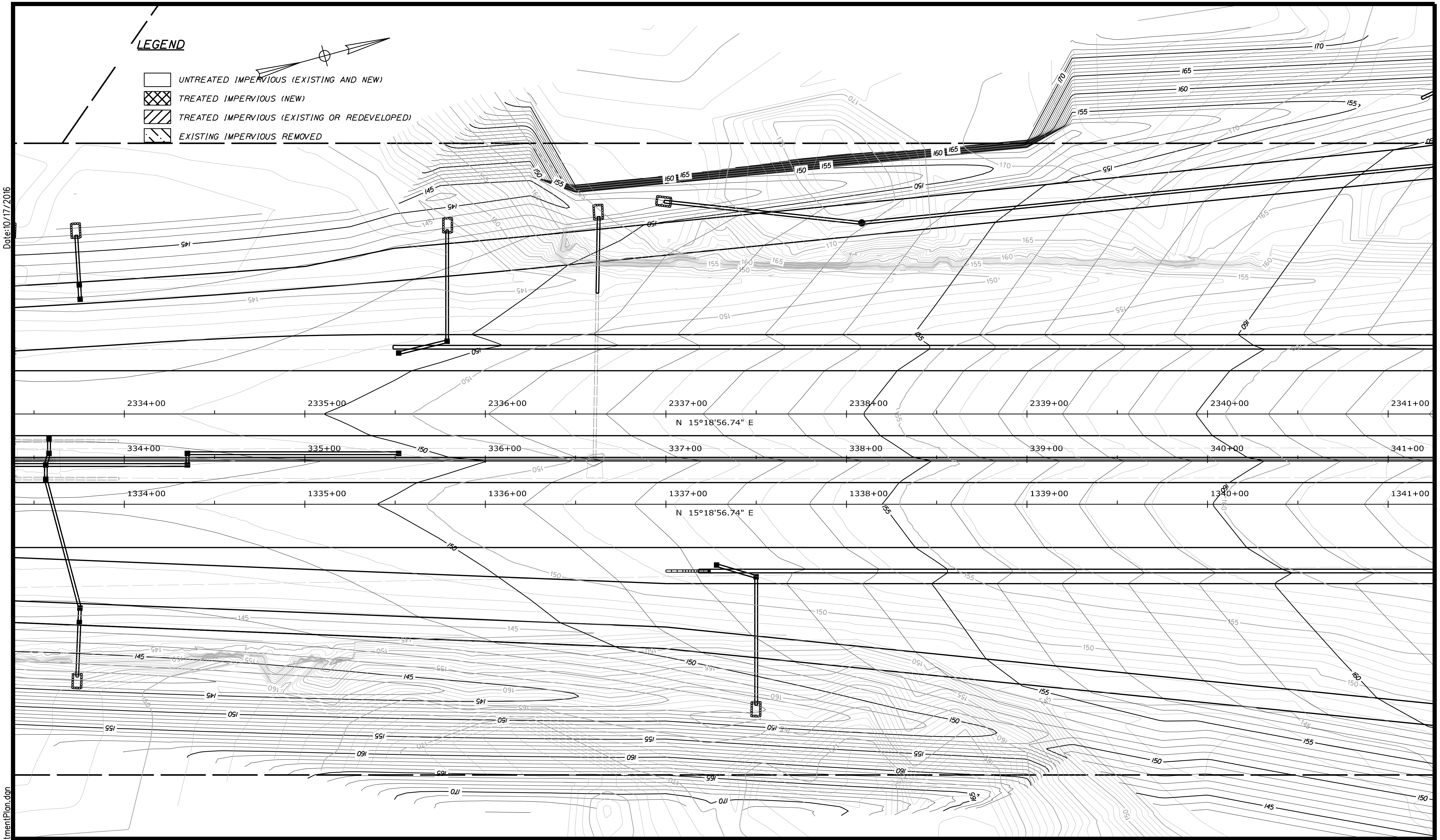
SHEET NUMBER: 19

CONTRACT: 2017.09

19 OF 34

Filename: ...\MSTA113_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐	UNTREATED IMPERVIOUS (EXISTING AND NEW)
▩	TREATED IMPERVIOUS (NEW)
▨	TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)
⬚	EXISTING IMPERVIOUS REMOVED

Scale:

25 0 25 50
Scale of Feet

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MAINE TURNPIKE

THE GOLD STAR
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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 13

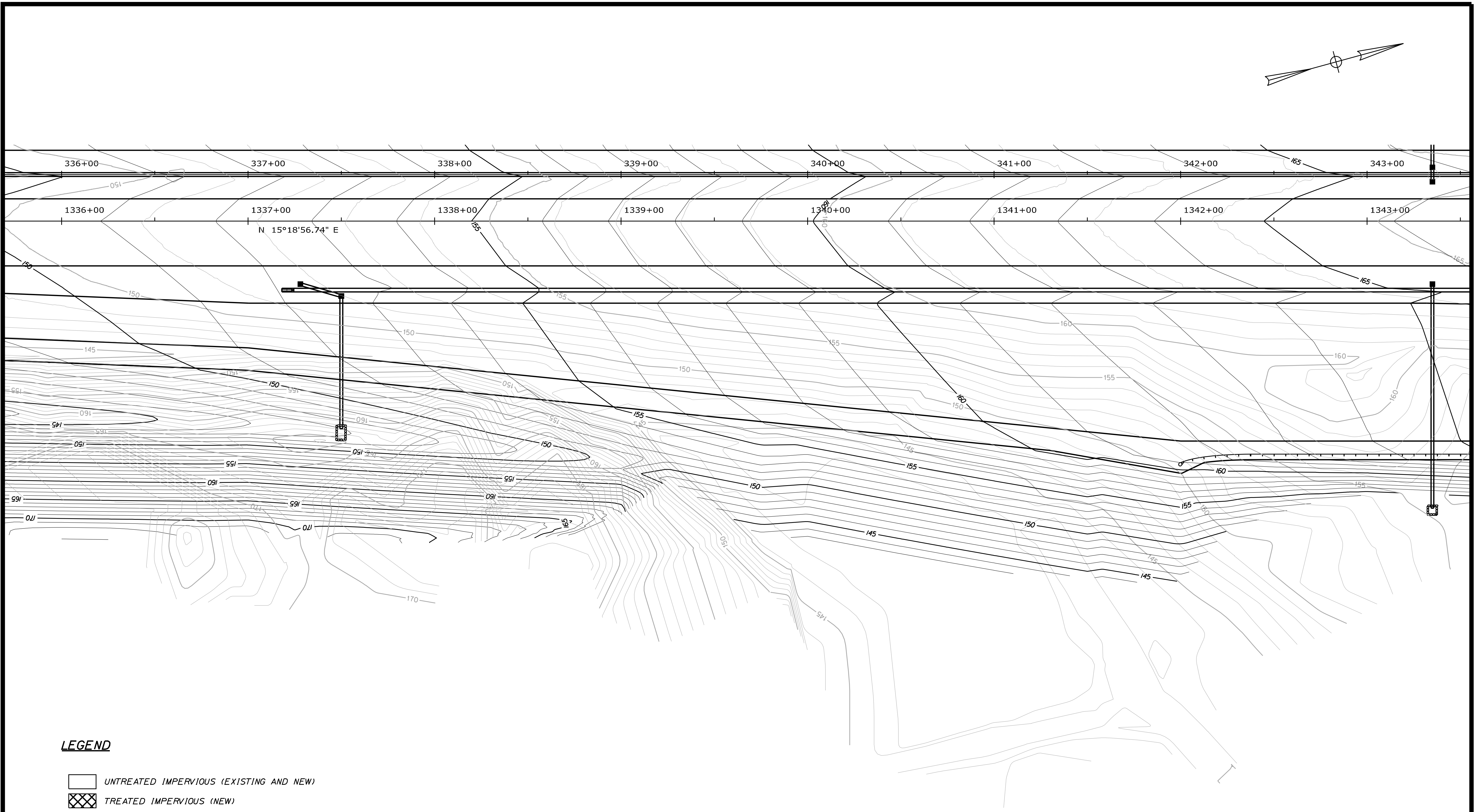
SHEET NUMBER: 20

CONTRACT: 2017.09

20 OF 34

Filename: ...\MSTA\114_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)

▩ TREATED IMPERVIOUS (NEW)

▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)

