HANCOCK
ASSOCIATES

Stormwater Report

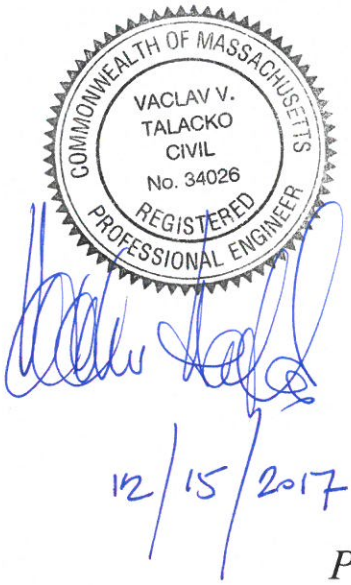
In Support of

Site Plan Review Application

for

40 Sam Fonzo Drive

Beverly, MA



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December, 2017

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Introduction

Existing
The existing property at 40 Sam Fonzo Drive in Beverly, Massachusetts is currently a 4.3 acre empty lot comprised almost entirely of a relatively flat grassed field with bordering vegetated wetlands at the western edge of the property. However, an "approval not required" plan shall be filed to change the lot lines prior to commencement of construction so as to provide adequate setbacks for the proposed building. After the lot lines are changed, the new property area will be 5.3 acres.

Proposed
Fonzo Realty, LLC proposes to construct a new commercial office and warehouse building at 40 Sam Fonzo Drive. The new building includes an 18,489 S.F. office to be occupied by one tenant and a second 5,550 S.F. office with an attached 23,376 S.F. warehouse to be occupied by a second tenant. Associated site improvements will include paved pedestrian and vehicular areas, landscaped areas, truck loading docks, utility services and stormwater management systems.

Stormwater runoff drains over-land to existing wetlands located on the western edge of the project area. The proposed stormwater system is designed to approximate the existing drainage conditions. Stormwater runoff from the majority of the proposed impervious areas will drain to two separate subsurface systems of chambers that will promote infiltration and detention to meet the existing peak rates and volumes of stormwater runoff. Additionally, a small portion of the proposed impervious area will drain directly to a Vortsentry HS36 Unit and then outlet to the wetlands. The stormwater runoff from the building roof will be split equally and half of all the runoff will be distributed to each of the infiltration chamber systems. Stormwater runoff from the remaining project area will drain over-land directly to the wetlands.

The stormwater system has been designed to meet the standards described in the "Massachusetts Stormwater Handbook." The report is organized into sections that correspond to the categories listed in the "Massachusetts Stormwater Report Checklist."

Standard 1: No New Untreated Discharges

The Massachusetts Stormwater Handbook states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosions in wetlands or waters of the Commonwealth. The project will not include untreated stormwater discharges. The stormwater system will provide water quality treatment for all paved vehicular areas via an isolator row within the subsurface system of chambers. A stone pad at the stormwater system outlet point will prevent erosion.

Standard 2: Peak Rate Attenuation

The Massachusetts Stormwater Handbook states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. A summary of the existing and proposed discharge rates follows. The proposed condition discharge rates of runoff are at or below the existing rates to the same discharge points. Please see the attached "Existing Drainage Areas" and "Proposed Drainage Areas" figures (Appendix IV) and Hydrocad summary (Appendix V) for more information.

The Natural Resources Conservation Service (NRCS) Web Soil Survey of Essex County defines soils in the project area as the following:

- 102C, Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes (Hydrologic Soil Group B)
- 254B, Merrimac fine sandy loam, 3 to 8 percent slopes (Hydrologic Soil Group A)
- 254C, Merrimac fine sandy loam, 8 to 15 percent slopes (Hydrologic Soil Group A)
- 276A, Ninigret fine sandy loam, 0 to 3 percent slopes (Hydrologic Soil Group C)
- 276B Ninigret fine sandy loam, 3 to 8 percent slopes (Hydrologic Soil Group C)

Please see the attached NRCS Web Soil Summary (Appendix II).

One drainage area has been modeled to represent the existing conditions within the project area. The following is a description of the existing drainage area:

- *Drainage Area EX1*
  Drainage Area EX1 is 209,245 square feet and drains over-land to the wetlands on the western edge of the project area. The wetlands are represented as discharge point DP1 for the purpose of these calculations. The existing watershed consists almost entirely of open grass fields with some woods and wetlands on the western edge of the project area as well as some impervious paved areas.

Twelve drainage areas have been modeled to represent the proposed conditions. The following is a description of the proposed drainage areas:

- *Drainage Area PR-1*
  Drainage Area PR-1 is 24,267 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-1 drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-2*
  Drainage Area PR-2 is 15,219 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-2 drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-3*
  Drainage Area PR-3 is 7,825 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-3 drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-4*
  Drainage Area PR-4 is 15,089 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-4 drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-5*
  Drainage Area PR-5 is 3,797 square feet and consists of the paved truck dock and trash compactor areas but also includes some landscaped areas. Stormwater runoff from PR-5 drains via a network

of pipes to Infiltration Basin #2. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-6*
  Drainage Area PR-6 is 7,825 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-6 drains via a network of pipes to Infiltration Basin #2. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-7*
  Drainage Area PR-7 is 14,941 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-7 drains via a network of pipes to Infiltration Basin #2. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-8*
  Drainage Area PR-8 is 25,204 square feet and consists mainly of paved vehicular areas but also includes some landscaped areas. Stormwater runoff from PR-8 drains via a network of pipes to Infiltration Basin #2. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-9a*
  Drainage Area PR-9a is 23,660 square feet and consists of half of the proposed building roof area. Stormwater runoff from PR-9a drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-9b*
  Drainage Area PR-9b is 23,659 square feet and consists of half of the proposed building roof area. Stormwater runoff from PR-9b drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-10*
  Drainage Area PR-10 is 13,948 square feet and consists mainly of paved vehicular areas but also includes some landscaped areas. Stormwater runoff from PR-10 drains directly to a Vortsentry Unit for pretreatment before discharging westerly to the wetlands, discharge point DP1.

- *Drainage Area PR-11*
  Drainage Area PR-11 is 27,448 square feet and consists of undisturbed landscaped areas. Stormwater runoff from PR-11 drains directly over-land to the wetlands, discharge point DP1.

- *Drainage Area PR-12*
  Drainage Area PR-12 is 10,095 square feet and consists mainly of paved vehicular areas but also includes some paved pedestrian areas and landscaped areas. Stormwater runoff from PR-12 drains via a network of pipes to Infiltration Basin #1. Overflow from the infiltration basin will drain westerly to the wetlands, discharge point DP1.

Subsurface soil investigations were performed at each of the infiltration basin locations. Soils at each infiltration basin location were found to be loamy sand. Groundwater was not observed in these

investigations. However, ledge refusal was prominent at varying depths. For the purpose of these calculations, the Rawls's rate corresponding to loamy sand (2.41 inches per hour) was used as an exfiltration rate at each infiltration basin.

The following table compares the peak rates and volumes of runoff under the existing and proposed conditions:

Discharge Point	**2-Year Storm** (3.1" Rainfall Depth)		**10-Year Storm** (4.6" Rainfall Depth)		**25-Year Storm** (5.4" Rainfall Depth)		**100-Year Storm** (6.5" Rainfall Depth)	
	Existing (cfs)	Proposed (cfs)	Existing (cfs)	Proposed (cfs)	Existing (cfs)	Proposed (cfs)	Existing (cfs)	Proposed (cfs)
Peak Rate (cfs)	2.60	1.53	6.20	3.27	8.35	4.28	11.45	8.37
Volume (ac-ft)	0.34	0.08	0.74	0.16	0.97	0.35	1.32	0.68

cfs - Cubic Feet per Second

Standard 3: Recharge

The Massachusetts Stormwater Handbook states that loss of annual recharge to groundwater shall be eliminated or minimized. The annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. Recharge volumes are provided for all of the proposed impervious areas. For the purpose of these calculations, all of the project areas are considered to be Hydrologic Soil Group B. The required recharge volume is 0.35" multiplied by the area of impervious surfaces. Please see the attached HydroCAD summaries for the recharge volumes provided within the infiltration basins (Appendix VI). The volumes are as follows:

Required Recharge Volume, HSG B = Target Depth * Impervious Area = 0.35" * 144,796 SF = 4,223 CF

Since not all the impervious areas will drain to the infiltration basins, a capture area adjustment has been calculated as follows:
Capture Area Adjustment = Total Impervious Area / Impervious Area Draining to Recharge Volume = 144,796 SF / 135,205 SF = 1.07
Required Recharge Volume with Capture Area Adjustment = 4,223 SF * 1.07 = 4,523 CF

The recharge volume provided is the volume within the subsurface system of chambers that is below the elevation of the weir (59.50'). The total recharge volume provided is 28,929 C.F. (16,250 C.F. from Infiltration Chambers #1 and 12,679 C.F. from Infiltration Chambers #2). Since the recharge volume provided is greater than the required recharge volume, the standard is met for the project area.

The Massachusetts Stormwater Handbook states that the recharge volume must drain within 72 hours. The following "drawdown" calculations assumes a Rawl's Rate associated with the texture class and Hydrologic Soil Group of the soils in the area of the recharge volume. These rates are listed in Table 2.3.3. of Volume 3, Chapter 1 of the Massachusetts Stormwater Handbook. The drawdown time is calculated using the following equation:

Drawdown Time = Storage Volume / (Rawl's Rate * Bottom Area)

Drawdown times for the recharge volumes are listed below:

Recharge BMP	Recharge Volume (Cubic Feet)	Bottom Area (Square Feet)	Rawl's Rate (Inches/Hour)	Drawdown Time (Hours)
Infiltration Basin #1	16,250	5,565	2.41	15
Infiltration Basin #2	12,679	4,352	2.41	15

Since the drawdown times are less than 72 hours, the requirement is met.

Standard 4: Water Quality

The Massachusetts Stormwater Handbook states that systems shall be designed to remove 80% of the average annual post-development construction load of Total Suspended Solids (TSS). The treatment BMP's have been sized to provide at least 80% TSS removal and measures will be taken for long-term pollution prevention.

Stormwater runoff from the vehicular paved area will be treated for a total of 84% TSS removal. The isolator rows for each infiltration chamber system, consisting of Stormtech MC-3500 chambers wrapped in filter fabric, has been sized to provide 84% TSS removal per the Stormtech Isolator Row Sizing Chart (Appendix VII) and the DEP's Equivalent Water Quality Peak Flow Rate guidelines:

Infiltration Basin #1
Time of Concentration, Tc = 0.083 Hours
Unit Peak Discharge, qu = 773 csm/in
Vehicular Impervious Surface Area, A = 0.00267 mi^2
Water Quality Volume, WQV = 0.5 Inches
Water Quality Flow, WQF = 1.03 cfs

Isolator Row Chambers Required = 1.03 cfs / 0.24 cfs = **5 Chambers**
Isolator Row Chambers Provided = 11 Chambers

Infiltration Basin #2
Time of Concentration, Tc = 0.083 Hours
Unit Peak Discharge, qu = 773 csm/in
Vehicular Impervious Surface Area, A = 0.00218 mi^2
Water Quality Volume, WQV = 0.5 Inches
Water Quality Flow, WQF = 0.84 cfs

Isolator Row Chambers Required = 0.84 cfs / 0.24 cfs = **4 Chambers**
Isolator Row Chambers Provided = 11 Chambers

Standard 5: Land Uses with Higher Potential Pollutant Loads

The project site is not considered a Land Use with Higher Potential Pollutant Load (LUHPPL). Therefore, this standard is not applicable.