▧ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 14

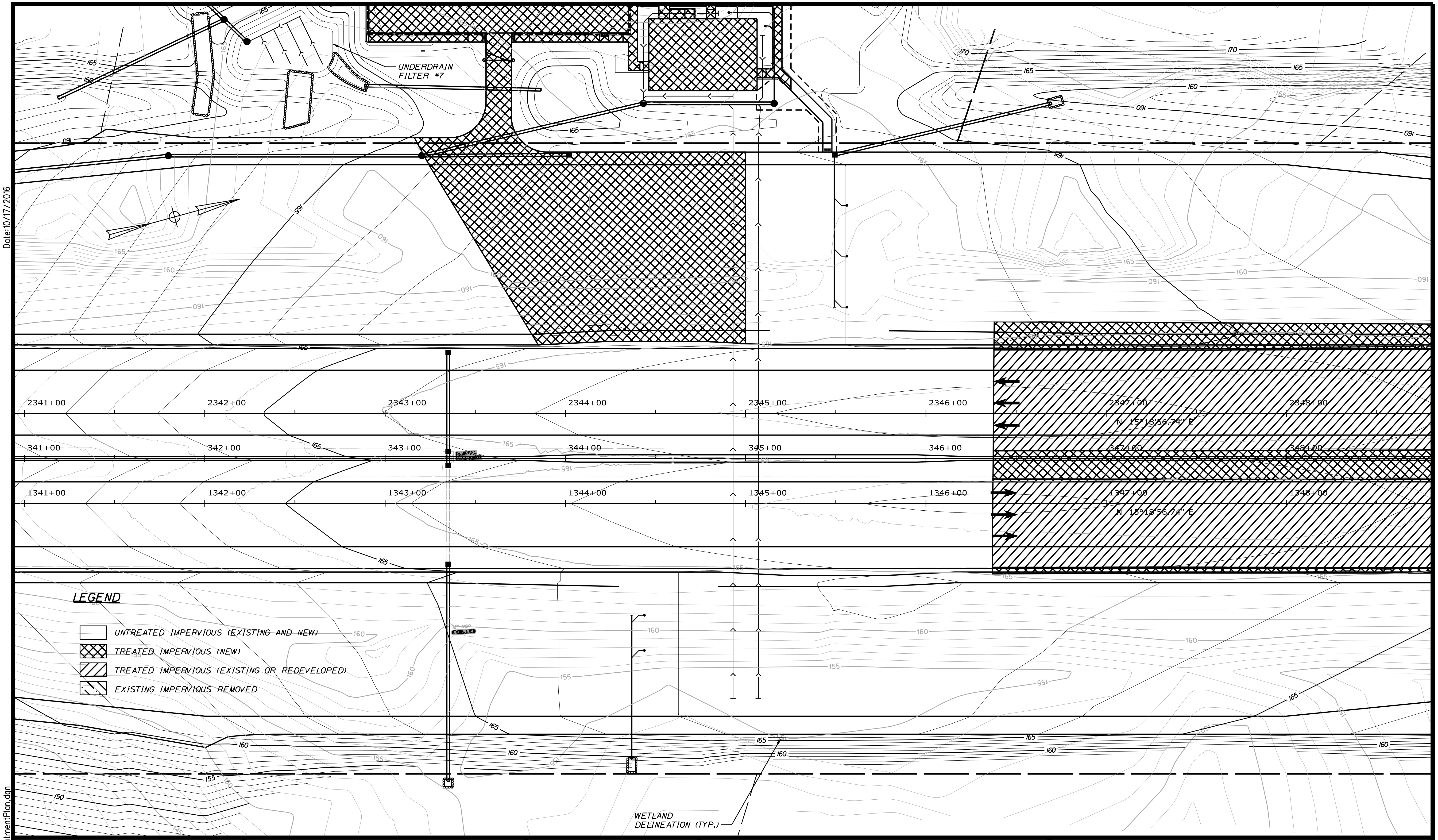
SHEET NUMBER: 21

CONTRACT: 2017.09

21 OF 34

Filename: ...\MSTA\115_TreatmentPlan.dgn

Date:10/17/2016



Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 15

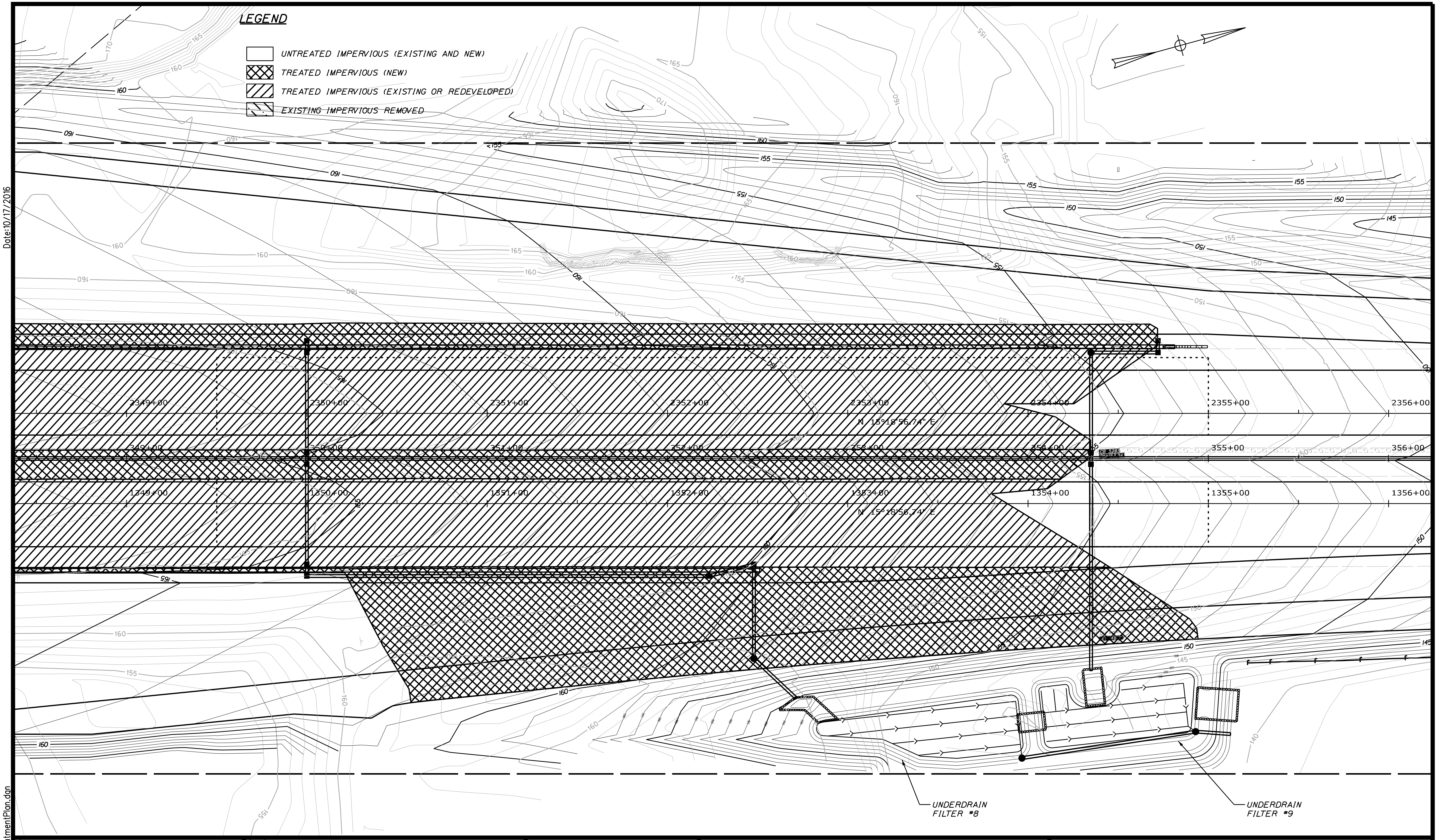
SHEET NUMBER: 22

CONTRACT: 2017.09

22 OF 34

Filename: ...\MSTA\116_TreatmentPlan.dgn

Date:10/17/2016



Scale:

25 0 25 50
Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 16

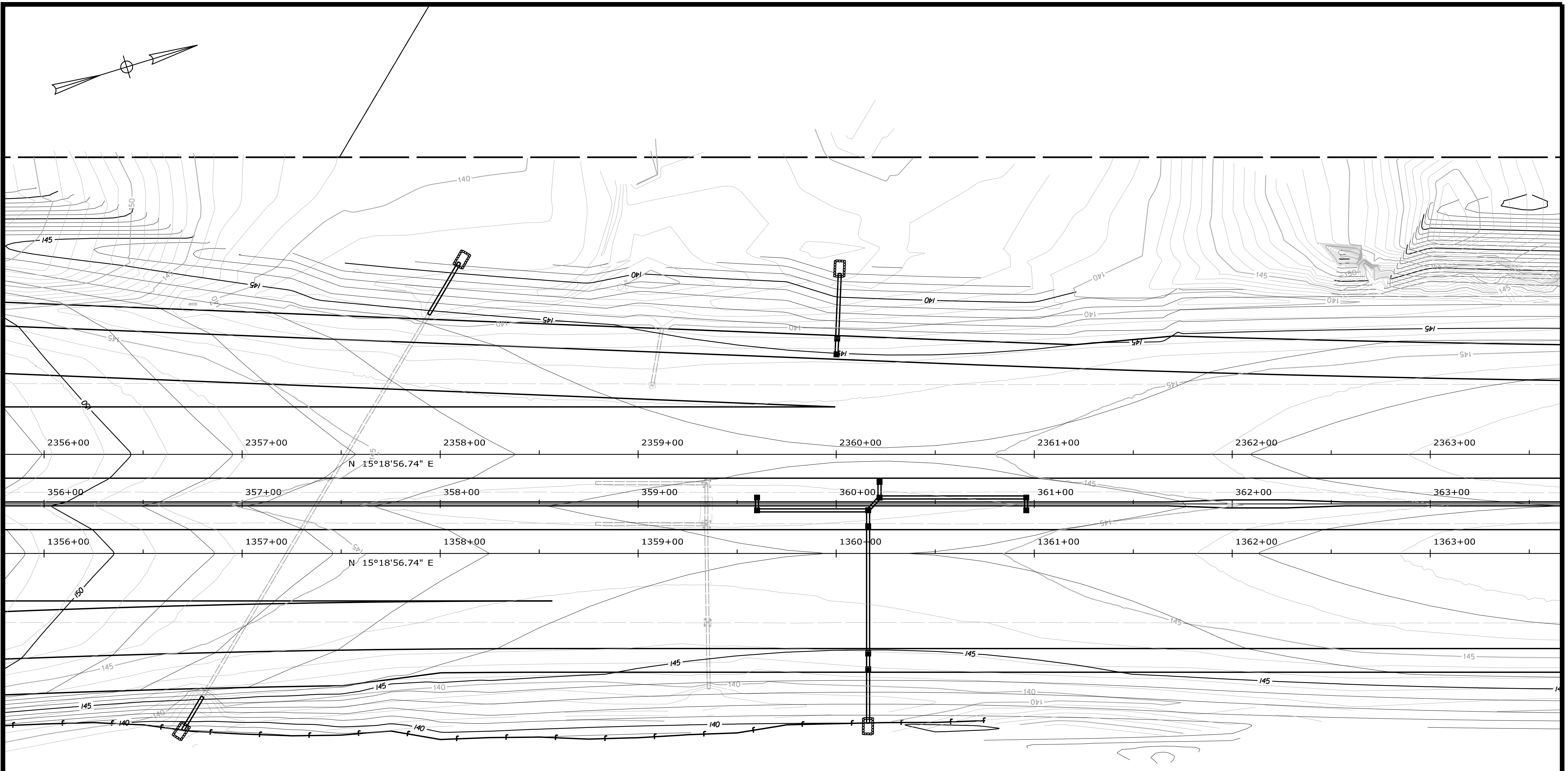
SHEET NUMBER: 23

CONTRACT: 2017.09

23 OF 34

Filename: ...\MSTA\117_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐ UNTREATED IMPERVIOUS (EXISTING AND NEW)

▦ TREATED IMPERVIOUS (NEW)

▨ TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)

▧ EXISTING IMPERVIOUS REMOVED

Scale:
25 0 25 50
Scale of Feet

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

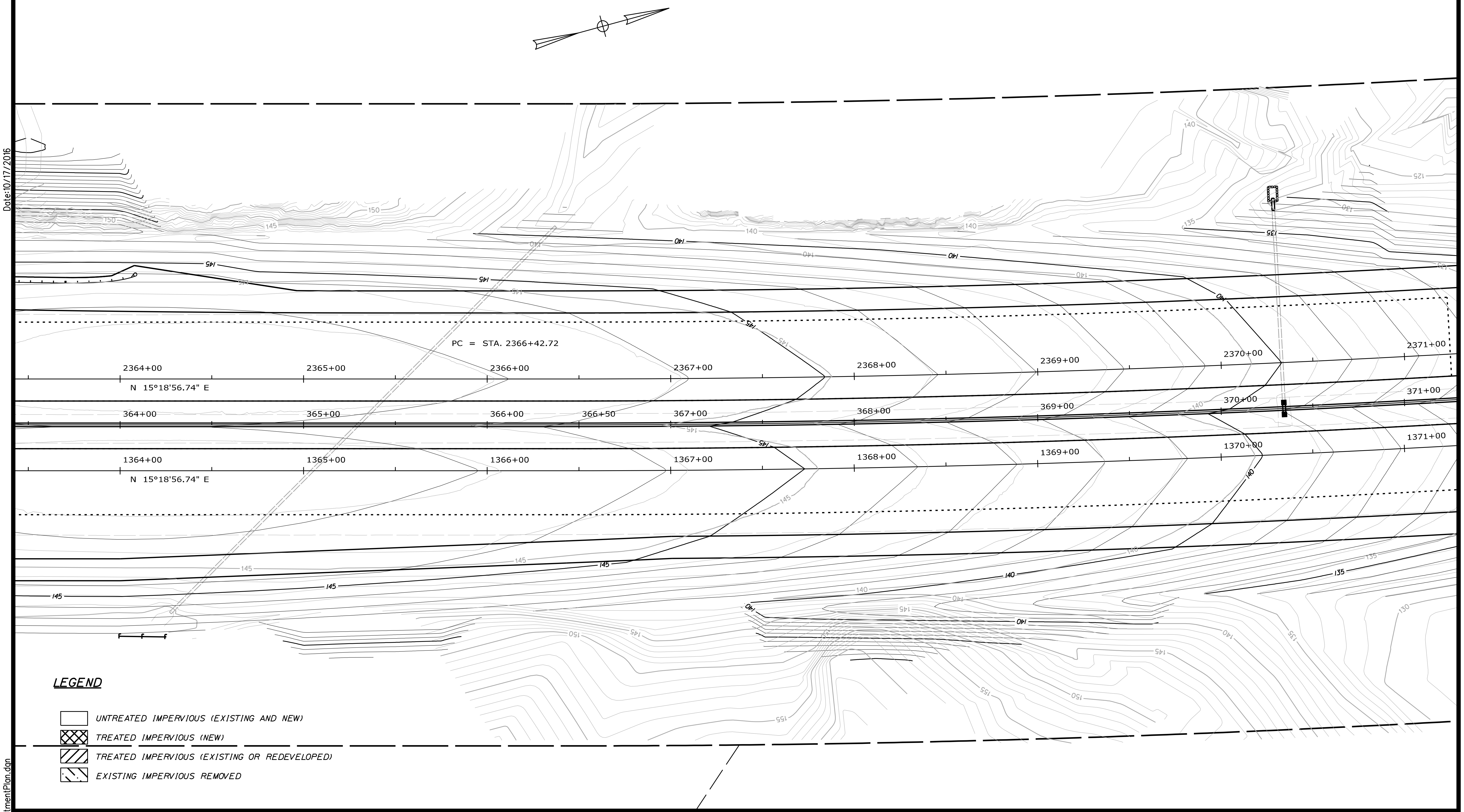
STORMWATER TREATMENT PLAN 17

SHEET NUMBER: 24

CONTRACT: 2017.09

Filename: ...\MSTA\118_TreatmentPlan.dgn

Date:10/17/2016



LEGEND

☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*

▩ *TREATED IMPERVIOUS (NEW)*

▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*

▧ *EXISTING IMPERVIOUS REMOVED*

Filename: ...\MSTA\119_TreatmentPlan.dgn

Scale:

25 0 25 50

Scale of Feet

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 18

SHEET NUMBER: 25

CONTRACT: 2017.09

25 OF 34

Date:10/17/2016

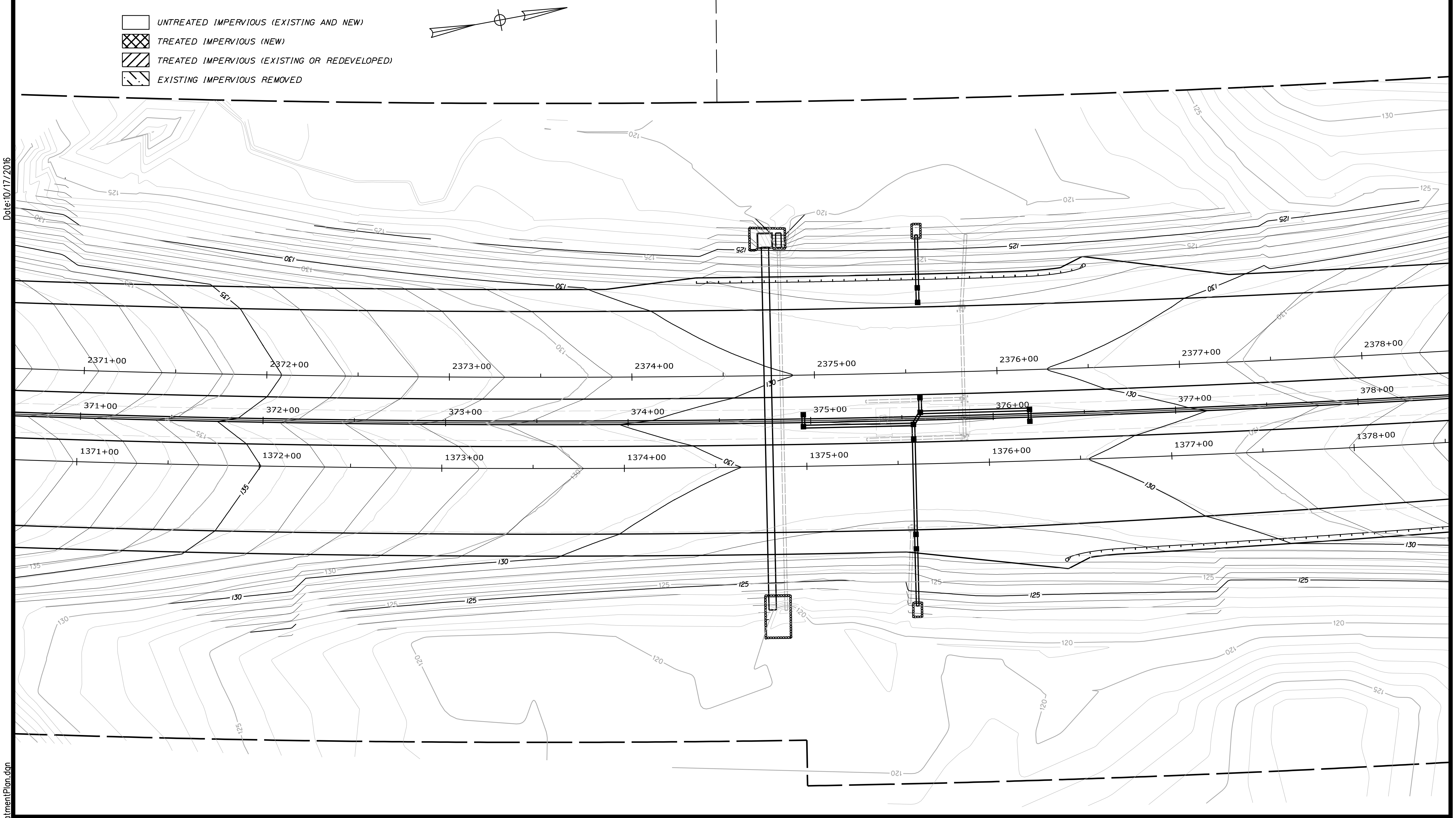
LEGEND

☐ *UNTREATED IMPERVIOUS (EXISTING AND NEW)*

▩ *TREATED IMPERVIOUS (NEW)*

▨ *TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*

⋱ *EXISTING IMPERVIOUS REMOVED*



Filename: ...\MSTA\120_TreatmentPlan.dgn

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

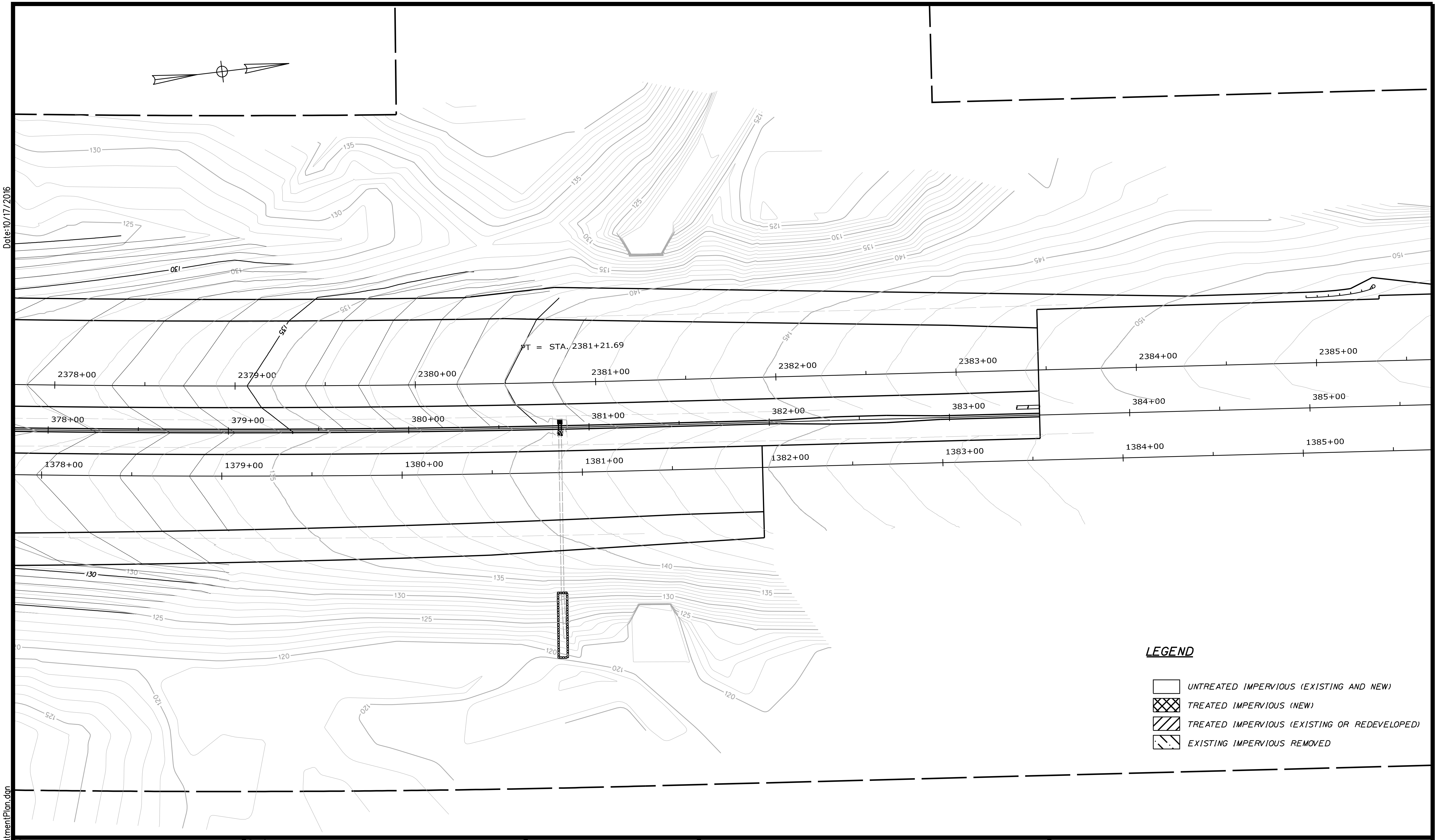
STORMWATER TREATMENT PLAN 19

SHEET NUMBER: 26

CONTRACT: 2017.09

26 OF 34

Date:10/17/2016



LEGEND

☐	*UNTREATED IMPERVIOUS (EXISTING AND NEW)*
▩	*TREATED IMPERVIOUS (NEW)*
▨	*TREATED IMPERVIOUS (EXISTING OR REDEVELOPED)*
⬚	*EXISTING IMPERVIOUS REMOVED*

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
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Drawn	RLM	09/16/16	In Charge of	---	--/--

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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 20