Standard 6: Critical Areas

The proposed project is not in a critical area. Therefore, this standard is not applicable.

Standard 7: Redevelopment

The proposed project is not considered a redevelopment.

Standard 8: Construction Period Pollution Prevention and Erosion & Sedimentation Control

Best management practices (BMP) for erosion and sedimentation control consist of siltation barriers, such as straw wattles, and hydroseeding. Many stormwater BMP technologies (e.g., infiltration technologies) are not designed to handle the high concentrations of sediments typically found in construction runoff and must be protected from construction-related sediment loadings. Construction BMPs **must** be maintained.

In developing the proposed project certain measures will be implemented to minimize impacts erosion and sedimentation could have on the surrounding resource areas. This section addresses items that involve proper construction techniques, close surveillance of workmanship, and immediate response to emergency situations. The contractor must be prepared to provide whatever reasonable measures are necessary to protect the environment during construction and to stabilize all disturbed areas as soon as construction ends.

Pre-Construction

1. The contractor shall install a siltation barrier as approved by the City of Beverly Conservation Commission. The contractor shall install silt sacks in existing catch basins in Sam Fonzo Drive.

2. The contractor shall install a construction entrance

3. The contractor shall comply with the requirements of the Order of Conditions.

4. The contractor shall have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials shall include, but are not limited to, crushed stone, straw wattles and silt fencing.

5. The contractor is responsible for erosion control on site and shall utilize erosion control measures where needed, regardless of whether the measures are specified on the plan or in the order of conditions.

Preliminary Site Work

1. Contractor shall be responsible to construct and maintain a stabilized construction entrance at the driveway entrance, beyond the existing pavement, to minimize the transport of sediment onto the adjacent roadway. If any material enters the surrounding roadways the contractor shall sweep the area.

2. Excavated materials should be stockpiled, separating the topsoil for future use on the site. All stockpiled materials shall be located outside of the 100ft buffer zone and be surrounded by siltation barriers. Any soil stockpiles shall be seeded if left for more than 14 days.

3. If intense rainfall is anticipated, the installation of supplemental filter socks, hay bale dikes, silt

fences, or armored dikes shall be considered.

4. Unsuitable excavated material shall be removed from the site.

5. Construction entrance shall be installed.

6. Existing catch basins shall be protected with silt sacks.

Ongoing Site Work

1. Erosion control measures shall be regularly inspected and replaced as needed.

2. Dewatering shall be done in a manner so as not to transmit silt, sand or particulate matter to the receiving water or existing drainage system.

Landscaping

1. Planting shall occur as soon as possible to provide permanent stabilization of disturbed surfaces.

2. If the season or adverse weather conditions do not allow the establishment of vegetation, temporary mulching with straw, wood chips weighted with snow fence or branches, or other methods shall be provided.

3. A minimum of 4 inches of topsoil shall be placed and its surface smoothed to the specified grades.

4. The use of herbicides is strongly discouraged.

5. Hydro seeding is encouraged for steep slopes. Application rates on slopes greater than 3:1 shall have a minimum seeding rate of 5-lbs/1000 SF. A latex or fiber tackifier shall be used on these slopes at a minimum rate of 50 lbs. of tackifier per 500 gallons of water used.

Standard 9: Operations and Maintenance Plan

The information provided herein is intended to provide the base information for operation and maintenance of the site in perpetuity subject to updates and revisions as required at a future date. As such all future property owners must be notified in writing of the this plan and be provided with a copy of this plan, a complete set of the design drawings and/or a completed as-built plan showing all the drainage features as they were constructed, which are considered part of this document. Please see the attached Operations and Maintenance Log (Appendix VIII).

Stormwater management system owner:	Property Owner
The party responsible for operation and maintenance:	Property Owner

Illicit Discharge - Practices to Minimize Storm Water Contamination

- All waste materials will be collected and stored in a securely lidded metal dumpster.
- All trash and debris from the site will be deposited in the dumpster. The dumpster will be emptied on a regular schedule prior to being over full.
- All personnel will be instructed regarding the correct procedure for waste disposal.

- Good housekeeping and spill control practices will be followed to minimize storm water contamination from petroleum products, paints, and cleaning products.
- All site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Spill kits will be provided with any activity that could provide contamination.
- All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewers, but will be properly disposed according to the manufacturer's instructions.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm sewers will be reported to the Massachusetts Department of Environmental Protection Northeast Regional Office at 1-888-304-1133.

Deep Sump Hooded Catch Basins

Inspect deep sump catch basins four times per year including the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or when the depth of deposits is greater than or equal to one half the depth of the sump. Vacuum trucks are to be used to remove trapped sediment and supernatant.

Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Any contaminated materials must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.00, and handled as hazardous waste. MassDEP regulations prohibit landfills from accepting materials that contain free draining liquids.

Infiltration BMP

The infiltration BMP (subsurface chamber system) shall be inspected after every major storm for the first few months to ensure it is stabilized and functioning properly. If necessary, corrective action shall be taken until the system functions properly. Inspectors should note how long water remains standing in the inspection port after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging. Thereafter, inspect the infiltration BMP at least twice per year.

Roof Drain Leaders

Routine roof inspections shall be performed two times per year. The roof shall be kept clean and free of debris, and the roof drainage systems shall be kept clear. Gutters and downspouts shall be cleaned at least twice per year, or more frequently as necessary.

Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

Initial Post-Construction Inspection

During the initial period of vegetation establishment pruning and weeding are required twice in first year by contractor or owner. Any dead vegetation/plantings found after the first year will be replaced. Proper mulching is mandatory and regular watering may be required initially to ensure proper establishment of new vegetation.

Long-Term Maintenance
The planted areas shall be inspected on a semi-annual basis and any litter removed. Weeds and invasive plant species shall be removed by hand. Maintain planted areas adjacent to pavement to prevent soil washout. Immediately clean any soil deposits on pavement. Leaf litter and other detritus shall be removed twice per year. If needed to maintain aesthetic appearance, perennial plantings may be trimmed at the end of the growing season.

Trees and shrubs shall be inspected twice per year to evaluate health and attended to as necessary. Seeded ground cover or grass areas shall not receive mulching. Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming. Plant alternative mixtures of grass species in the event of unsuccessful establishment. The grass vegetation should not be cut to a height less than four inches.

Pesticide/Herbicide Usage
No pesticides are to be used unless a single spot treatment is required for a specific control application.

Standard 10: Prohibition of Illicit Discharges

Illicit Discharge Compliance Statement
To the best of my knowledge no illicit discharges currently exist on the site and no future illicit discharge will be allowed, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

_____

Signed by Stormwater System Owner *Date*

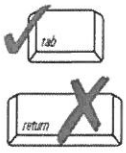
Appendix I. Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

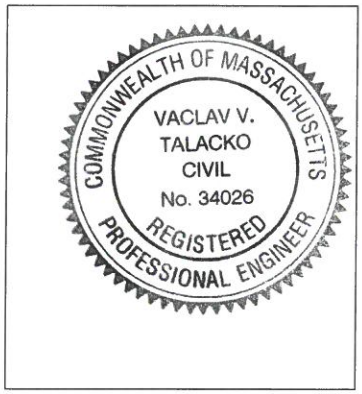
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



12/15/2017

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☐ Name of the stormwater management system owners;
- ☐ Party responsible for operation and maintenance;
- ☐ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

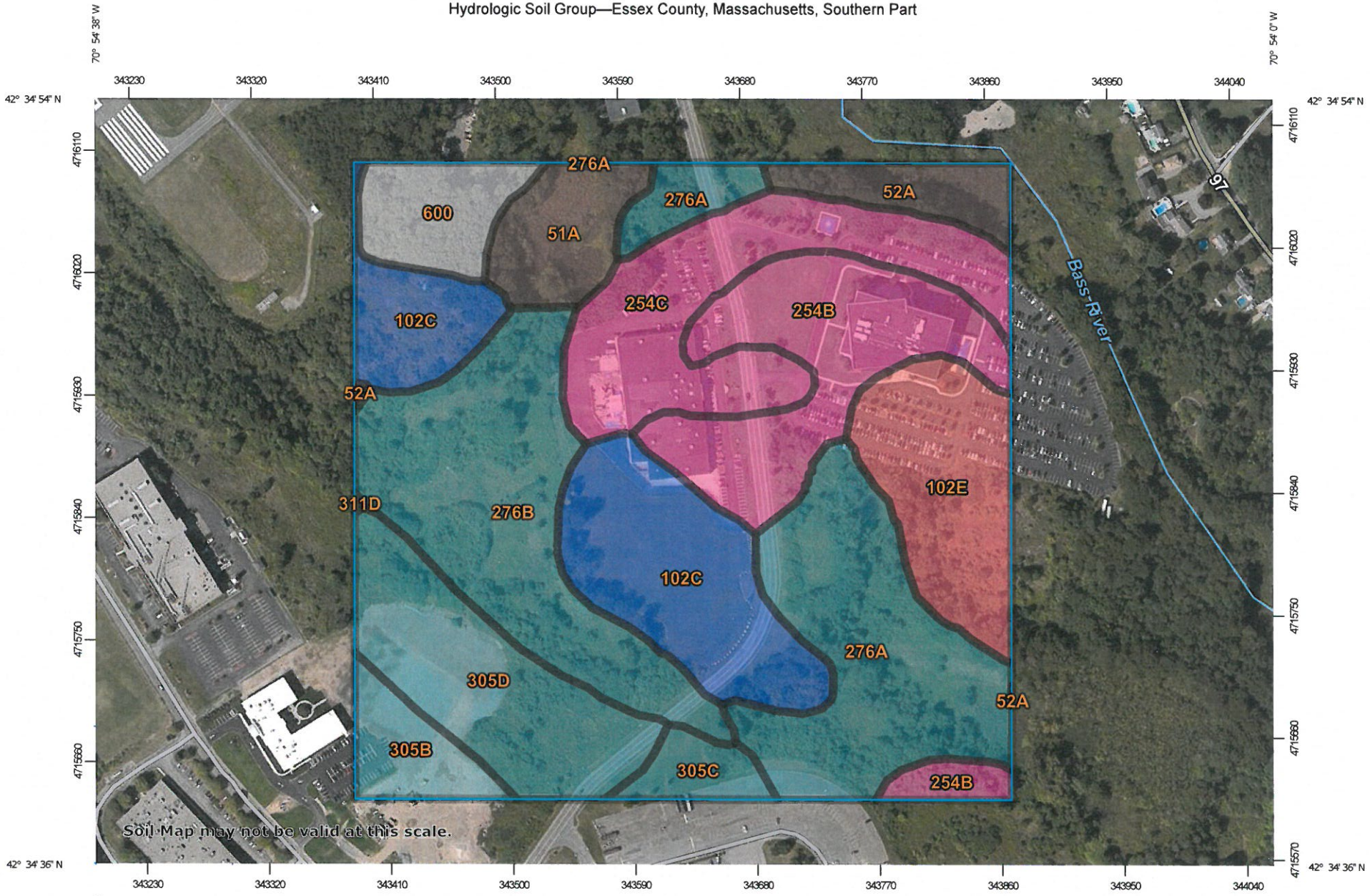
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix II. NRCS Soils Map