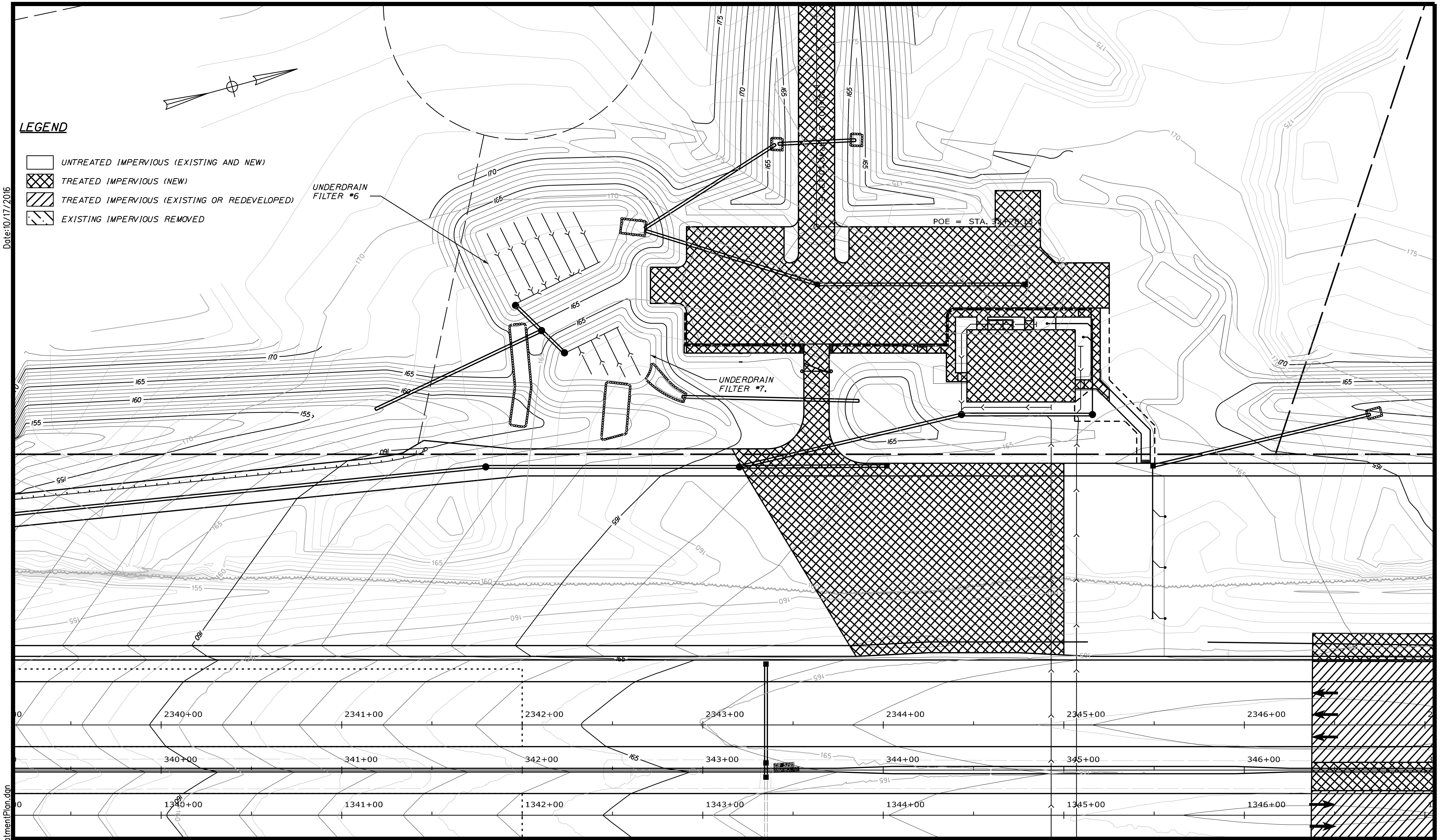
SHEET NUMBER: 27

CONTRACT: 2017.09

27 OF 34

Filename: ...\MSTA\121_TreatmentPlan.dgn

Date:10/17/2016



Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER TREATMENT PLAN 21

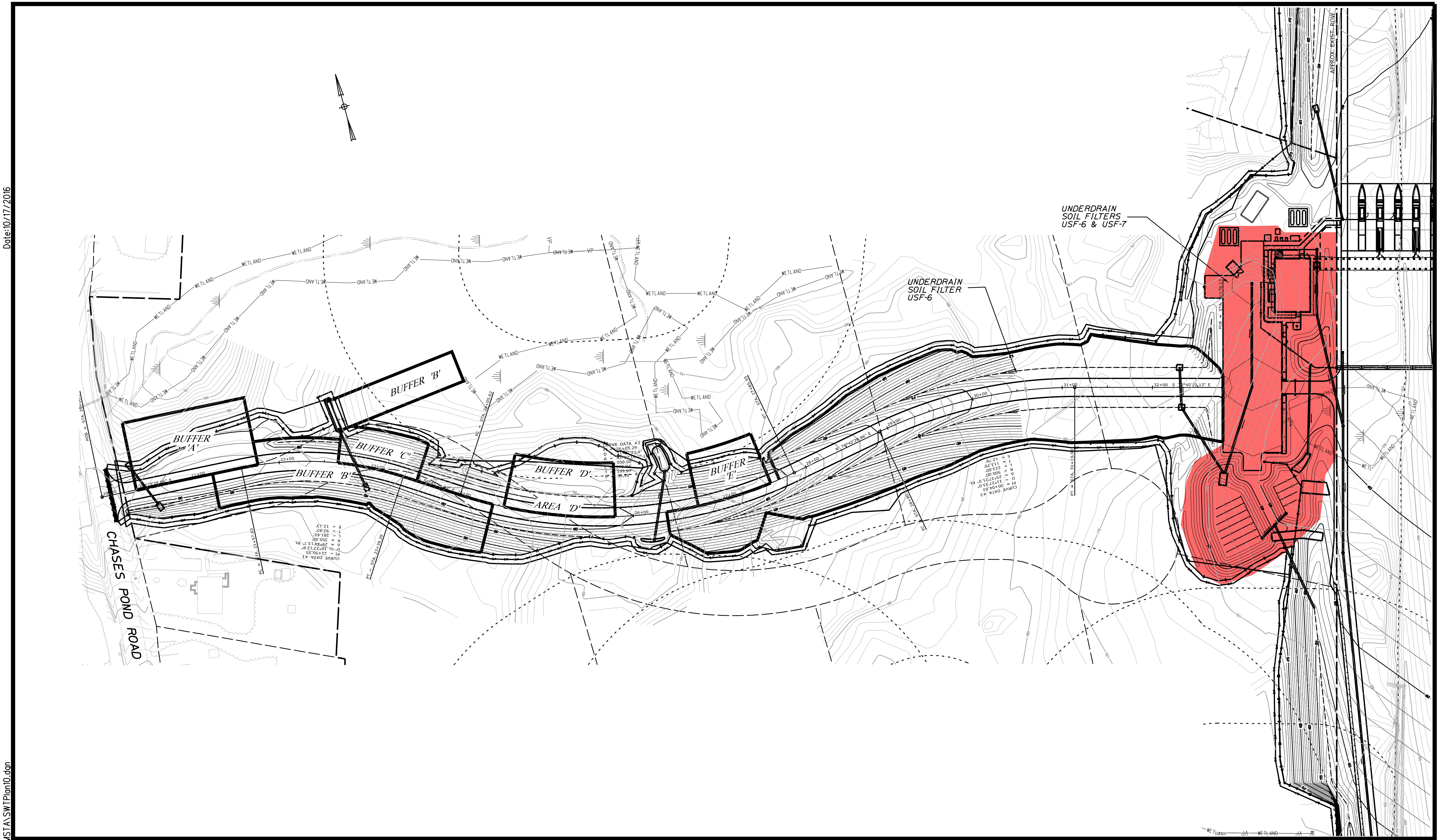
SHEET NUMBER: 28

CONTRACT: 2017.09

28 OF 34

Filename: ...\MSTA\122_TreatmentPlan.dgn

Date:10/17/2016



Filename: ...\STORMWATER\MSTA\SWTPlan10.dgn

Scale: 50 0 50 100

Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

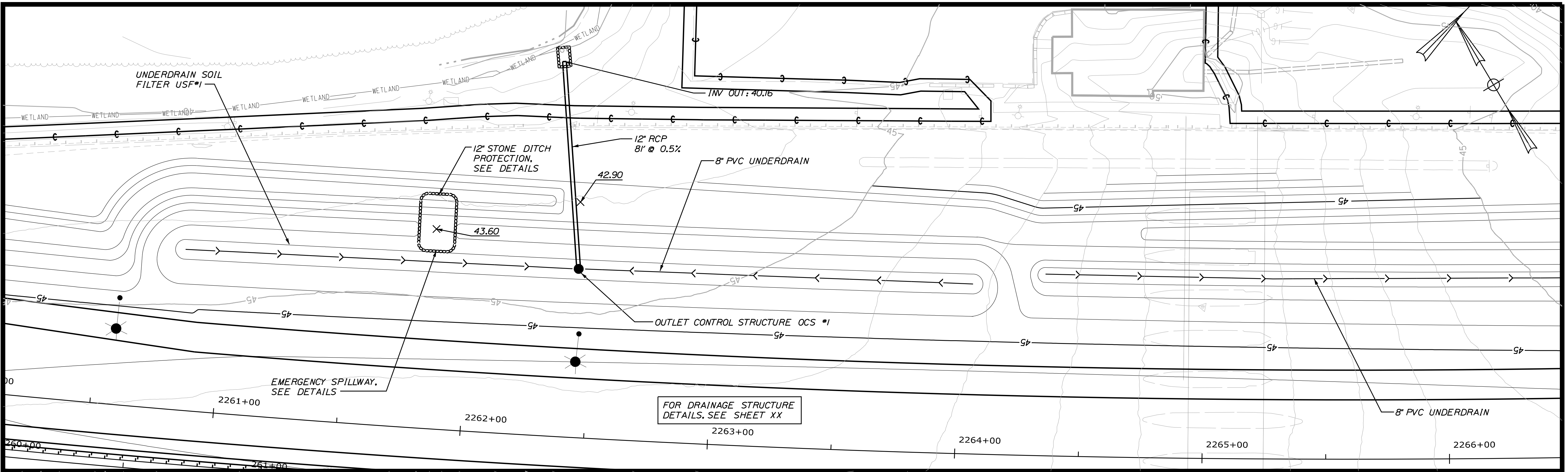
ACCESS ROAD BUFFER/TREATMENT PLAN

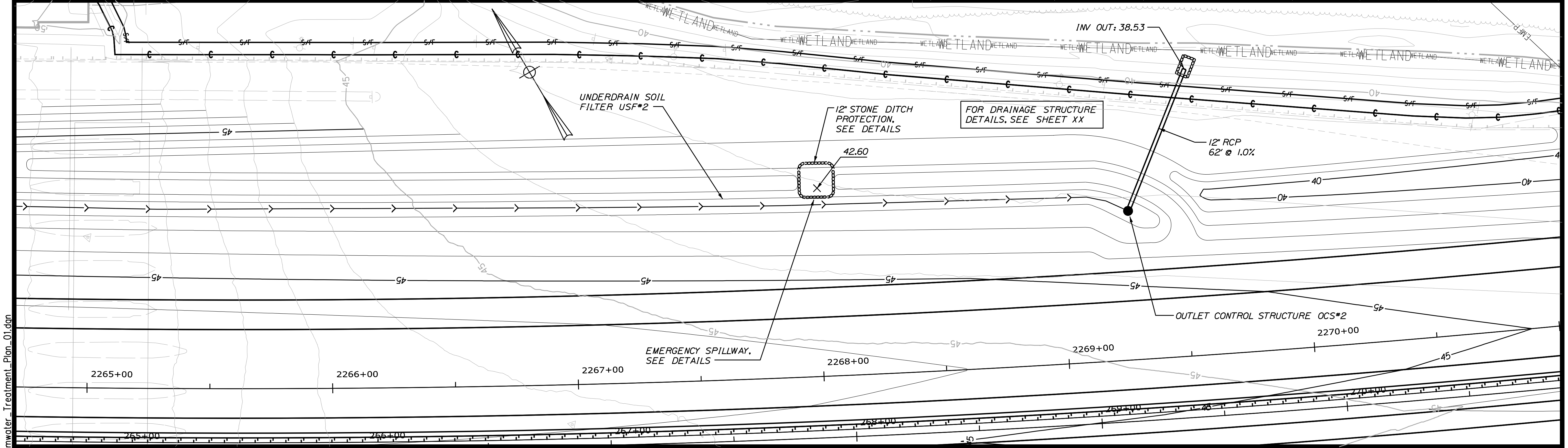
SHEET NUMBER: 29

CONTRACT: WIN 2017.09

29 OF 34

Date:10/17/2016





Scale:

20 0 20 40

Scale of Feet

No.	Revision	By	Date

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Drawn	DB	09/16/16	In Charge of	---	--/--

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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER PONDS #1 AND #2

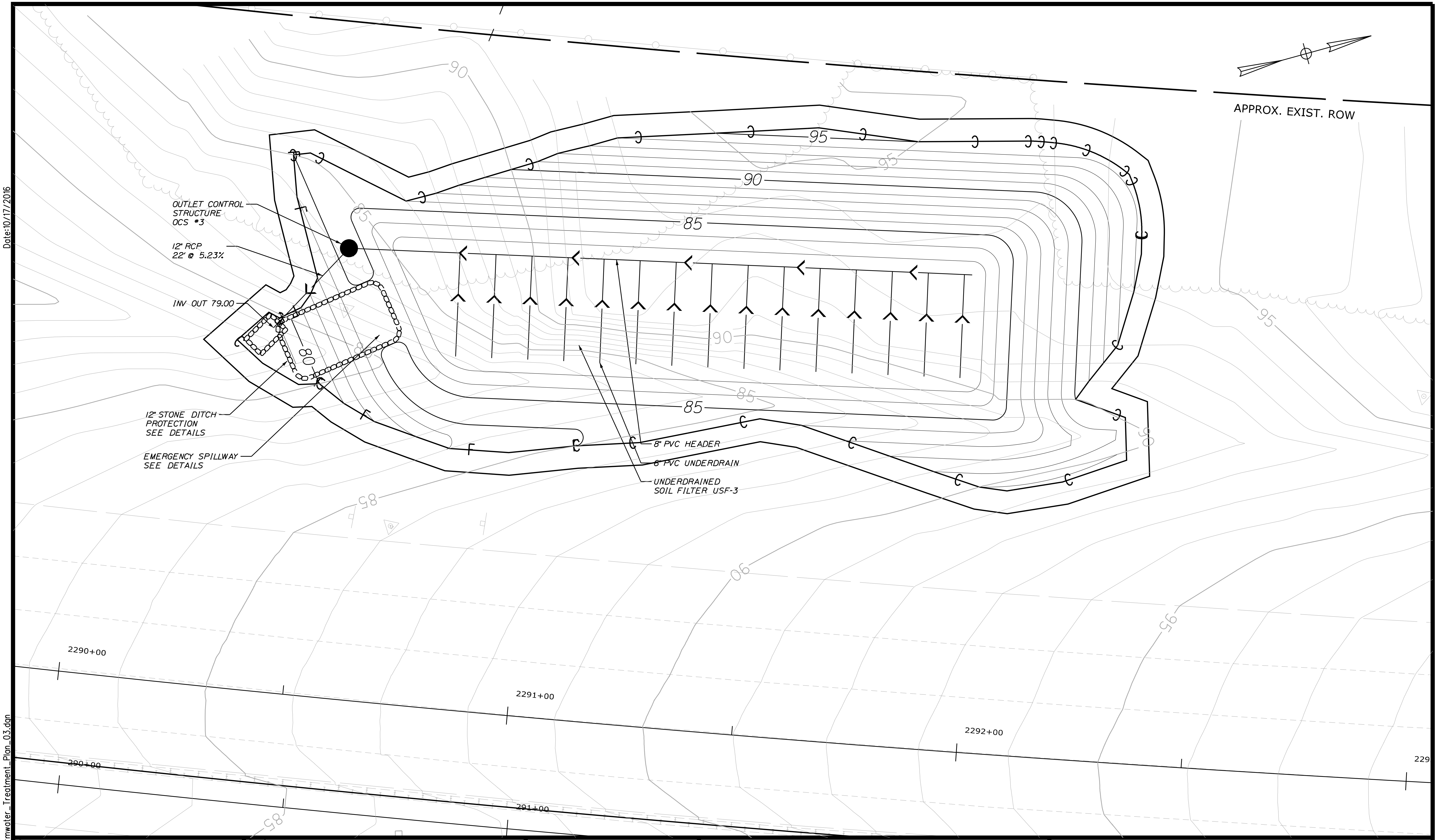
SHEET NUMBER: 30

CONTRACT: 2017.09

30 OF 34

Filename: ...\097a_HW_Stormwater_Treatment_Plan_01.dgn

Date:10/17/2016



Filename: ...\097b_HW_Stormwater_Treatment_Plan_03.dgn

Scale:

10 0 10 20
Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	DB	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

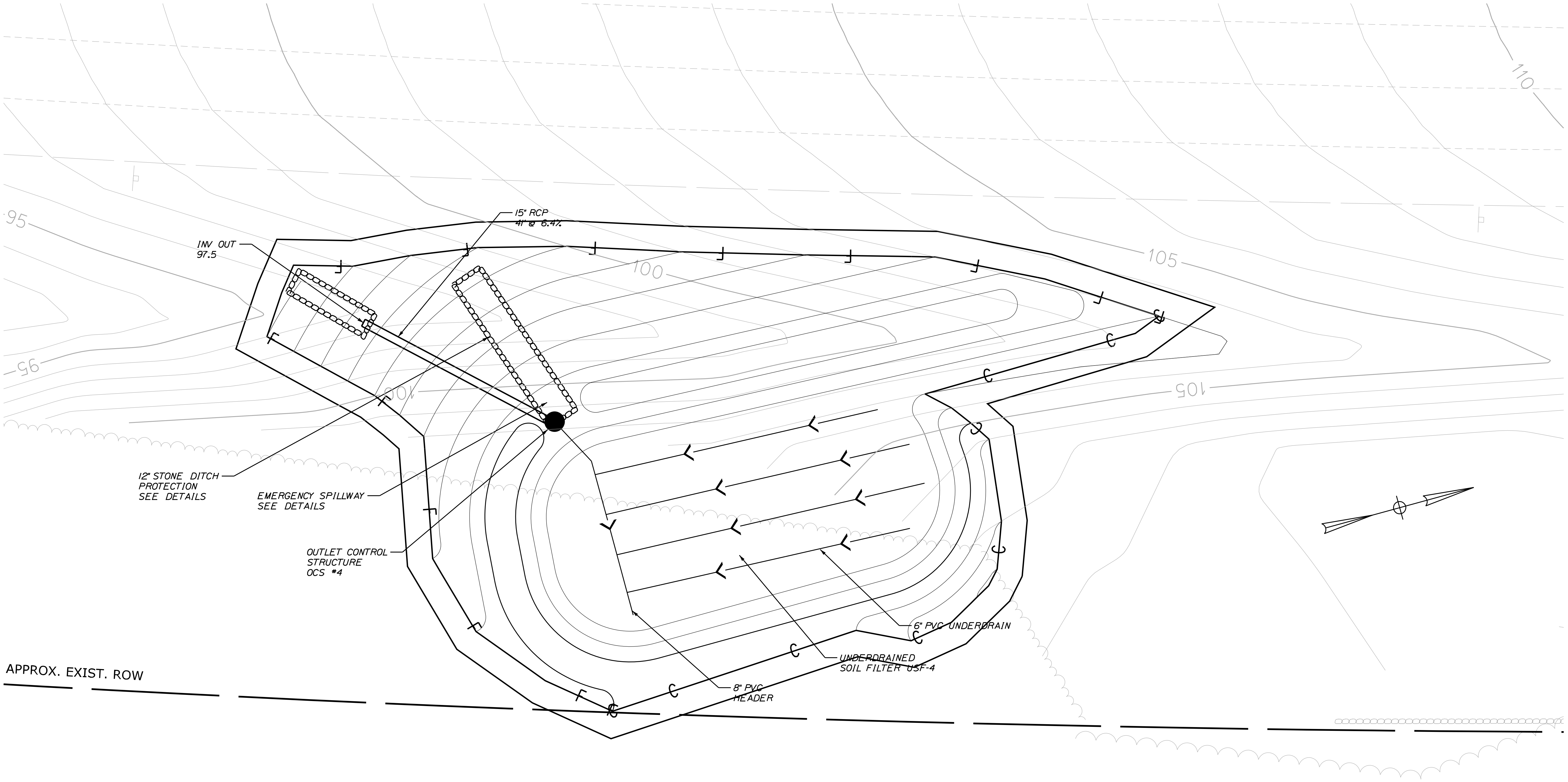
STORMWATER POND #3

SHEET NUMBER: 31

CONTRACT: 2017.09

31OF 34

Date:10/17/2016



Scale:

10 0 10 20

Scale of Feet

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Drawn	DB	09/16/16	In Charge of	---	--/--

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

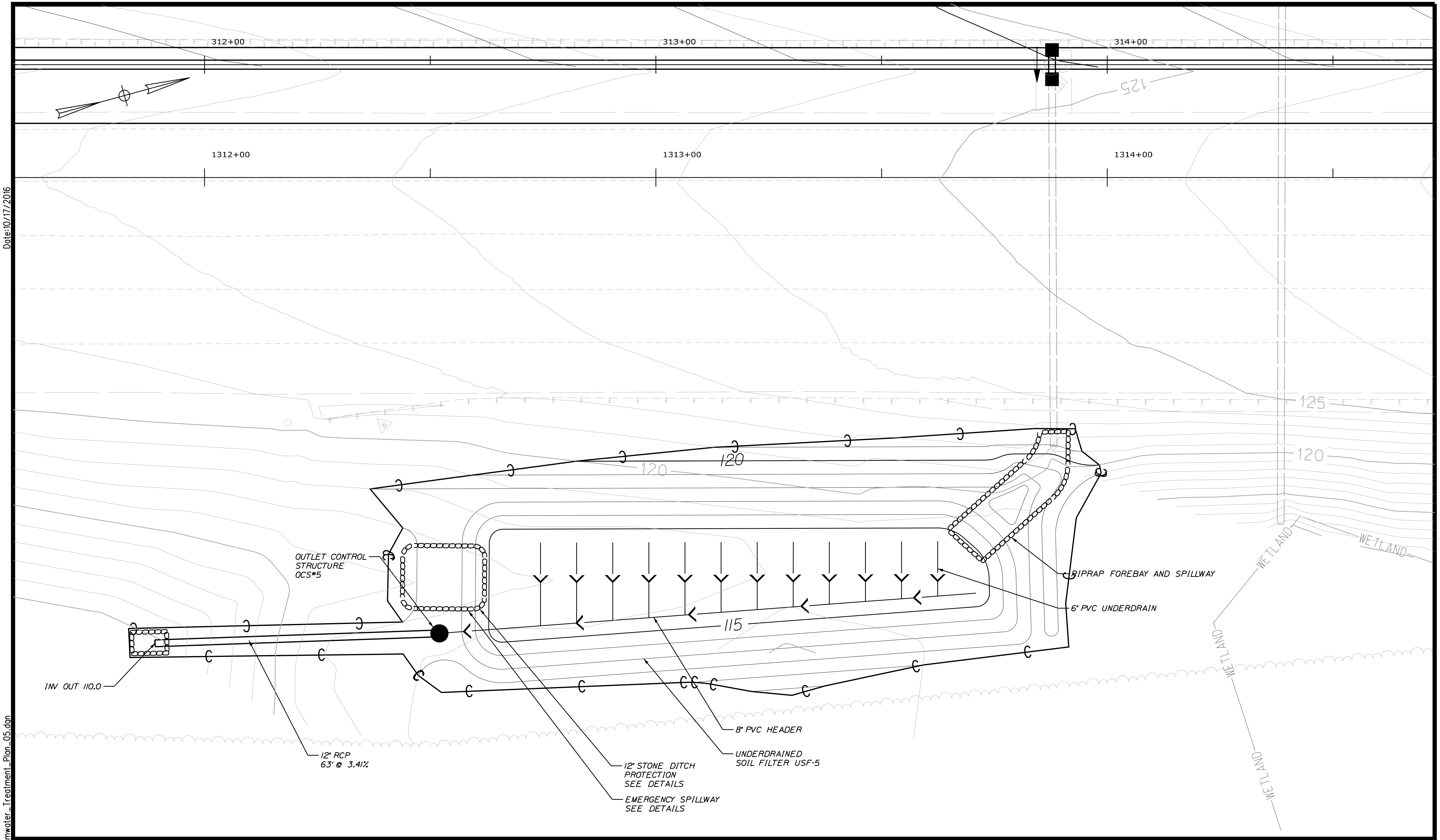
STORMWATER POND #4

SHEET NUMBER: 32

CONTRACT: 2017.09

32 OF 34

Filename: ...\097c_HW Stormwater_Treatment_Plan_04.dgn



Date:10/17/2016

Filename: ...\097d_HW Stormwater_Treatment_Plan_05.dgn

Scale:

10 0 10 20

Scale of Feet

No.	Revision	By	Date

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Drawn	DB	09/16/16	In Charge of	---	--/--

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

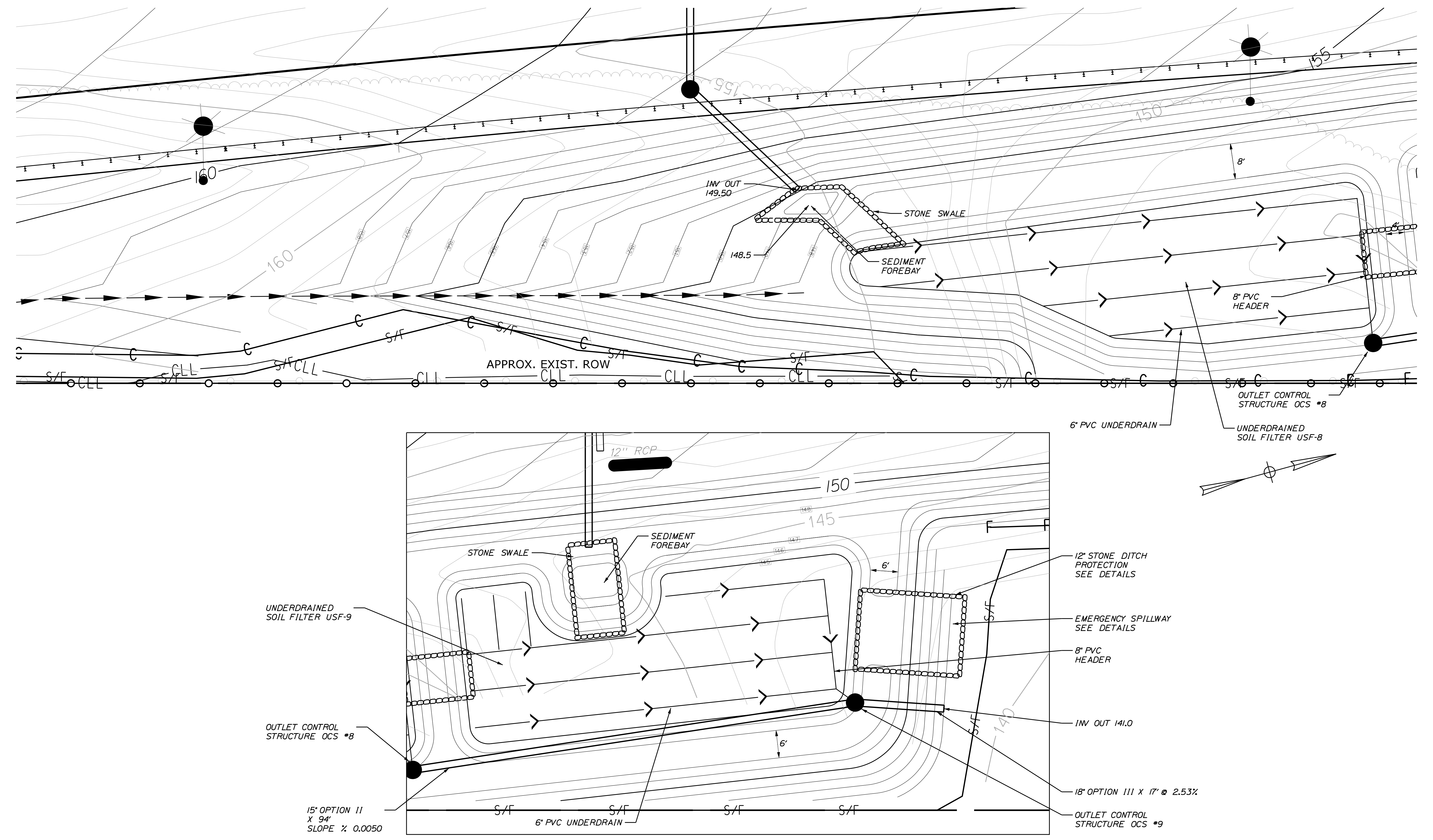
STORMWATER POND #5

SHEET NUMBER: 33

CONTRACT: 2017.09

33 OF 34

Date:10/17/2016



Scale:
10 0 10 20
Scale of Feet

No.	Revision	By	Date

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	By	Date		By	Date
Designed	PDO	09/16/16	Checked	DLR	10/17/16
Drawn	DB	09/16/16	In Charge of	---	--/--