Hydrologic Soil Group—Essex County, Massachusetts, Southern Part



Map Scale: 1:3,970 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 13, Sep 14, 2016

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

Date(s) aerial images were photographed: Aug 29, 2014—Sep 19, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	B/D	2.3	4.1%
52A	Freetown muck, 0 to 1 percent slopes	B/D	1.6	2.9%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	7.6	13.6%
102E	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes	D	4.5	8.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	6.7	12.0%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	A	6.5	11.7%
276A	Ninigret fine sandy loam, 0 to 3 percent slopes	C	8.5	15.1%
276B	Ninigret fine sandy loam, 3 to 8 percent slopes	C	8.2	14.7%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	1.6	2.9%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	1.0	1.8%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	5.4	9.6%
311D	Woodbridge fine sandy loam, 15 to 25 percent slopes, very stony	C/D	0.0	0.0%
600	Pits, gravel		2.1	3.8%
Totals for Area of Interest			**56.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix III. Soil Logs

Soil Evaluation for Drainage Design
October 16, 2017
Evaluation by: Vasek Talacko

Sam Fonzo Drive
Beverly

HANCOCK ASSOCIATES

See Site Plan for Locations

TP-1

Depth (in)	Soil Horizon/ Layer	Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)
			Depth	Color	Percent		Gravel	Cobbles & Stones		
0-4	FILL		n/a	n/a	n/a	Loamy Sand			Friable	
4-70	FILL		n/a	n/a	n/a	Loamy Sand		Crushed Stone	V. Friable	Firm in place
No observed groundwater, Ledge refusal at 70"										

TP-2

Depth (in)	Soil Horizon/ Layer	Soil Matrix: Color- Moist	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)
			Depth	Color	Percent		Gravel	Cobbles & Stones		
0-4	FILL		n/a	n/a	n/a	Loamy Sand			Friable	
4-57	FILL		n/a	n/a	n/a	Loamy Sand	10	20	Friable	
57-98	C1		n/a	n/a	n/a	Fine-Med. Sand	10	15		
No observed groundwater, Refusal at 98"										

TP-3

Depth (in)	Soil Horizon/ Layer	Soil Matrix: Color- Moist	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)
			Depth	Color	Percent		Gravel	Cobbles & Stones		
0-4	FILL		n/a	n/a	n/a	Loamy Sand			Friable	
4-100	FILL		n/a	n/a	n/a	Loamy Sand			Friable	
No observed groundwater, Refusal at 100"										

TP-4

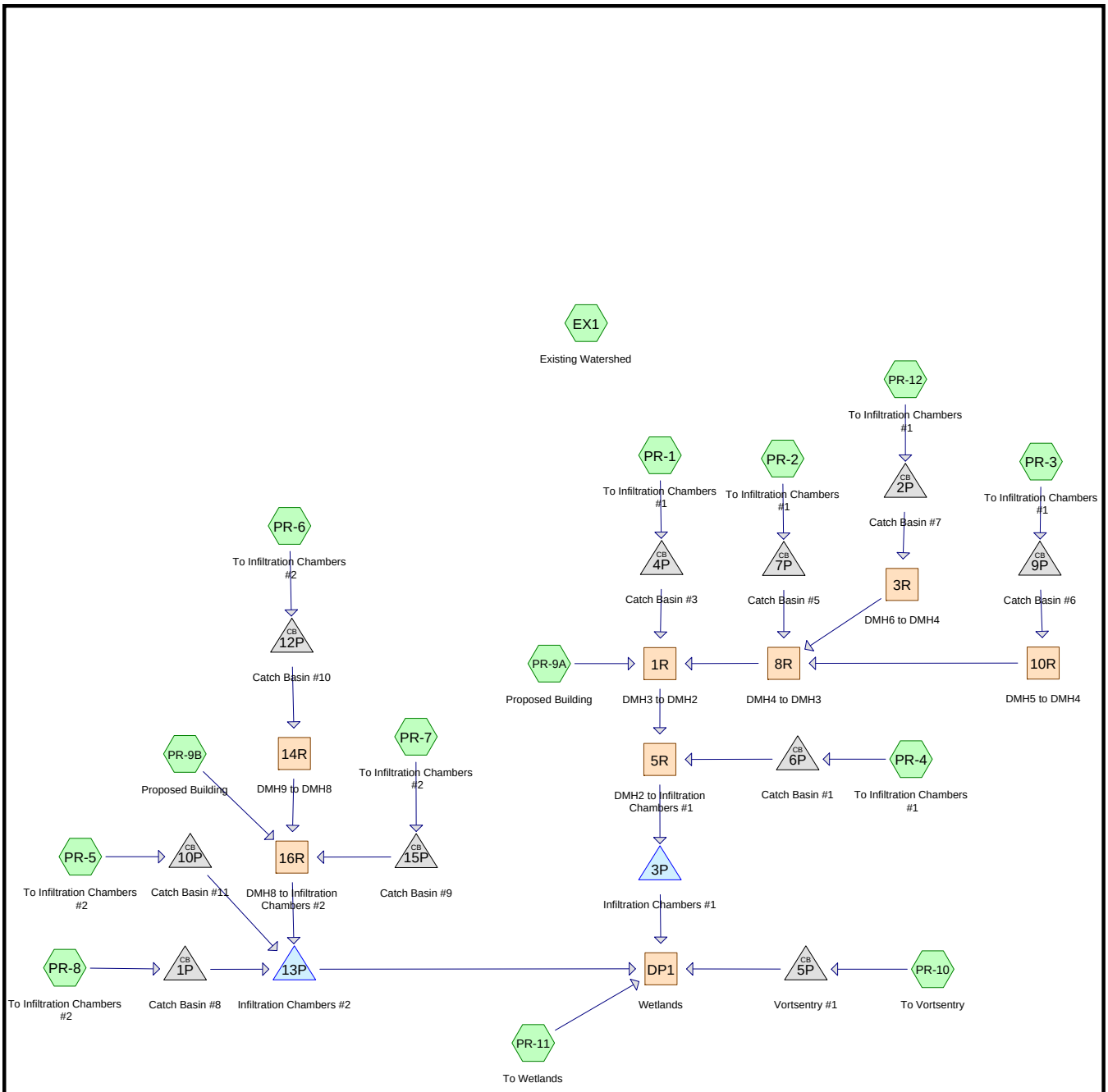
Depth (in)	Soil Horizon/ Layer	Soil Matrix: Color- Moist	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)
			Depth	Color	Percent		Gravel	Cobbles & Stones		
0-4	FILL		n/a	n/a	n/a	Loamy Sand			Friable	
4-100	FILL		n/a	n/a	n/a	Loamy Sand		15	V. Friable	
No observed groundwater, Refusal at 100"										

TP-5

Depth (in)	Soil Horizon/ Layer	Soil Matrix: Color-Moist	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)
			Depth	Color	Percent		Gravel	Cobbles & Stones		
0-4	FILL					Loamy Sand			Friable	
4-50	FILL					Loamy Sand			Friable	
50-100	C1					Crushed Rock			Loose	
No observed groundwater. Possible refusal at 100" the sides were collapsing										

Appendix IV. Existing and Proposed Drainage Figures

Appendix V. Hydrocad Output



Routing Diagram for 20652 HydroCAD
Prepared by Microsoft, Printed 12/15/2017

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,097	49	50-75% Grass cover, Fair, HSG A (EX1)
168,589	69	50-75% Grass cover, Fair, HSG B (EX1)
16,751	79	50-75% Grass cover, Fair, HSG C (EX1)
40,079	61	>75% Grass cover, Good, HSG B (PR-1, PR-10, PR-12, PR-2, PR-3, PR-4, PR-5, PR-6, PR-7, PR-8)
27,448	65	Woods/grass comb., Fair, HSG B (PR-11)
163,533	98	paved (EX1, PR-1, PR-10, PR-12, PR-2, PR-3, PR-4, PR-5, PR-6, PR-7, PR-8, PR-9A, PR-9B)
417,497	**80**	**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1R	58.60	57.60	182.0	0.0055	0.011	18.0	0.0	0.0
2	3R	59.90	59.30	88.0	0.0068	0.011	12.0	0.0	0.0
3	5R	57.50	56.80	27.0	0.0259	0.011	18.0	0.0	0.0
4	8R	58.80	58.70	23.0	0.0043	0.011	18.0	0.0	0.0
5	10R	62.40	59.30	57.0	0.0544	0.011	12.0	0.0	0.0
6	14R	59.80	59.00	141.0	0.0057	0.011	12.0	0.0	0.0
7	16R	58.50	55.90	141.0	0.0184	0.011	18.0	0.0	0.0
8	1P	57.20	55.90	40.0	0.0325	0.011	18.0	0.0	0.0
9	2P	60.50	60.00	15.0	0.0333	0.011	12.0	0.0	0.0
10	3P	57.80	57.30	46.0	0.0109	0.011	8.0	0.0	0.0
11	4P	60.30	59.20	20.0	0.0550	0.011	12.0	0.0	0.0
12	5P	58.00	57.70	27.0	0.0111	0.011	12.0	0.0	0.0
13	6P	59.50	58.10	15.0	0.0933	0.011	12.0	0.0	0.0
14	7P	60.50	59.30	15.0	0.0800	0.011	12.0	0.0	0.0
15	9P	62.70	62.50	17.0	0.0118	0.011	12.0	0.0	0.0
16	10P	57.00	56.60	73.0	0.0055	0.011	12.0	0.0	0.0
17	12P	60.50	59.90	32.0	0.0188	0.011	12.0	0.0	0.0
18	13P	57.80	57.50	34.0	0.0088	0.011	12.0	0.0	0.0
19	15P	59.30	59.00	8.0	0.0375	0.011	12.0	0.0	0.0

Summary for Subcatchment EX1: Existing Watershed

Runoff = 2.60 cfs @ 12.40 hrs, Volume= 14,638 cf, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	18,803	98	paved
	1,097	49	50-75% Grass cover, Fair, HSG A
	168,589	69	50-75% Grass cover, Fair, HSG B
	16,751	79	50-75% Grass cover, Fair, HSG C
	205,240	72	Weighted Average
	186,437		90.84% Pervious Area
	18,803		9.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-1: To Infiltration Chambers #1

Runoff = 1.95 cfs @ 11.95 hrs, Volume= 4,022 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	18,411	98	paved
	5,856	61	>75% Grass cover, Good, HSG B
	24,267	89	Weighted Average
	5,856		24.13% Pervious Area
	18,411		75.87% Impervious Area

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

Summary for Subcatchment PR-10: To Vortsentry

Runoff = 1.00 cfs @ 11.96 hrs, Volume= 2,031 cf, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	9,601	98	paved
	4,347	61	>75% Grass cover, Good, HSG B
	13,948	86	Weighted Average
	4,347		31.17% Pervious Area
	9,601		68.83% Impervious Area

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

Summary for Subcatchment PR-11: To Wetlands

Runoff = 0.55 cfs @ 11.98 hrs, Volume= 1,262 cf, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
27,448	65	Woods/grass comb., Fair, HSG B
27,448		100.00% Pervious Area

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

Summary for Subcatchment PR-12: To Infiltration Chambers #1

Runoff = 0.72 cfs @ 11.96 hrs, Volume= 1,470 cf, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	6,954	98	paved
	3,141	61	>75% Grass cover, Good, HSG B
	10,095	86	Weighted Average
	3,141		31.11% Pervious Area
	6,954		68.89% Impervious Area