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

STORMWATER PONDS #8 AND #9

SHEET NUMBER: 34

CONTRACT: 2017.09

34 OF 34

Filename: ...\097f_HW Stormwater_Treatment_Plan_08.dgn

Date:9/16/2016

Scale:

25 0 25 50

Scale of Feet

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MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

ACCESS ROAD
GRADING AND DRAINAGE 1

SHEET NUMBER: GP-19

CONTRACT: 2017.09

$PSET$ OF

Filename: ...\xxx_AccessRd_Grading_01.dgn

Date:9/16/2016

Scale:

25 0 25 50

Scale of Feet

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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

ACCESS ROAD
GRADING AND DRAINAGE 2

SHEET NUMBER: GP-20

CONTRACT: 2017.09

$PSET$ OF

Filename: ...\xxx_AccessRd_Grading_02.dgn

Date:9/16/2016

Filename: ...\xxx_AccessRd_Grading_03.dgn

Scale:
25 0 25 50
Scale of Feet

No.	Revision	By	Date

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Drawn	RLM	09/16/16	In Charge of	---	--/--

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MAINE TURNPIKE

THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

ACCESS ROAD
GRADING AND DRAINAGE 3

SHEET NUMBER: GP-21

CONTRACT: 2017.09

$PSET$ OF

Date:9/16/2016

Scale: 20 0 20 40
Scale of Feet

No.	Revision	By	Date

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

ADMINISTRATIVE BUILDING
GRADING PLAN

SHEET NUMBER: 94

CONTRACT: 2017.09

94 OF

Filename: ...\094_Admin_Grading_Plan.dgn

Date:9/16/2016

Scale:

20 0 20 40

Scale of Feet

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MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

ADMINISTRATIVE BUILDING
DRAINAGE PLAN

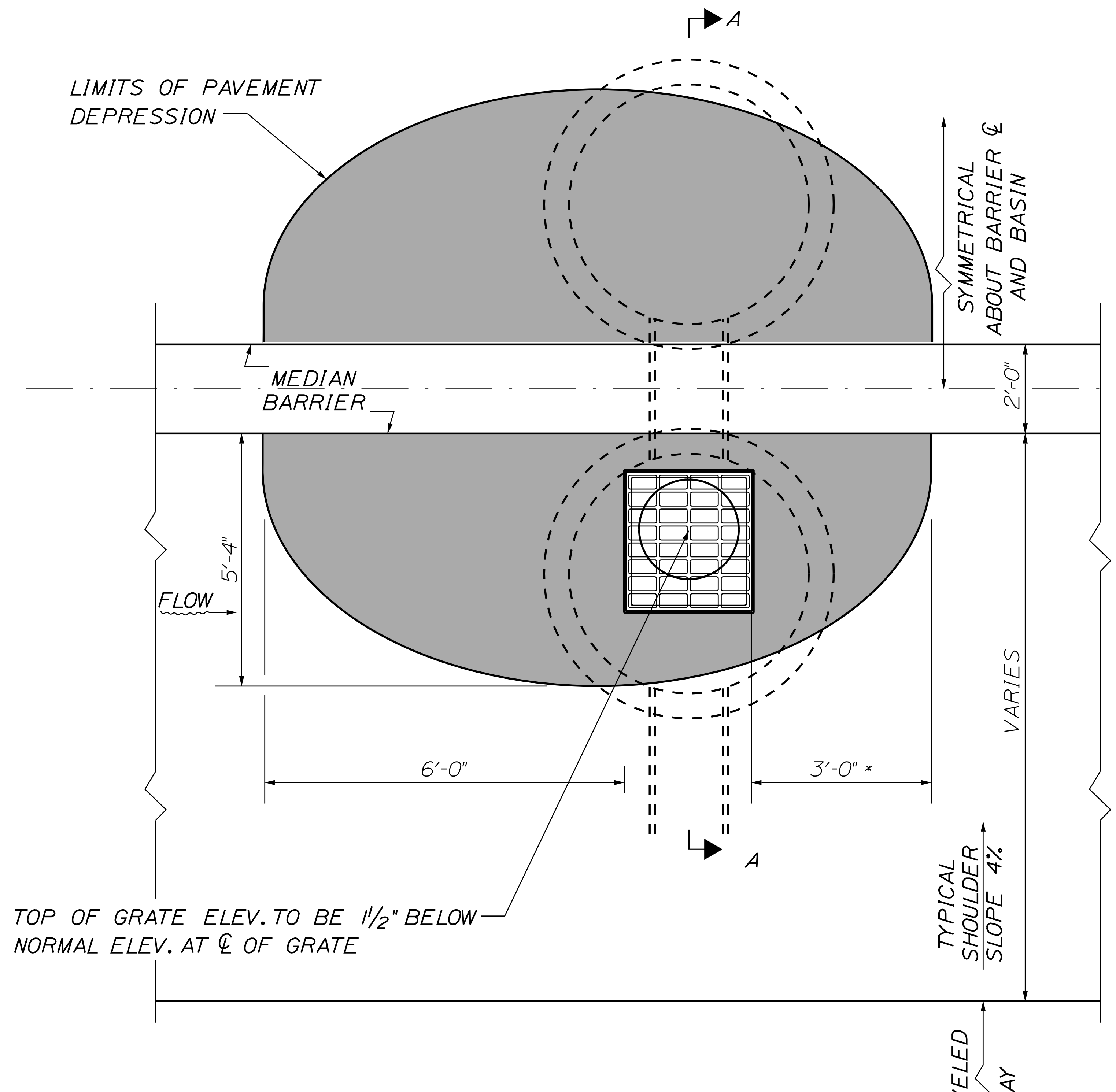
SHEET NUMBER: 94

CONTRACT: 2017.09

94 OF

Filename: ...\094a_Admin_Drainage_Plan.dgn

Date:10/14/2016



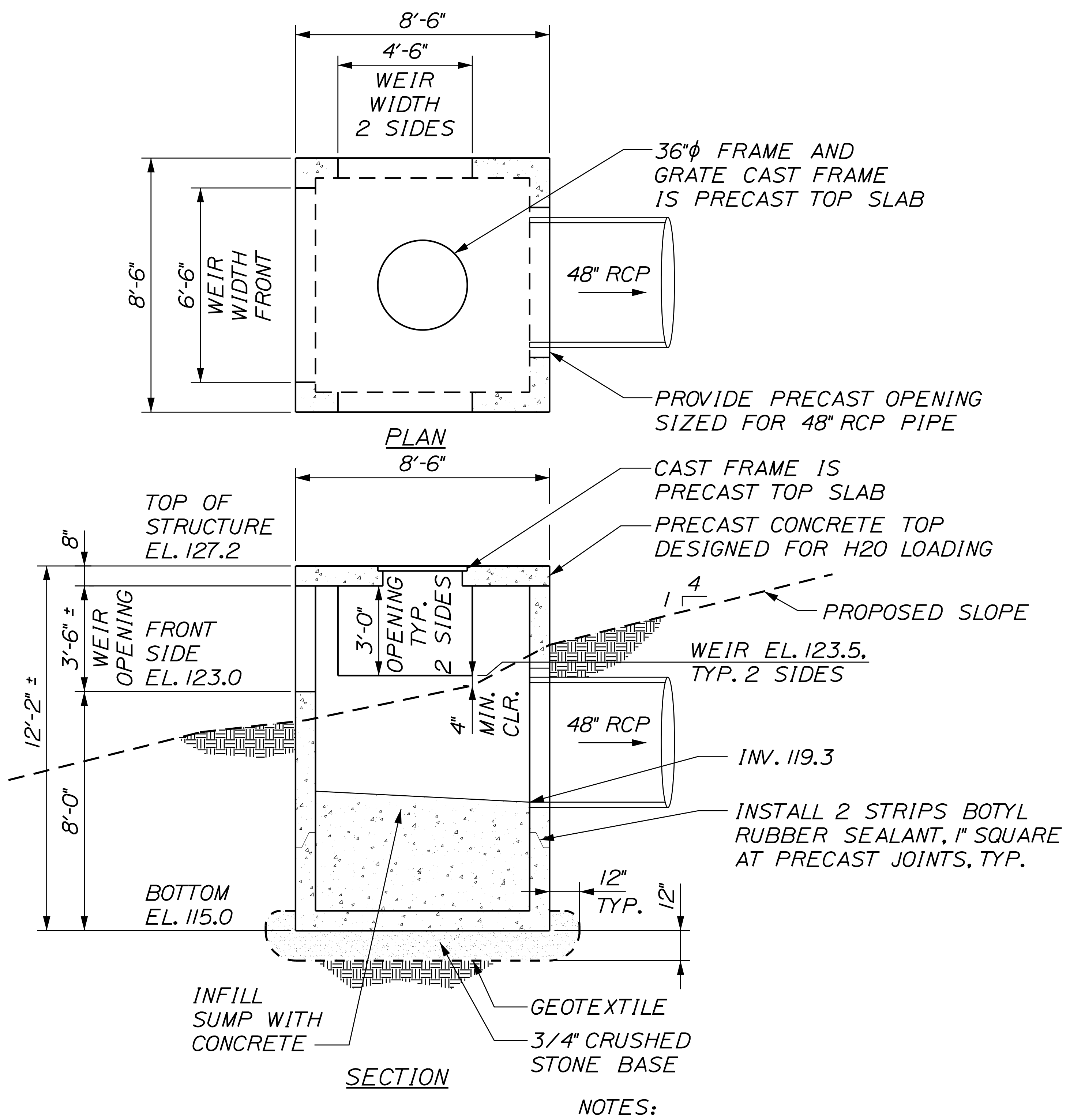
PLAN

NOTES:

1. SHADED AREA REPRESENTS APPROXIMATE LIMITS OF PAVEMENT DEPRESSION.

2. GRATE SHALL BE PLACED 1½" BELOW AND PARALLEL TO THE NORMAL PAVEMENT GRADE.

3. FRESHLY PLACED PAVEMENT SHALL BE REMOVED BEFORE COMPACTING DEPRESSED AREA.

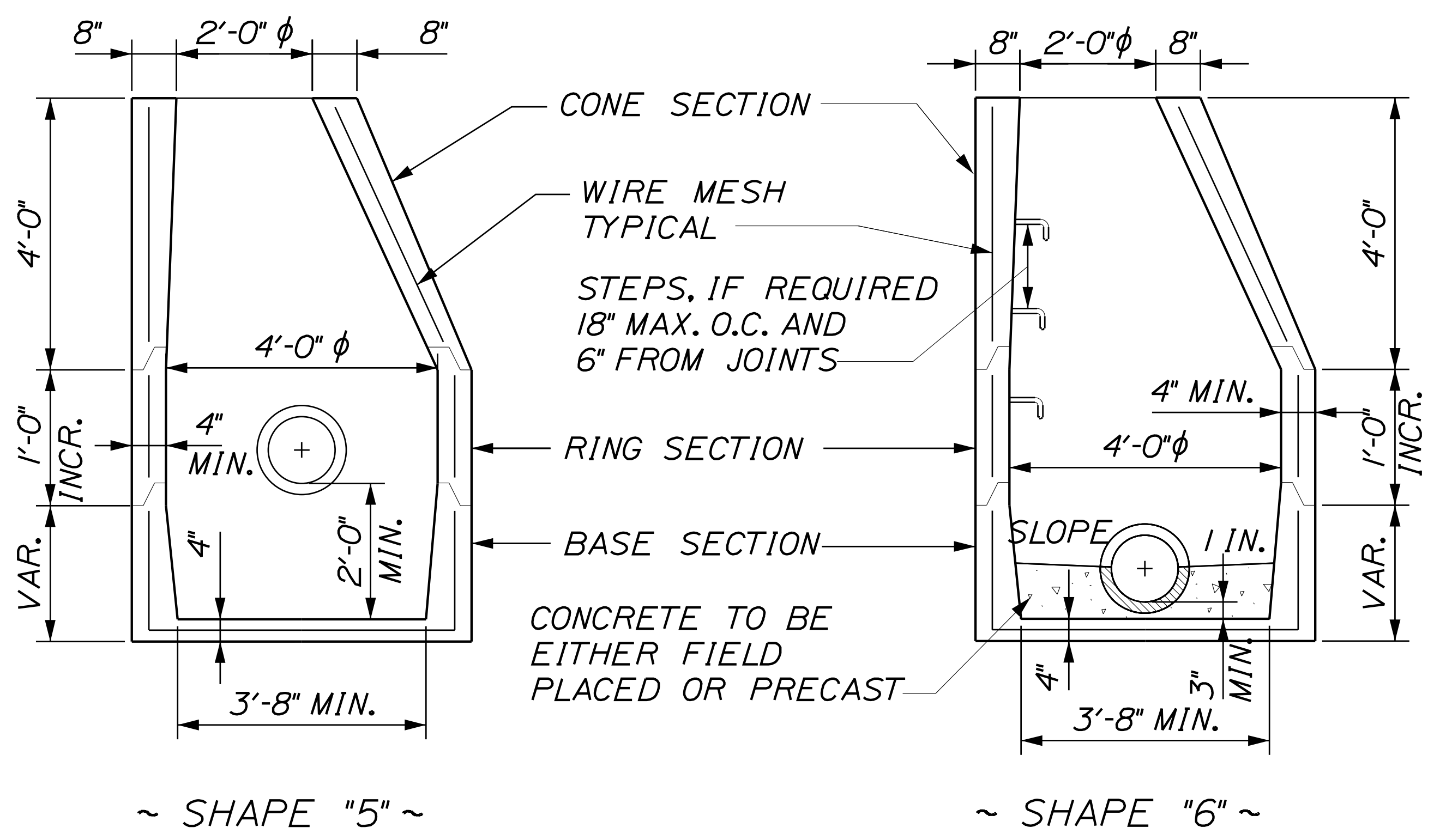


INLET DETAIL

NOT TO SCALE

NOTES:

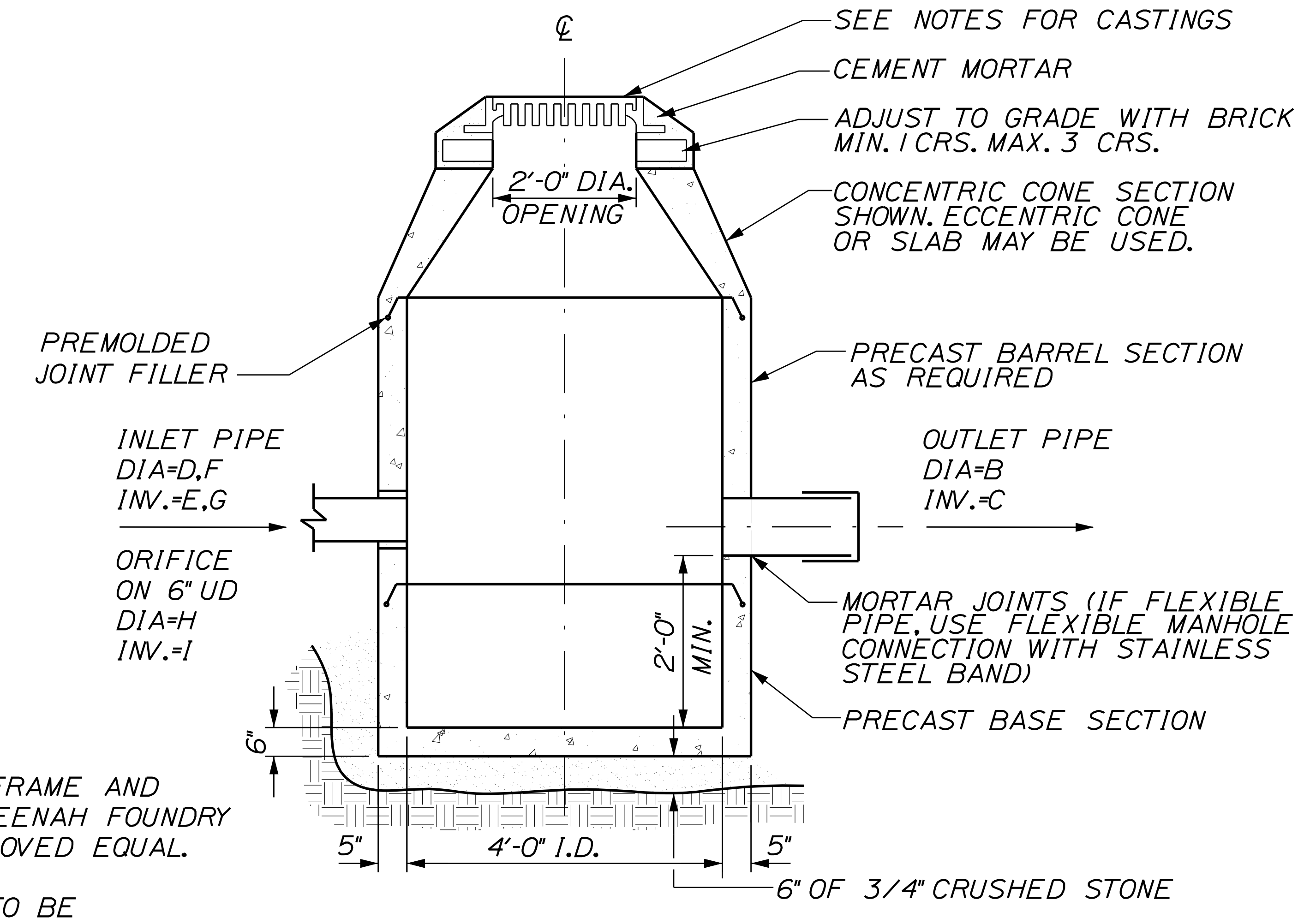
1. SUBMIT SHOP DRAWINGS FOR PRECAST STRUCTURE FOR ENGINEERS APPROVAL.



DIMENSIONS ARE INTENDED TO BE NOMINAL.

CATCH BASIN OR MANHOLE

NOT TO SCALE



NOTES:

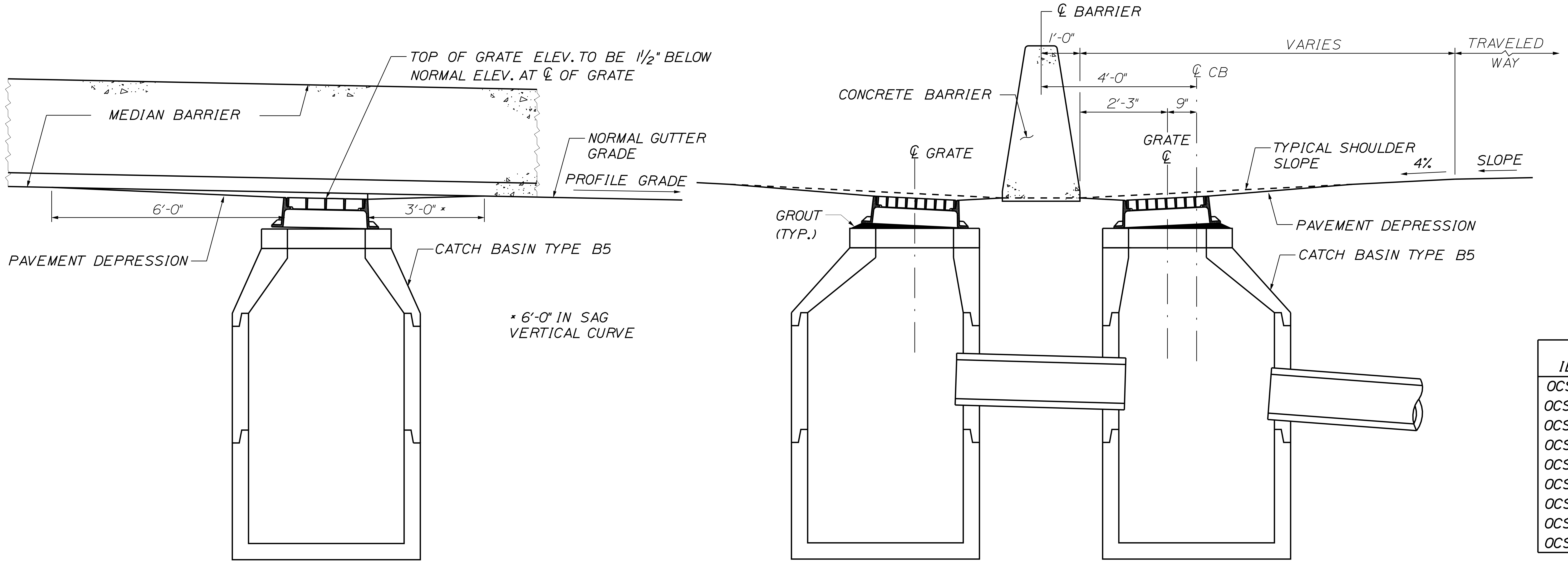
1. CATCH BASIN FRAME AND GRATE TO BE NEENAH FOUNDRY R-3405, OR APPROVED EQUAL.

2. STRUCTURES TO BE DESIGNED FOR H-20 LOADING.

ID	STATION	RIM (A)	OUTLET PIPE		INLET PIPE		INLET PIPE		ORIFICE FROM UDF	
			DIA (B)	INVERT (C)	DIA (D)	INVERT (E)	DIA (F)	INVERT (G)	DIA (H)	INVERT (I)
OCS#1	262+43.0, 88.0' LT	43.40	12"	40.57	8"	40.67	--	--	0.7"	40.67
OCS#2	269+16.0, 84.0' LT	42.40	12"	39.15	8"	39.65	--	--	0.8"	39.65
OCS#3	291+53.0, 125.0' LT	84.00	12"	80.15	8"	80.65	--	--	1.3"	80.65
OCS#4	293+95.0, 118.5' RT	104.00	15"	100.15	8"	100.65	--	--	1.2"	100.65
OCS#5	312+51.0, 126.0' RT	116.00	12"	112.15	8"	112.65	--	--	0.8"	112.65
OCS#6	341+95.0, 257.0' LT	163.00	12"	158.15	8"	158.65	--	--	1.2"	158.65
OCS#7	347+22.0, 231.0' LT	163.25	12"	159.15	8"	159.65	--	--	0.7"	159.65
OCS#8	353+95.0, 166.0' RT	146.15	15"	142.15	8"	142.65	--	--	1.1"	142.65
OCS#9	354+94, 152.0' RT	146.00	18"	141.43	8"	142.65	15"	141.68	1.2"	142.65

OUTLET CONTROL STRUCTURE (CB-4)

NOT TO SCALE



ELEVATION

SECTION A-A

PLACEMENT OF DRAINAGE STRUCTURES ALONG BARRIER

Filename: ...\014_Typical_01_DRAINAGE.dgn

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THE GOLD STAR
MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