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

Summary for Subcatchment PR-2: To Infiltration Chambers #1

Runoff = 1.00 cfs @ 11.96 hrs, Volume= 2,026 cf, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	9,660	98	paved
	5,559	61	>75% Grass cover, Good, HSG B
	15,219	84	Weighted Average
	5,559		36.53% Pervious Area
	9,660		63.47% Impervious Area

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

Summary for Subcatchment PR-3: To Infiltration Chambers #1

Runoff = 0.12 cfs @ 12.39 hrs, Volume= 661 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	3,033	98	paved
	4,792	61	>75% Grass cover, Good, HSG B
	7,825	75	Weighted Average
	4,792		61.24% Pervious Area
	3,033		38.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-4: To Infiltration Chambers #1

Runoff = 1.45 cfs @ 11.95 hrs, Volume= 3,201 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	13,704	98	paved
	1,385	61	>75% Grass cover, Good, HSG B
	15,089	95	Weighted Average
	1,385		9.18% Pervious Area
	13,704		90.82% Impervious Area

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

Summary for Subcatchment PR-5: To Infiltration Chambers #2

Runoff = 0.16 cfs @ 11.96 hrs, Volume= 325 cf, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	1,470	98	paved
	2,327	61	>75% Grass cover, Good, HSG B
	3,797	75	Weighted Average
	2,327		61.29% Pervious Area
	1,470		38.71% Impervious Area

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

Summary for Subcatchment PR-6: To Infiltration Chambers #2

Runoff = 0.57 cfs @ 11.95 hrs, Volume= 1,178 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	5,287	98	paved
	1,818	61	>75% Grass cover, Good, HSG B
	7,105	89	Weighted Average
	1,818		25.59% Pervious Area
	5,287		74.41% Impervious Area

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

Summary for Subcatchment PR-7: To Infiltration Chambers #2

Runoff = 0.78 cfs @ 11.96 hrs, Volume= 1,570 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	7,143	98	paved
	7,798	61	>75% Grass cover, Good, HSG B
	14,941	79	Weighted Average
	7,798		52.19% Pervious Area
	7,143		47.81% Impervious Area

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

Summary for Subcatchment PR-8: To Infiltration Chambers #2

Runoff = 2.37 cfs @ 11.95 hrs, Volume= 5,136 cf, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	22,148	98	paved
	3,056	61	>75% Grass cover, Good, HSG B
	25,204	94	Weighted Average
	3,056		12.13% Pervious Area
	22,148		87.87% Impervious Area

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

Summary for Subcatchment PR-9A: Proposed Building

Runoff = 2.40 cfs @ 11.95 hrs, Volume= 5,651 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	23,660	98	paved
	23,660		100.00% Impervious Area

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

Summary for Subcatchment PR-9B: Proposed Building

Runoff = 2.40 cfs @ 11.95 hrs, Volume= 5,651 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	23,659	98	paved
	23,659		100.00% Impervious Area

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

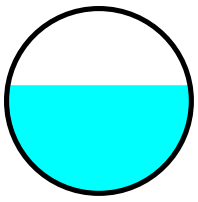
Summary for Reach 1R: DMH3 to DMH2

Inflow Area = 81,066 sf, 76.13% Impervious, Inflow Depth > 2.05" for 2-year event
Inflow = 6.04 cfs @ 11.96 hrs, Volume= 13,827 cf
Outflow = 5.78 cfs @ 11.97 hrs, Volume= 13,818 cf, Atten= 4%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.52 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 1.9 min

Peak Storage= 195 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.20 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 182.0' Slope= 0.0055 '/'
Inlet Invert= 58.60', Outlet Invert= 57.60'



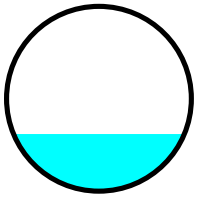
Summary for Reach 3R: DMH6 to DMH4

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 1.75" for 2-year event
Inflow = 0.72 cfs @ 11.96 hrs, Volume= 1,470 cf
Outflow = 0.70 cfs @ 11.97 hrs, Volume= 1,469 cf, Atten= 4%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.47 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 1.4 min

Peak Storage= 18 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.48 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 88.0' Slope= 0.0068 '/'
Inlet Invert= 59.90', Outlet Invert= 59.30'



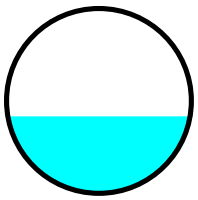
Summary for Reach 5R: DMH2 to Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 2.12" for 2-year event
Inflow = 7.20 cfs @ 11.97 hrs, Volume= 17,019 cf
Outflow = 7.18 cfs @ 11.97 hrs, Volume= 17,018 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.34 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.95 fps, Avg. Travel Time= 0.2 min

Peak Storage= 19 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.99 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 27.0' Slope= 0.0259 '/'
Inlet Invert= 57.50', Outlet Invert= 56.80'



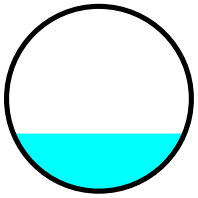
Summary for Reach 8R: DMH4 to DMH3

Inflow Area = 33,139 sf, 59.29% Impervious, Inflow Depth > 1.50" for 2-year event
Inflow = 1.72 cfs @ 11.96 hrs, Volume= 4,155 cf
Outflow = 1.70 cfs @ 11.97 hrs, Volume= 4,155 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.65 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 0.3 min

Peak Storage= 11 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.19 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 23.0' Slope= 0.0043 '/'
Inlet Invert= 58.80', Outlet Invert= 58.70'



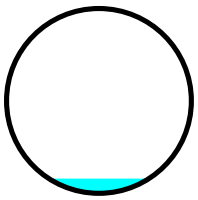
Summary for Reach 10R: DMH5 to DMH4

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 1.01" for 2-year event
Inflow = 0.12 cfs @ 12.39 hrs, Volume= 661 cf
Outflow = 0.12 cfs @ 12.40 hrs, Volume= 661 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.30 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.00 fps, Avg. Travel Time= 0.5 min

Peak Storage= 2 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.82 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 57.0' Slope= 0.0544 '/'
Inlet Invert= 62.40', Outlet Invert= 59.30'



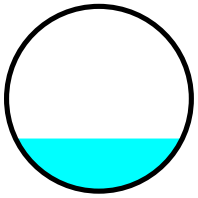
Summary for Reach 14R: DMH9 to DMH8

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 1.99" for 2-year event
Inflow = 0.57 cfs @ 11.95 hrs, Volume= 1,178 cf
Outflow = 0.54 cfs @ 11.98 hrs, Volume= 1,176 cf, Atten= 5%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 2.6 min

Peak Storage= 26 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.17 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0057 '/'
Inlet Invert= 59.80', Outlet Invert= 59.00'



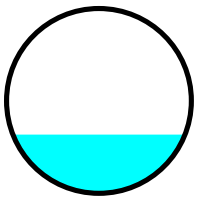
Summary for Reach 16R: DMH8 to Infiltration Chambers #2

Inflow Area = 45,705 sf, 78.96% Impervious, Inflow Depth > 2.20" for 2-year event
Inflow = 3.70 cfs @ 11.96 hrs, Volume= 8,397 cf
Outflow = 3.61 cfs @ 11.96 hrs, Volume= 8,394 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.17 fps, Avg. Travel Time= 1.1 min

Peak Storage= 68 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.86 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0184 '/'
Inlet Invert= 58.50', Outlet Invert= 55.90'



Summary for Reach DP1: Wetlands

Inflow Area = 212,257 sf, 68.19% Impervious, Inflow Depth > 0.19" for 2-year event
Inflow = 1.53 cfs @ 11.96 hrs, Volume= 3,292 cf
Outflow = 1.53 cfs @ 11.96 hrs, Volume= 3,292 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Catch Basin #8

Inflow Area = 25,204 sf, 87.87% Impervious, Inflow Depth > 2.45" for 2-year event
Inflow = 2.37 cfs @ 11.95 hrs, Volume= 5,136 cf
Outflow = 2.37 cfs @ 11.95 hrs, Volume= 5,136 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.37 cfs @ 11.95 hrs, Volume= 5,136 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.01' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**18.0" Round Culvert** L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 57.20' / 55.90' S= 0.0325 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.35 cfs @ 11.95 hrs HW=58.01' (Free Discharge)
1=Culvert (Inlet Controls 2.35 cfs @ 2.42 fps)

Summary for Pond 2P: Catch Basin #7

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 1.75" for 2-year event
Inflow = 0.72 cfs @ 11.96 hrs, Volume= 1,470 cf
Outflow = 0.72 cfs @ 11.96 hrs, Volume= 1,470 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 11.96 hrs, Volume= 1,470 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.99' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 60.00' S= 0.0333 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 11.96 hrs HW=60.99' (Free Discharge)
1=Culvert (Inlet Controls 0.71 cfs @ 1.87 fps)

Summary for Pond 3P: Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 2.12" for 2-year event
Inflow = 7.18 cfs @ 11.97 hrs, Volume= 17,018 cf
Outflow = 0.31 cfs @ 11.30 hrs, Volume= 16,197 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.31 cfs @ 11.30 hrs, Volume= 16,197 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.32' @ 13.49 hrs Surf.Area= 5,565 sf Storage= 8,019 cf

Plug-Flow detention time= 234.3 min calculated for 16,164 cf (95% of inflow)
Center-of-Mass det. time= 206.0 min (996.9 - 790.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	7,776 cf	**65.75'W x 84.64'L x 5.50'H Field A** 30,607 cf Overall - 11,166 cf Embedded = 19,441 cf x 40.0% Voids
#2A	55.95'	11,166 cf	**ADS_StormTech MC-3500 c +Cap** x 99 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 9 rows = 280.8 cf
		18,942 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**8.0" Round Culvert** L= 46.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.30' S= 0.0109 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 11.30 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.20' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: Catch Basin #3

Inflow Area = 24,267 sf, 75.87% Impervious, Inflow Depth > 1.99" for 2-year event
Inflow = 1.95 cfs @ 11.95 hrs, Volume= 4,022 cf
Outflow = 1.95 cfs @ 11.95 hrs, Volume= 4,022 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 11.95 hrs, Volume= 4,022 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.22' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.30'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.30' / 59.20' S= 0.0550 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=1.92 cfs @ 11.95 hrs HW=61.21' (Free Discharge)
1=Culvert (Inlet Controls 1.92 cfs @ 2.56 fps)

Summary for Pond 5P: Vortsentry #1

Inflow Area = 13,948 sf, 68.83% Impervious, Inflow Depth > 1.75" for 2-year event
Inflow = 1.00 cfs @ 11.96 hrs, Volume= 2,031 cf
Outflow = 1.00 cfs @ 11.96 hrs, Volume= 2,031 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 11.96 hrs, Volume= 2,031 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.59' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**12.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 57.70' S= 0.0111 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.98 cfs @ 11.96 hrs HW=58.58' (Free Discharge)
1=Culvert (Inlet Controls 0.98 cfs @ 2.05 fps)

Summary for Pond 6P: Catch Basin #1

Inflow Area = 15,089 sf, 90.82% Impervious, Inflow Depth > 2.55" for 2-year event
Inflow = 1.45 cfs @ 11.95 hrs, Volume= 3,201 cf
Outflow = 1.45 cfs @ 11.95 hrs, Volume= 3,201 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.45 cfs @ 11.95 hrs, Volume= 3,201 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.24' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.50' / 58.10' S= 0.0933 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.44 cfs @ 11.95 hrs HW=60.24' (Free Discharge)
1=Culvert (Inlet Controls 1.44 cfs @ 2.31 fps)

Summary for Pond 7P: Catch Basin #5

Inflow Area = 15,219 sf, 63.47% Impervious, Inflow Depth > 1.60" for 2-year event
Inflow = 1.00 cfs @ 11.96 hrs, Volume= 2,026 cf
Outflow = 1.00 cfs @ 11.96 hrs, Volume= 2,026 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 11.96 hrs, Volume= 2,026 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.09' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.30' S= 0.0800 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.98 cfs @ 11.96 hrs HW=61.08' (Free Discharge)
1=Culvert (Inlet Controls 0.98 cfs @ 2.06 fps)

Summary for Pond 9P: Catch Basin #6

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 1.01" for 2-year event
Inflow = 0.12 cfs @ 12.39 hrs, Volume= 661 cf
Outflow = 0.12 cfs @ 12.39 hrs, Volume= 661 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.39 hrs, Volume= 661 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 62.89' @ 12.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**12.0" Round Culvert** L= 17.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 62.70' / 62.50' S= 0.0118 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.39 hrs HW=62.89' (Free Discharge)
1=Culvert (Inlet Controls 0.12 cfs @ 1.17 fps)

Summary for Pond 10P: Catch Basin #11

Inflow Area = 3,797 sf, 38.71% Impervious, Inflow Depth > 1.03" for 2-year event
Inflow = 0.16 cfs @ 11.96 hrs, Volume= 325 cf
Outflow = 0.16 cfs @ 11.96 hrs, Volume= 325 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.16 cfs @ 11.96 hrs, Volume= 325 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.22' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**12.0" Round Culvert** L= 73.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 57.00' / 56.60' S= 0.0055 '/' Cc= 0.900
n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 11.96 hrs HW=57.21' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.15 cfs @ 1.24 fps)

Summary for Pond 12P: Catch Basin #10

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 1.99" for 2-year event
Inflow = 0.57 cfs @ 11.95 hrs, Volume= 1,178 cf
Outflow = 0.57 cfs @ 11.95 hrs, Volume= 1,178 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 11.95 hrs, Volume= 1,178 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.93' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 32.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.90' S= 0.0188 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.56 cfs @ 11.95 hrs HW=60.93' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.56 cfs @ 1.76 fps)

Summary for Pond 13P: Infiltration Chambers #2

Inflow Area = 74,706 sf, 79.92% Impervious, Inflow Depth > 2.23" for 2-year event
Inflow = 6.12 cfs @ 11.96 hrs, Volume= 13,854 cf
Outflow = 0.24 cfs @ 11.20 hrs, Volume= 12,967 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.24 cfs @ 11.20 hrs, Volume= 12,967 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.40' @ 13.43 hrs Surf.Area= 4,352 sf Storage= 6,541 cf

Plug-Flow detention time= 239.8 min calculated for 12,967 cf (94% of inflow)
Center-of-Mass det. time= 203.5 min (985.2 - 781.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	6,100 cf	**51.42'W x 84.64'L x 5.50'H Field A** 23,935 cf Overall - 8,685 cf Embedded = 15,250 cf x 40.0% Voids
#2A	55.95'	8,685 cf	**ADS_StormTech MC-3500 c +Cap** x 77 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 7 rows = 218.4 cf
		14,785 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**12.0" Round Culvert** L= 34.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.50' S= 0.0088 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 11.20 hrs HW=55.26' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.20' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 15P: Catch Basin #9

Inflow Area = 14,941 sf, 47.81% Impervious, Inflow Depth > 1.26" for 2-year event
Inflow = 0.78 cfs @ 11.96 hrs, Volume= 1,570 cf
Outflow = 0.78 cfs @ 11.96 hrs, Volume= 1,570 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 11.96 hrs, Volume= 1,570 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.81' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.30'	**12.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.30' / 59.00' S= 0.0375 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 11.96 hrs HW=59.80' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.76 cfs @ 1.91 fps)

Summary for Subcatchment EX1: Existing Watershed

Runoff = 6.20 cfs @ 12.38 hrs, Volume= 32,018 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	18,803	98	paved
	1,097	49	50-75% Grass cover, Fair, HSG A
	168,589	69	50-75% Grass cover, Fair, HSG B
	16,751	79	50-75% Grass cover, Fair, HSG C
	205,240	72	Weighted Average
	186,437		90.84% Pervious Area
	18,803		9.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-1: To Infiltration Chambers #1

Runoff = 3.22 cfs @ 11.95 hrs, Volume= 6,851 cf, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	18,411	98	paved
	5,856	61	>75% Grass cover, Good, HSG B
	24,267	89	Weighted Average
	5,856		24.13% Pervious Area
	18,411		75.87% Impervious Area

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

Summary for Subcatchment PR-10: To Vortsentry

Runoff = 1.73 cfs @ 11.95 hrs, Volume= 3,595 cf, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	9,601	98	paved
	4,347	61	>75% Grass cover, Good, HSG B
	13,948	86	Weighted Average
	4,347		31.17% Pervious Area
	9,601		68.83% Impervious Area

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

Summary for Subcatchment PR-11: To Wetlands

Runoff = 1.55 cfs @ 11.97 hrs, Volume= 3,183 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
27,448	65	Woods/grass comb., Fair, HSG B
27,448		100.00% Pervious Area

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

Summary for Subcatchment PR-12: To Infiltration Chambers #1

Runoff = 1.25 cfs @ 11.95 hrs, Volume= 2,602 cf, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	6,954	98	paved
	3,141	61	>75% Grass cover, Good, HSG B
	10,095	86	Weighted Average
	3,141		31.11% Pervious Area
	6,954		68.89% Impervious Area

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

Summary for Subcatchment PR-2: To Infiltration Chambers #1

Runoff = 1.79 cfs @ 11.95 hrs, Volume= 3,683 cf, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	9,660	98	paved
	5,559	61	>75% Grass cover, Good, HSG B
	15,219	84	Weighted Average
	5,559		36.53% Pervious Area
	9,660		63.47% Impervious Area

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

Summary for Subcatchment PR-3: To Infiltration Chambers #1

Runoff = 0.27 cfs @ 12.37 hrs, Volume= 1,373 cf, Depth> 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	3,033	98	paved
	4,792	61	>75% Grass cover, Good, HSG B
	7,825	75	Weighted Average
	4,792		61.24% Pervious Area
	3,033		38.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-4: To Infiltration Chambers #1

Runoff = 2.23 cfs @ 11.95 hrs, Volume= 5,056 cf, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	13,704	98	paved
	1,385	61	>75% Grass cover, Good, HSG B
	15,089	95	Weighted Average
	1,385		9.18% Pervious Area
	13,704		90.82% Impervious Area

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

Summary for Subcatchment PR-5: To Infiltration Chambers #2

Runoff = 0.33 cfs @ 11.96 hrs, Volume= 673 cf, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	1,470	98	paved
	2,327	61	>75% Grass cover, Good, HSG B
	3,797	75	Weighted Average
	2,327		61.29% Pervious Area
	1,470		38.71% Impervious Area

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

Summary for Subcatchment PR-6: To Infiltration Chambers #2

Runoff = 0.94 cfs @ 11.95 hrs, Volume= 2,006 cf, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	5,287	98	paved
	1,818	61	>75% Grass cover, Good, HSG B
	7,105	89	Weighted Average
	1,818		25.59% Pervious Area
	5,287		74.41% Impervious Area

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

Summary for Subcatchment PR-7: To Infiltration Chambers #2

Runoff = 1.51 cfs @ 11.96 hrs, Volume= 3,061 cf, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	7,143	98	paved
	7,798	61	>75% Grass cover, Good, HSG B
	14,941	79	Weighted Average
	7,798		52.19% Pervious Area
	7,143		47.81% Impervious Area

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

Summary for Subcatchment PR-8: To Infiltration Chambers #2

Runoff = 3.67 cfs @ 11.95 hrs, Volume= 8,215 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	22,148	98	paved
	3,056	61	>75% Grass cover, Good, HSG B
	25,204	94	Weighted Average
	3,056		12.13% Pervious Area
	22,148		87.87% Impervious Area

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

Summary for Subcatchment PR-9A: Proposed Building

Runoff = 3.59 cfs @ 11.95 hrs, Volume= 8,599 cf, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	23,660	98	paved
	23,660		100.00% Impervious Area

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

Summary for Subcatchment PR-9B: Proposed Building

Runoff = 3.59 cfs @ 11.95 hrs, Volume= 8,598 cf, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	23,659	98	paved
	23,659		100.00% Impervious Area

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

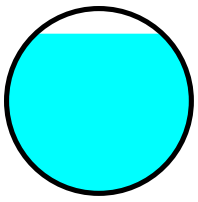
Summary for Reach 1R: DMH3 to DMH2

Inflow Area = 81,066 sf, 76.13% Impervious, Inflow Depth > 3.42" for 10-year event
Inflow = 9.83 cfs @ 11.95 hrs, Volume= 23,105 cf
Outflow = 9.41 cfs @ 11.97 hrs, Volume= 23,093 cf, Atten= 4%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.93 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.87 fps, Avg. Travel Time= 1.6 min

Peak Storage= 296 cf @ 11.96 hrs
Average Depth at Peak Storage= 1.29'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.20 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 182.0' Slope= 0.0055 '/'
Inlet Invert= 58.60', Outlet Invert= 57.60'



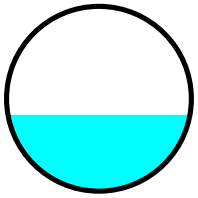
Summary for Reach 3R: DMH6 to DMH4

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 3.09" for 10-year event
Inflow = 1.25 cfs @ 11.95 hrs, Volume= 2,602 cf
Outflow = 1.21 cfs @ 11.96 hrs, Volume= 2,601 cf, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.05 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 1.2 min

Peak Storage= 27 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.48 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 88.0' Slope= 0.0068 '/'
Inlet Invert= 59.90', Outlet Invert= 59.30'



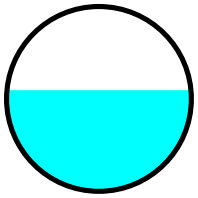
Summary for Reach 5R: DMH2 to Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 3.51" for 10-year event
Inflow = 11.59 cfs @ 11.97 hrs, Volume= 28,149 cf
Outflow = 11.56 cfs @ 11.97 hrs, Volume= 28,148 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.69 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.43 fps, Avg. Travel Time= 0.1 min

Peak Storage= 27 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.99 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 27.0' Slope= 0.0259 '/'
Inlet Invert= 57.50', Outlet Invert= 56.80'



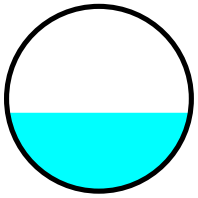
Summary for Reach 8R: DMH4 to DMH3

Inflow Area = 33,139 sf, 59.29% Impervious, Inflow Depth > 2.77" for 10-year event
Inflow = 3.05 cfs @ 11.96 hrs, Volume= 7,657 cf
Outflow = 3.03 cfs @ 11.96 hrs, Volume= 7,656 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 0.3 min