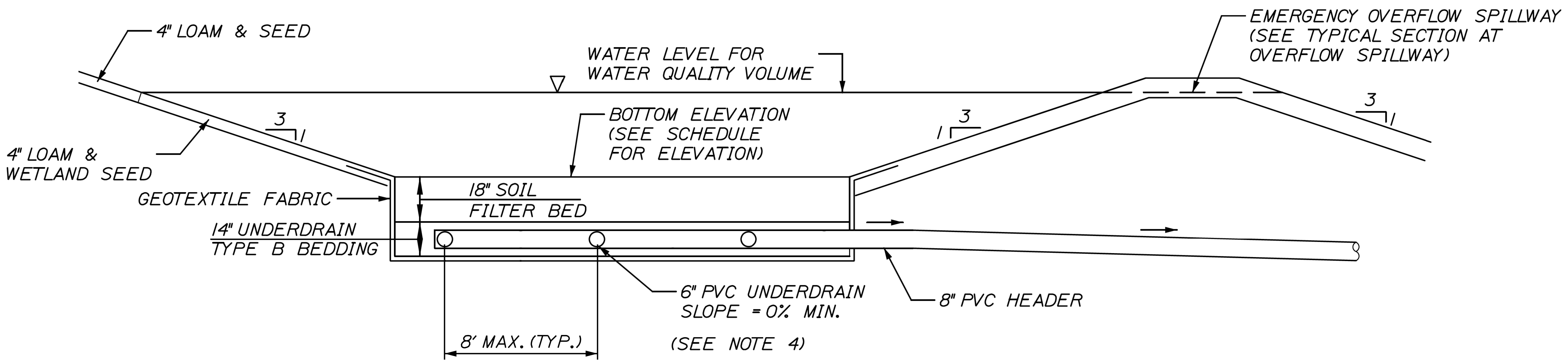
YORK TOLL PLAZA

DRAINAGE DETAILS

SHEET NUMBER: 14

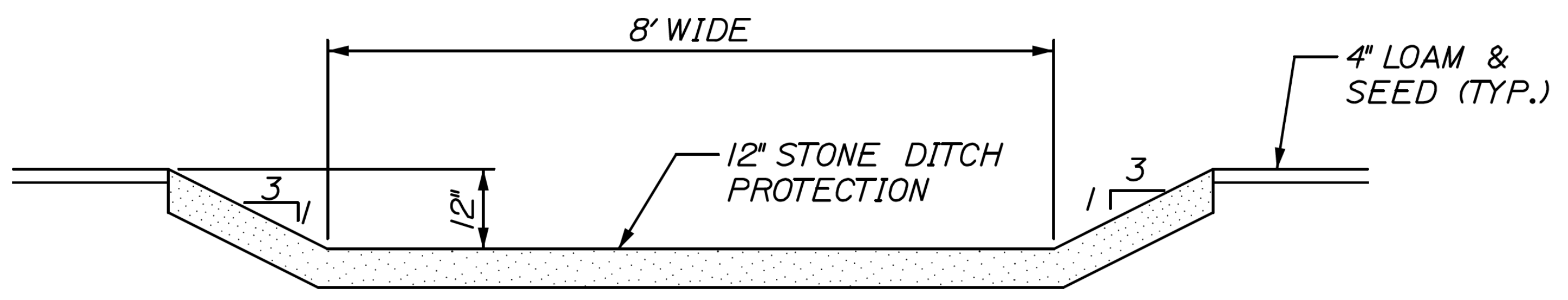
CONTRACT: WIN 2017.XX

14 OF _



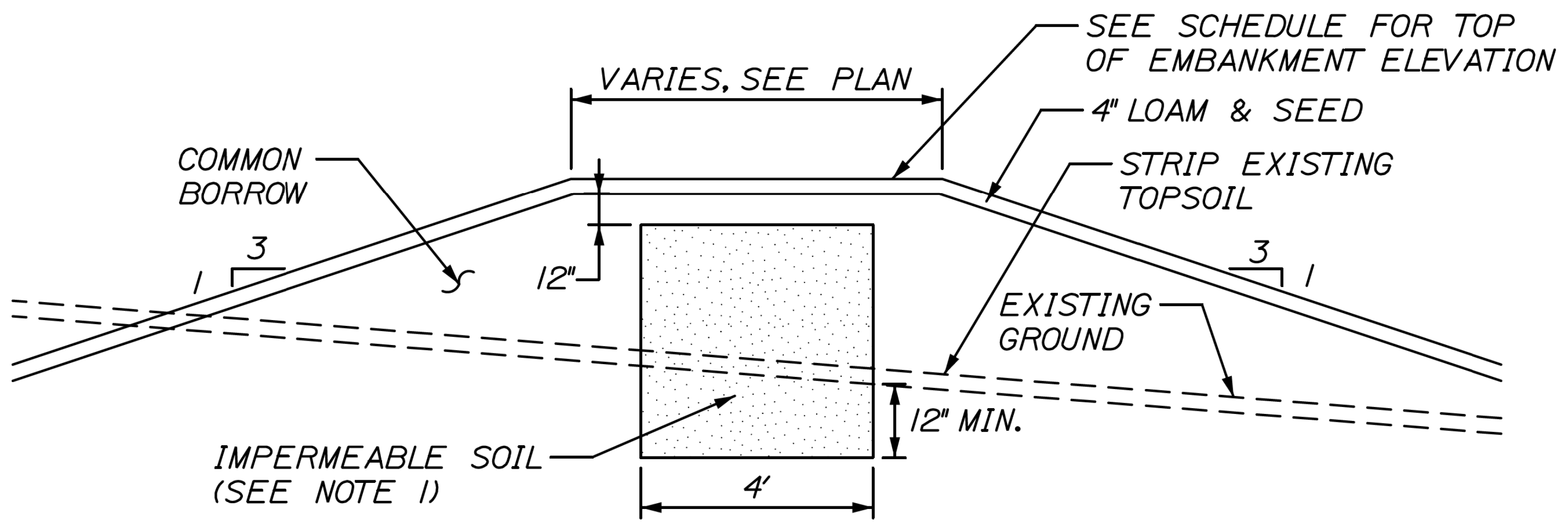
USF BASIN TYPICAL SECTION

NOT TO SCALE



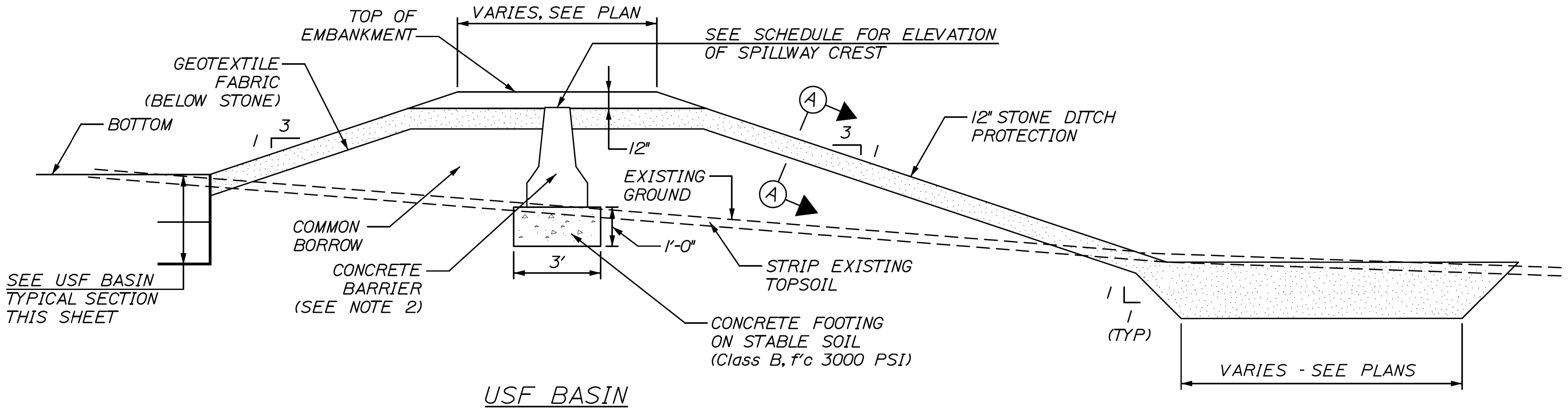
USF BASIN-EMERGENCY SPILLWAY SECTION A-A

NOT TO SCALE



USF BASIN TYPICAL SECTION AT EMBANKMENTS

NOT TO SCALE



USF BASIN TYPICAL SECTION AT OVERFLOW SPILLWAY

NOT TO SCALE

USF BASIN SPECIFICATIONS:

1. SOIL FILTER BED MATERIAL SHALL BE A LIGHTLY COMPACTED THOROUGHLY BLENDED MIXTURE OF THE FOLLOWING:
   - SAND (50-55% BY VOLUME): MEDOT SPEC. 703.01 (FINE AGGREGATE FOR CONCRETE).
   - TOPSOIL (20-30% BY VOLUME): LOAMY SAND TOPSOIL W/ MINIMAL CLAY CONTENT & BETWEEN 15-25% FINES PASSING #200 SIEVE.
   - MULCH (20-30% BY VOLUME): MODERATELY FINE SHREDDED BARK MULCH OR WOOD FIBER MULCH W/ LESS THAN 5% PASSING #200 SIEVE.
2. UNDERDRAIN BACKFILL (BEDDING) SHALL BE WELL GRADED, CLEAN, COARSE GRAVEL MEETING MEDOT SPECIFICATION 703.22, TYPE B UNDERDRAIN BACKFILL. NO MORE THAN 2% BY WEIGHT SHALL PASS THE #200 SIEVE.
3. GEOTEXTILE FABRIC SHALL BE MEDOT SPECIFICATION 722.02, CLASS A DESIGNATION.
4. UNDERDRAIN PIPE SHALL BE PVC CONFORMING TO ASTM D3034, SDR 35. (UNDERDRAIN LATERALS SHALL BE 6" INCH SLOTTED PVC. 8 INCH PVC HEADER/OUTLET PIPE SHALL NOT BE SLOTTED.)
5. STONE DITCH PROTECTION FOR EMERGENCY SPILLWAY AND PIPE OUTLET/DITCH PROTECTION SHALL BE MEDOT SPECIFICATION 703.29, WITH 90-100% WEIGHT OF ROCK PASSING AN 8 INCH SIEVE AND 0-15% PASSING A 4 INCH SIEVE.
6. PRECAST CONCRETE BARRIER SHALL BE NEW, UNUSED (CLEAN) UNITS, 10 FOOT LONG EACH.
7. SURFACE OF SOIL FILTER SHALL BE PLANTED WITH WETLAND SEED "NEW ENGLAND EROSION CONTROL/RESTORATION MIX" AS SUPPLIED BY NEW ENGLAND WETLAND PLANTS, INC. SEED MIX SHALL BE APPLIED AT DOUBLE THE MANUFACTURERS APPLICATION RATE. SURFACE SHALL BE STABILIZED WITH AN APPROVED EROSION CONTROL MATTING.
8. IMPERMEABLE SOIL (EMBANKMENT CORE) SHALL BE MEDOT SPECIFICATION 203.245, CLAY BORROW.
9. STORMWATER FILTER SHALL BE CONSTRUCTED TO THE LIMITS AND DETAILS SHOWN ON THE PLANS AND THE ABOVE SPECIFICATIONS UNLESS OTHERWISE APPROVED BY THE RESIDENT.
10. FILTER BED MATERIAL SHALL NOT BE PLACED IN USF BASINS UNTIL THE TRIBUTARY DRAINAGE AREA IS PERMANENTLY STABILIZED AGAINST EROSION.
11. EROSION CONTROL BLANKETS CONFORMING TO MAINE DOT STANDARD DETAIL 802(02) SHALL BE PROVIDED ON ALL USF BASIN EMBANKMENT SLOPES, BOTH INTERIOR & EXTERIOR SLOPES.

NOTES:

1. AT EMERGENCY SPILLWAY, IMPERMEABLE SOIL (EMBANKMENT CORE) SHALL TIE INTO CONCRETE BARRIER AND EXTEND 3 FEET ALONG EACH END OF CONCRETE BARRIER.
2. SET TOP OF CONCRETE BARRIER LEVEL AND AT DESIGNATED ELEVATION OF SPILLWAY CREST.
3. FOR LAYOUT OF UNDERDRAIN SOIL FILTER (USF BASINS), SEE PROPOSED GRADING AND DRAINAGE PLANS.
4. FOR LAYOUT OF UNDERDRAIN PIPING, SEE PROPOSED GRADING AND DRAINAGE PLANS.
5. 6" PVC PIPE LOCATED BELOW SEDIMENT FOREBAY SHALL BE SOLID WALL PIPE.

USF BASIN SCHEDULE

USF BASIN	BASIN ELEVATIONS			STATION
	BOTTOM	TOP OF EMBANKMENT	SPILLWAY CREST	
#1	43.00	44.00	43.60	262+00 LT
#2	42.00	43.00	42.60	268+00 LT
#3	83.00	85.00	84.50	291+00 LT
#4	103.00	105.00	104.50	295+00 RT
#5	115.00	118.00	117.00	313+00 RT
#6	161.00	165.00	164.50	342+00 LT
#7	162.00	164.00	163.75	342+50 LT
#8	145.00	147.00	147.00	353+50 RT
#9	145.00	147.00	146.75	354+50 RT

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YORK TOLL PLAZA

DRAINAGE DETAILS

SHEET NUMBER: 15

CONTRACT: 2017.09

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