Peak Storage= 16 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.19 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 23.0' Slope= 0.0043 '/'
Inlet Invert= 58.80', Outlet Invert= 58.70'



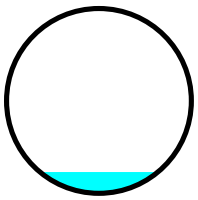
Summary for Reach 10R: DMH5 to DMH4

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 2.11" for 10-year event
Inflow = 0.27 cfs @ 12.37 hrs, Volume= 1,373 cf
Outflow = 0.27 cfs @ 12.38 hrs, Volume= 1,372 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.45 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.32 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.82 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 57.0' Slope= 0.0544 '/'
Inlet Invert= 62.40', Outlet Invert= 59.30'



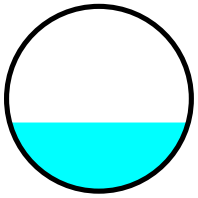
Summary for Reach 14R: DMH9 to DMH8

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 3.39" for 10-year event
Inflow = 0.94 cfs @ 11.95 hrs, Volume= 2,006 cf
Outflow = 0.90 cfs @ 11.97 hrs, Volume= 2,004 cf, Atten= 5%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 2.3 min

Peak Storage= 37 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.17 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0057 '/'
Inlet Invert= 59.80', Outlet Invert= 59.00'



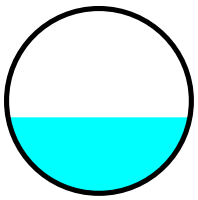
Summary for Reach 16R: DMH8 to Infiltration Chambers #2

Inflow Area = 45,705 sf, 78.96% Impervious, Inflow Depth > 3.59" for 10-year event
Inflow = 5.98 cfs @ 11.95 hrs, Volume= 13,663 cf
Outflow = 5.85 cfs @ 11.96 hrs, Volume= 13,659 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.70 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.49 fps, Avg. Travel Time= 0.9 min

Peak Storage= 96 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.86 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0184 '/'
Inlet Invert= 58.50', Outlet Invert= 55.90'



Summary for Reach DP1: Wetlands

Inflow Area = 212,257 sf, 68.19% Impervious, Inflow Depth > 0.38" for 10-year event
Inflow = 3.27 cfs @ 11.96 hrs, Volume= 6,778 cf
Outflow = 3.27 cfs @ 11.96 hrs, Volume= 6,778 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Catch Basin #8

Inflow Area = 25,204 sf, 87.87% Impervious, Inflow Depth > 3.91" for 10-year event
Inflow = 3.67 cfs @ 11.95 hrs, Volume= 8,215 cf
Outflow = 3.67 cfs @ 11.95 hrs, Volume= 8,215 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.67 cfs @ 11.95 hrs, Volume= 8,215 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.26' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**18.0" Round Culvert** L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 57.20' / 55.90' S= 0.0325 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.66 cfs @ 11.95 hrs HW=58.25' (Free Discharge)
↑**1=Culvert** (Inlet Controls 3.66 cfs @ 2.76 fps)

Summary for Pond 2P: Catch Basin #7

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 3.09" for 10-year event
Inflow = 1.25 cfs @ 11.95 hrs, Volume= 2,602 cf
Outflow = 1.25 cfs @ 11.95 hrs, Volume= 2,602 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 11.95 hrs, Volume= 2,602 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.18' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 60.00' S= 0.0333 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 11.95 hrs HW=61.17' (Free Discharge)
↑**1=Culvert** (Inlet Controls 1.23 cfs @ 2.20 fps)

Summary for Pond 3P: Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 3.51" for 10-year event
Inflow = 11.56 cfs @ 11.97 hrs, Volume= 28,148 cf
Outflow = 0.31 cfs @ 10.60 hrs, Volume= 17,762 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.31 cfs @ 10.60 hrs, Volume= 17,762 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.16' @ 14.77 hrs Surf.Area= 5,565 sf Storage= 15,307 cf

Plug-Flow detention time= 277.6 min calculated for 17,725 cf (63% of inflow)
Center-of-Mass det. time= 172.5 min (953.1 - 780.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	7,776 cf	**65.75'W x 84.64'L x 5.50'H Field A** 30,607 cf Overall - 11,166 cf Embedded = 19,441 cf x 40.0% Voids
#2A	55.95'	11,166 cf	**ADS_StormTech MC-3500 c +Cap** x 99 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 9 rows = 280.8 cf
		18,942 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**8.0" Round Culvert** L= 46.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.30' S= 0.0109 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 10.60 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.20' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: Catch Basin #3

Inflow Area = 24,267 sf, 75.87% Impervious, Inflow Depth > 3.39" for 10-year event
Inflow = 3.22 cfs @ 11.95 hrs, Volume= 6,851 cf
Outflow = 3.22 cfs @ 11.95 hrs, Volume= 6,851 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.22 cfs @ 11.95 hrs, Volume= 6,851 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.97' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.30'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.30' / 59.20' S= 0.0550 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=3.20 cfs @ 11.95 hrs HW=61.95' (Free Discharge)
1=Culvert (Inlet Controls 3.20 cfs @ 4.07 fps)

Summary for Pond 5P: Vortsentry #1

Inflow Area = 13,948 sf, 68.83% Impervious, Inflow Depth > 3.09" for 10-year event
Inflow = 1.73 cfs @ 11.95 hrs, Volume= 3,595 cf
Outflow = 1.73 cfs @ 11.95 hrs, Volume= 3,595 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.73 cfs @ 11.95 hrs, Volume= 3,595 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.84' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**12.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 57.70' S= 0.0111 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.71 cfs @ 11.95 hrs HW=58.83' (Free Discharge)
1=Culvert (Inlet Controls 1.71 cfs @ 2.45 fps)

Summary for Pond 6P: Catch Basin #1

Inflow Area = 15,089 sf, 90.82% Impervious, Inflow Depth > 4.02" for 10-year event
Inflow = 2.23 cfs @ 11.95 hrs, Volume= 5,056 cf
Outflow = 2.23 cfs @ 11.95 hrs, Volume= 5,056 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.23 cfs @ 11.95 hrs, Volume= 5,056 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.56' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.50' / 58.10' S= 0.0933 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.22 cfs @ 11.95 hrs HW=60.55' (Free Discharge)
1=Culvert (Inlet Controls 2.22 cfs @ 2.83 fps)

Summary for Pond 7P: Catch Basin #5

Inflow Area = 15,219 sf, 63.47% Impervious, Inflow Depth > 2.90" for 10-year event
Inflow = 1.79 cfs @ 11.95 hrs, Volume= 3,683 cf
Outflow = 1.79 cfs @ 11.95 hrs, Volume= 3,683 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.79 cfs @ 11.95 hrs, Volume= 3,683 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.36' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.30' S= 0.0800 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.76 cfs @ 11.95 hrs HW=61.35' (Free Discharge)
1=Culvert (Inlet Controls 1.76 cfs @ 2.48 fps)

Summary for Pond 9P: Catch Basin #6

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 2.11" for 10-year event
Inflow = 0.27 cfs @ 12.37 hrs, Volume= 1,373 cf
Outflow = 0.27 cfs @ 12.37 hrs, Volume= 1,373 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.37 hrs, Volume= 1,373 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 62.99' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**12.0" Round Culvert** L= 17.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 62.70' / 62.50' S= 0.0118 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.37 hrs HW=62.99' (Free Discharge)
1=Culvert (Inlet Controls 0.27 cfs @ 1.44 fps)

Summary for Pond 10P: Catch Basin #11

Inflow Area = 3,797 sf, 38.71% Impervious, Inflow Depth > 2.13" for 10-year event
Inflow = 0.33 cfs @ 11.96 hrs, Volume= 673 cf
Outflow = 0.33 cfs @ 11.96 hrs, Volume= 673 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 11.96 hrs, Volume= 673 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.32' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**12.0" Round Culvert** L= 73.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 57.00' / 56.60' S= 0.0055 '/' Cc= 0.900
n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 11.96 hrs HW=57.32' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.33 cfs @ 1.52 fps)

Summary for Pond 12P: Catch Basin #10

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 3.39" for 10-year event
Inflow = 0.94 cfs @ 11.95 hrs, Volume= 2,006 cf
Outflow = 0.94 cfs @ 11.95 hrs, Volume= 2,006 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 11.95 hrs, Volume= 2,006 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.07' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert**
			L= 32.0' CMP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 60.50' / 59.90' S= 0.0188 '/' Cc= 0.900
			n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 11.95 hrs HW=61.07' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.94 cfs @ 2.03 fps)

Summary for Pond 13P: Infiltration Chambers #2

Inflow Area = 74,706 sf, 79.92% Impervious, Inflow Depth > 3.62" for 10-year event
Inflow = 9.84 cfs @ 11.96 hrs, Volume= 22,547 cf
Outflow = 0.24 cfs @ 10.45 hrs, Volume= 14,242 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.24 cfs @ 10.45 hrs, Volume= 14,242 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.26' @ 14.70 hrs Surf.Area= 4,352 sf Storage= 12,197 cf

Plug-Flow detention time= 272.7 min calculated for 14,213 cf (63% of inflow)
Center-of-Mass det. time= 167.7 min (940.0 - 772.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	6,100 cf	**51.42'W x 84.64'L x 5.50'H Field A**
			23,935 cf Overall - 8,685 cf Embedded = 15,250 cf x 40.0% Voids
#2A	55.95'	8,685 cf	**ADS_StormTech MC-3500 c +Cap** x 77 Inside #1
			Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
			Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
			Cap Storage= +15.6 cf x 2 x 7 rows = 218.4 cf
		14,785 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**12.0" Round Culvert** L= 34.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.50' S= 0.0088 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 10.45 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.20' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 15P: Catch Basin #9

Inflow Area = 14,941 sf, 47.81% Impervious, Inflow Depth > 2.46" for 10-year event
Inflow = 1.51 cfs @ 11.96 hrs, Volume= 3,061 cf
Outflow = 1.51 cfs @ 11.96 hrs, Volume= 3,061 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 11.96 hrs, Volume= 3,061 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.06' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.30'	**12.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.30' / 59.00' S= 0.0375 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.48 cfs @ 11.96 hrs HW=60.05' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.48 cfs @ 2.33 fps)

Summary for Subcatchment EX1: Existing Watershed

Runoff = 8.35 cfs @ 12.37 hrs, Volume= 42,453 cf, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	18,803	98	paved
	1,097	49	50-75% Grass cover, Fair, HSG A
	168,589	69	50-75% Grass cover, Fair, HSG B
	16,751	79	50-75% Grass cover, Fair, HSG C
	205,240	72	Weighted Average
	186,437		90.84% Pervious Area
	18,803		9.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-1: To Infiltration Chambers #1

Runoff = 3.90 cfs @ 11.95 hrs, Volume= 8,398 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	18,411	98	paved
	5,856	61	>75% Grass cover, Good, HSG B
	24,267	89	Weighted Average
	5,856		24.13% Pervious Area
	18,411		75.87% Impervious Area

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

Summary for Subcatchment PR-10: To Vortsentry

Runoff = 2.12 cfs @ 11.95 hrs, Volume= 4,462 cf, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	9,601	98	paved
	4,347	61	>75% Grass cover, Good, HSG B
	13,948	86	Weighted Average
	4,347		31.17% Pervious Area
	9,601		68.83% Impervious Area

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

Summary for Subcatchment PR-11: To Wetlands

Runoff = 2.17 cfs @ 11.96 hrs, Volume= 4,399 cf, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

Area (sf)	CN	Description
27,448	65	Woods/grass comb., Fair, HSG B
27,448		100.00% Pervious Area

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

Summary for Subcatchment PR-12: To Infiltration Chambers #1

Runoff = 1.53 cfs @ 11.95 hrs, Volume= 3,230 cf, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	6,954	98	paved
	3,141	61	>75% Grass cover, Good, HSG B
	10,095	86	Weighted Average
	3,141		31.11% Pervious Area
	6,954		68.89% Impervious Area

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

Summary for Subcatchment PR-2: To Infiltration Chambers #1

Runoff = 2.21 cfs @ 11.95 hrs, Volume= 4,611 cf, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	9,660	98	paved
	5,559	61	>75% Grass cover, Good, HSG B
	15,219	84	Weighted Average
	5,559		36.53% Pervious Area
	9,660		63.47% Impervious Area

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

Summary for Subcatchment PR-3: To Infiltration Chambers #1

Runoff = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	3,033	98	paved
	4,792	61	>75% Grass cover, Good, HSG B
	7,825	75	Weighted Average
	4,792		61.24% Pervious Area
	3,033		38.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-4: To Infiltration Chambers #1

Runoff = 2.64 cfs @ 11.95 hrs, Volume= 6,052 cf, Depth> 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	13,704	98	paved
	1,385	61	>75% Grass cover, Good, HSG B
	15,089	95	Weighted Average
	1,385		9.18% Pervious Area
	13,704		90.82% Impervious Area

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

Summary for Subcatchment PR-5: To Infiltration Chambers #2

Runoff = 0.43 cfs @ 11.96 hrs, Volume= 878 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	1,470	98	paved
	2,327	61	>75% Grass cover, Good, HSG B
	3,797	75	Weighted Average
	2,327		61.29% Pervious Area
	1,470		38.71% Impervious Area

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

Summary for Subcatchment PR-6: To Infiltration Chambers #2

Runoff = 1.14 cfs @ 11.95 hrs, Volume= 2,459 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	5,287	98	paved
	1,818	61	>75% Grass cover, Good, HSG B
	7,105	89	Weighted Average
	1,818		25.59% Pervious Area
	5,287		74.41% Impervious Area

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

Summary for Subcatchment PR-7: To Infiltration Chambers #2

Runoff = 1.92 cfs @ 11.96 hrs, Volume= 3,917 cf, Depth> 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	7,143	98	paved
	7,798	61	>75% Grass cover, Good, HSG B
	14,941	79	Weighted Average
	7,798		52.19% Pervious Area
	7,143		47.81% Impervious Area

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

Summary for Subcatchment PR-8: To Infiltration Chambers #2

Runoff = 4.36 cfs @ 11.95 hrs, Volume= 9,871 cf, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	22,148	98	paved
	3,056	61	>75% Grass cover, Good, HSG B
	25,204	94	Weighted Average
	3,056		12.13% Pervious Area
	22,148		87.87% Impervious Area

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

Summary for Subcatchment PR-9A: Proposed Building

Runoff = 4.22 cfs @ 11.95 hrs, Volume= 10,173 cf, Depth> 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	23,660	98	paved
	23,660		100.00% Impervious Area

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

Summary for Subcatchment PR-9B: Proposed Building

Runoff = 4.22 cfs @ 11.95 hrs, Volume= 10,172 cf, Depth> 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=5.40"

	Area (sf)	CN	Description
*	23,659	98	paved
	23,659		100.00% Impervious Area

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

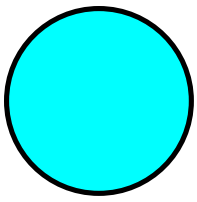
Summary for Reach 1R: DMH3 to DMH2

Inflow Area = 81,066 sf, 76.13% Impervious, Inflow Depth > 4.17" for 25-year event
Inflow = 11.86 cfs @ 11.95 hrs, Volume= 28,200 cf
Outflow = 9.57 cfs @ 12.05 hrs, Volume= 28,186 cf, Atten= 19%, Lag= 5.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.94 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.98 fps, Avg. Travel Time= 1.5 min

Peak Storage= 326 cf @ 11.98 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.20 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 182.0' Slope= 0.0055 '/'
Inlet Invert= 58.60', Outlet Invert= 57.60'



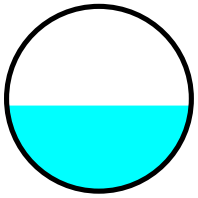
Summary for Reach 3R: DMH6 to DMH4

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 3.84" for 25-year event
Inflow = 1.53 cfs @ 11.95 hrs, Volume= 3,230 cf
Outflow = 1.49 cfs @ 11.96 hrs, Volume= 3,228 cf, Atten= 3%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.27 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 1.2 min

Peak Storage= 31 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.48 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 88.0' Slope= 0.0068 '/'
Inlet Invert= 59.90', Outlet Invert= 59.30'



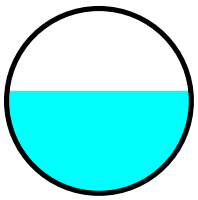
Summary for Reach 5R: DMH2 to Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 4.27" for 25-year event
Inflow = 11.86 cfs @ 11.96 hrs, Volume= 34,238 cf
Outflow = 11.87 cfs @ 11.96 hrs, Volume= 34,237 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.79 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.64 fps, Avg. Travel Time= 0.1 min

Peak Storage= 27 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.99 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 27.0' Slope= 0.0259 '/'
Inlet Invert= 57.50', Outlet Invert= 56.80'



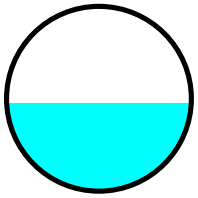
Summary for Reach 8R: DMH4 to DMH3

Inflow Area = 33,139 sf, 59.29% Impervious, Inflow Depth > 3.49" for 25-year event
Inflow = 3.78 cfs @ 11.96 hrs, Volume= 9,630 cf
Outflow = 3.75 cfs @ 11.96 hrs, Volume= 9,629 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.53 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.42 fps, Avg. Travel Time= 0.3 min

Peak Storage= 19 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.19 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 23.0' Slope= 0.0043 '/'
Inlet Invert= 58.80', Outlet Invert= 58.70'



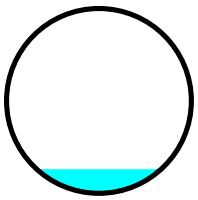
Summary for Reach 10R: DMH5 to DMH4

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 2.75" for 25-year event
Inflow = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf
Outflow = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.91 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.45 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.82 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 57.0' Slope= 0.0544 '/'
Inlet Invert= 62.40', Outlet Invert= 59.30'



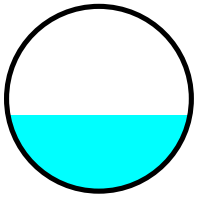
Summary for Reach 14R: DMH9 to DMH8

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 4.15" for 25-year event
Inflow = 1.14 cfs @ 11.95 hrs, Volume= 2,459 cf
Outflow = 1.09 cfs @ 11.97 hrs, Volume= 2,457 cf, Atten= 5%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 2.2 min

Peak Storage= 43 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.17 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0057 '/'
Inlet Invert= 59.80', Outlet Invert= 59.00'



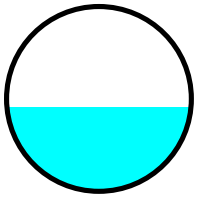
Summary for Reach 16R: DMH8 to Infiltration Chambers #2

Inflow Area = 45,705 sf, 78.96% Impervious, Inflow Depth > 4.34" for 25-year event
Inflow = 7.21 cfs @ 11.95 hrs, Volume= 16,547 cf
Outflow = 7.06 cfs @ 11.96 hrs, Volume= 16,542 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.14 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.9 min

Peak Storage= 110 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.86 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0184 '/'
Inlet Invert= 58.50', Outlet Invert= 55.90'



Summary for Reach DP1: Wetlands

Inflow Area = 212,257 sf, 68.19% Impervious, Inflow Depth > 0.86" for 25-year event
Inflow = 4.28 cfs @ 11.96 hrs, Volume= 15,170 cf
Outflow = 4.28 cfs @ 11.96 hrs, Volume= 15,170 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Catch Basin #8

Inflow Area = 25,204 sf, 87.87% Impervious, Inflow Depth > 4.70" for 25-year event
Inflow = 4.36 cfs @ 11.95 hrs, Volume= 9,871 cf
Outflow = 4.36 cfs @ 11.95 hrs, Volume= 9,871 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.36 cfs @ 11.95 hrs, Volume= 9,871 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.38' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**18.0" Round Culvert** L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 57.20' / 55.90' S= 0.0325 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.35 cfs @ 11.95 hrs HW=58.38' (Free Discharge)
1=Culvert (Inlet Controls 4.35 cfs @ 2.92 fps)

Summary for Pond 2P: Catch Basin #7

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 3.84" for 25-year event
Inflow = 1.53 cfs @ 11.95 hrs, Volume= 3,230 cf
Outflow = 1.53 cfs @ 11.95 hrs, Volume= 3,230 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.53 cfs @ 11.95 hrs, Volume= 3,230 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.27' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 60.00' S= 0.0333 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.52 cfs @ 11.95 hrs HW=61.27' (Free Discharge)
1=Culvert (Inlet Controls 1.52 cfs @ 2.35 fps)

Summary for Pond 3P: Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 4.27" for 25-year event
Inflow = 11.87 cfs @ 11.96 hrs, Volume= 34,237 cf
Outflow = 1.34 cfs @ 12.56 hrs, Volume= 21,945 cf, Atten= 89%, Lag= 36.0 min
Discarded = 0.31 cfs @ 10.20 hrs, Volume= 18,530 cf
Primary = 1.03 cfs @ 12.56 hrs, Volume= 3,414 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.68' @ 12.56 hrs Surf.Area= 5,565 sf Storage= 16,681 cf

Plug-Flow detention time= 238.4 min calculated for 21,945 cf (64% of inflow)
Center-of-Mass det. time= 133.9 min (910.7 - 776.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	7,776 cf	**65.75'W x 84.64'L x 5.50'H Field A** 30,607 cf Overall - 11,166 cf Embedded = 19,441 cf x 40.0% Voids
#2A	55.95'	11,166 cf	**ADS_StormTech MC-3500 c +Cap** x 99 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 9 rows = 280.8 cf
		18,942 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**8.0" Round Culvert** L= 46.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.30' S= 0.0109 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 10.20 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=1.02 cfs @ 12.56 hrs HW=59.68' (Free Discharge)
└**1=Culvert** (Passes 1.02 cfs of 2.03 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.02 cfs @ 1.40 fps)

Summary for Pond 4P: Catch Basin #3

Inflow Area = 24,267 sf, 75.87% Impervious, Inflow Depth > 4.15" for 25-year event
Inflow = 3.90 cfs @ 11.95 hrs, Volume= 8,398 cf
Outflow = 3.90 cfs @ 11.95 hrs, Volume= 8,398 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.90 cfs @ 11.95 hrs, Volume= 8,398 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 62.51' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.30'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.30' / 59.20' S= 0.0550 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=3.88 cfs @ 11.95 hrs HW=62.48' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.88 cfs @ 4.93 fps)

Summary for Pond 5P: Vortsentry #1

Inflow Area = 13,948 sf, 68.83% Impervious, Inflow Depth > 3.84" for 25-year event
Inflow = 2.12 cfs @ 11.95 hrs, Volume= 4,462 cf
Outflow = 2.12 cfs @ 11.95 hrs, Volume= 4,462 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 11.95 hrs, Volume= 4,462 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.00' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**12.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 57.70' S= 0.0111 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.10 cfs @ 11.95 hrs HW=58.99' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.10 cfs @ 2.68 fps)

Summary for Pond 6P: Catch Basin #1

Inflow Area = 15,089 sf, 90.82% Impervious, Inflow Depth > 4.81" for 25-year event
Inflow = 2.64 cfs @ 11.95 hrs, Volume= 6,052 cf
Outflow = 2.64 cfs @ 11.95 hrs, Volume= 6,052 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.64 cfs @ 11.95 hrs, Volume= 6,052 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.78' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.50' / 58.10' S= 0.0933 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.63 cfs @ 11.95 hrs HW=60.78' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.63 cfs @ 3.35 fps)

Summary for Pond 7P: Catch Basin #5

Inflow Area = 15,219 sf, 63.47% Impervious, Inflow Depth > 3.64" for 25-year event
Inflow = 2.21 cfs @ 11.95 hrs, Volume= 4,611 cf
Outflow = 2.21 cfs @ 11.95 hrs, Volume= 4,611 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.21 cfs @ 11.95 hrs, Volume= 4,611 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.55' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.30' S= 0.0800 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.19 cfs @ 11.95 hrs HW=61.54' (Free Discharge)
1=Culvert (Inlet Controls 2.19 cfs @ 2.79 fps)

Summary for Pond 9P: Catch Basin #6

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 2.75" for 25-year event
Inflow = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf
Outflow = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.37 hrs, Volume= 1,792 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 63.03' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**12.0" Round Culvert** L= 17.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 62.70' / 62.50' S= 0.0118 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.37 hrs HW=63.03' (Free Discharge)
1=Culvert (Inlet Controls 0.35 cfs @ 1.55 fps)

Summary for Pond 10P: Catch Basin #11

Inflow Area = 3,797 sf, 38.71% Impervious, Inflow Depth > 2.77" for 25-year event
Inflow = 0.43 cfs @ 11.96 hrs, Volume= 878 cf
Outflow = 0.43 cfs @ 11.96 hrs, Volume= 878 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 11.96 hrs, Volume= 878 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.37' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**12.0" Round Culvert** L= 73.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 57.00' / 56.60' S= 0.0055 '/' Cc= 0.900
n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 11.96 hrs HW=57.37' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.42 cfs @ 1.63 fps)

Summary for Pond 12P: Catch Basin #10

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 4.15" for 25-year event
Inflow = 1.14 cfs @ 11.95 hrs, Volume= 2,459 cf
Outflow = 1.14 cfs @ 11.95 hrs, Volume= 2,459 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.14 cfs @ 11.95 hrs, Volume= 2,459 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.14' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 32.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.90' S= 0.0188 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 11.95 hrs HW=61.14' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.13 cfs @ 2.15 fps)

Summary for Pond 13P: Infiltration Chambers #2

Inflow Area = 74,706 sf, 79.92% Impervious, Inflow Depth > 4.38" for 25-year event
Inflow = 11.84 cfs @ 11.96 hrs, Volume= 27,291 cf
Outflow = 1.21 cfs @ 12.37 hrs, Volume= 17,759 cf, Atten= 90%, Lag= 24.7 min
Discarded = 0.24 cfs @ 10.05 hrs, Volume= 14,864 cf
Primary = 0.97 cfs @ 12.37 hrs, Volume= 2,895 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.68' @ 12.37 hrs Surf.Area= 4,352 sf Storage= 13,003 cf

Plug-Flow detention time= 230.5 min calculated for 17,722 cf (65% of inflow)
Center-of-Mass det. time= 127.9 min (896.4 - 768.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	6,100 cf	**51.42'W x 84.64'L x 5.50'H Field A** 23,935 cf Overall - 8,685 cf Embedded = 15,250 cf x 40.0% Voids
#2A	55.95'	8,685 cf	**ADS_StormTech MC-3500 c +Cap** x 77 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 7 rows = 218.4 cf
		14,785 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**12.0" Round Culvert** L= 34.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.50' S= 0.0088 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 10.05 hrs HW=55.26' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.95 cfs @ 12.37 hrs HW=59.67' (Free Discharge)
↑**1=Culvert** (Passes 0.95 cfs of 4.43 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.95 cfs @ 1.37 fps)

Summary for Pond 15P: Catch Basin #9

Inflow Area = 14,941 sf, 47.81% Impervious, Inflow Depth > 3.15" for 25-year event
Inflow = 1.92 cfs @ 11.96 hrs, Volume= 3,917 cf
Outflow = 1.92 cfs @ 11.96 hrs, Volume= 3,917 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.92 cfs @ 11.96 hrs, Volume= 3,917 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.21' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.30'	**12.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.30' / 59.00' S= 0.0375 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.89 cfs @ 11.96 hrs HW=60.20' (Free Discharge)
↑**1=Culvert** (Inlet Controls 1.89 cfs @ 2.54 fps)

Summary for Subcatchment EX1: Existing Watershed

Runoff = 11.45 cfs @ 12.37 hrs, Volume= 57,658 cf, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	18,803	98	paved
	1,097	49	50-75% Grass cover, Fair, HSG A
	168,589	69	50-75% Grass cover, Fair, HSG B
	16,751	79	50-75% Grass cover, Fair, HSG C
	205,240	72	Weighted Average
	186,437		90.84% Pervious Area
	18,803		9.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-1: To Infiltration Chambers #1

Runoff = 4.83 cfs @ 11.95 hrs, Volume= 10,550 cf, Depth> 5.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	18,411	98	paved
	5,856	61	>75% Grass cover, Good, HSG B
	24,267	89	Weighted Average
	5,856		24.13% Pervious Area
	18,411		75.87% Impervious Area

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

Summary for Subcatchment PR-10: To Vortsentry

Runoff = 2.66 cfs @ 11.95 hrs, Volume= 5,675 cf, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	9,601	98	paved
	4,347	61	>75% Grass cover, Good, HSG B
	13,948	86	Weighted Average
	4,347		31.17% Pervious Area
	9,601		68.83% Impervious Area

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

Summary for Subcatchment PR-11: To Wetlands

Runoff = 3.09 cfs @ 11.96 hrs, Volume= 6,218 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
27,448	65	Woods/grass comb., Fair, HSG B
27,448		100.00% Pervious Area

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

Summary for Subcatchment PR-12: To Infiltration Chambers #1

Runoff = 1.92 cfs @ 11.95 hrs, Volume= 4,107 cf, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	6,954	98	paved
	3,141	61	>75% Grass cover, Good, HSG B
	10,095	86	Weighted Average
	3,141		31.11% Pervious Area
	6,954		68.89% Impervious Area

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

Summary for Subcatchment PR-2: To Infiltration Chambers #1

Runoff = 2.80 cfs @ 11.95 hrs, Volume= 5,914 cf, Depth> 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	9,660	98	paved
	5,559	61	>75% Grass cover, Good, HSG B
	15,219	84	Weighted Average
	5,559		36.53% Pervious Area
	9,660		63.47% Impervious Area

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

Summary for Subcatchment PR-3: To Infiltration Chambers #1

Runoff = 0.48 cfs @ 12.36 hrs, Volume= 2,396 cf, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	3,033	98	paved
	4,792	61	>75% Grass cover, Good, HSG B
	7,825	75	Weighted Average
	4,792		61.24% Pervious Area
	3,033		38.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.0300	2.79		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
30.4	300	0.0110	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
9.0	129	0.0430	0.24		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.10"
39.7	479	Total			

Summary for Subcatchment PR-4: To Infiltration Chambers #1

Runoff = 3.20 cfs @ 11.95 hrs, Volume= 7,425 cf, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	13,704	98	paved
	1,385	61	>75% Grass cover, Good, HSG B
	15,089	95	Weighted Average
	1,385		9.18% Pervious Area
	13,704		90.82% Impervious Area

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

Summary for Subcatchment PR-5: To Infiltration Chambers #2

Runoff = 0.58 cfs @ 11.96 hrs, Volume= 1,174 cf, Depth> 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	1,470	98	paved
	2,327	61	>75% Grass cover, Good, HSG B
	3,797	75	Weighted Average
	2,327		61.29% Pervious Area
	1,470		38.71% Impervious Area

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

Summary for Subcatchment PR-6: To Infiltration Chambers #2

Runoff = 1.41 cfs @ 11.95 hrs, Volume= 3,089 cf, Depth> 5.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	5,287	98	paved
	1,818	61	>75% Grass cover, Good, HSG B
	7,105	89	Weighted Average
	1,818		25.59% Pervious Area
	5,287		74.41% Impervious Area

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

Summary for Subcatchment PR-7: To Infiltration Chambers #2

Runoff = 2.49 cfs @ 11.95 hrs, Volume= 5,137 cf, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	7,143	98	paved
	7,798	61	>75% Grass cover, Good, HSG B
	14,941	79	Weighted Average
	7,798		52.19% Pervious Area
	7,143		47.81% Impervious Area

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

Summary for Subcatchment PR-8: To Infiltration Chambers #2

Runoff = 5.30 cfs @ 11.95 hrs, Volume= 12,158 cf, Depth> 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	22,148	98	paved
	3,056	61	>75% Grass cover, Good, HSG B
	25,204	94	Weighted Average
	3,056		12.13% Pervious Area
	22,148		87.87% Impervious Area

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

Summary for Subcatchment PR-9A: Proposed Building

Runoff = 5.09 cfs @ 11.95 hrs, Volume= 12,338 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	23,660	98	paved
	23,660		100.00% Impervious Area

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

Summary for Subcatchment PR-9B: Proposed Building

Runoff = 5.09 cfs @ 11.95 hrs, Volume= 12,337 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
*	23,659	98	paved
	23,659		100.00% Impervious Area

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

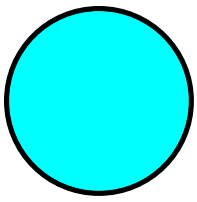
Summary for Reach 1R: DMH3 to DMH2

Inflow Area = 81,066 sf, 76.13% Impervious, Inflow Depth > 5.23" for 100-year event
Inflow = 14.65 cfs @ 11.95 hrs, Volume= 35,303 cf
Outflow = 9.20 cfs @ 11.95 hrs, Volume= 35,286 cf, Atten= 37%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.90 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.12 fps, Avg. Travel Time= 1.4 min

Peak Storage= 322 cf @ 11.90 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.20 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 182.0' Slope= 0.0055 '/'
Inlet Invert= 58.60', Outlet Invert= 57.60'



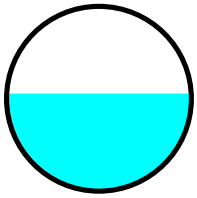
Summary for Reach 3R: DMH6 to DMH4

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 4.88" for 100-year event
Inflow = 1.92 cfs @ 11.95 hrs, Volume= 4,107 cf
Outflow = 1.87 cfs @ 11.96 hrs, Volume= 4,106 cf, Atten= 3%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.52 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 1.1 min

Peak Storage= 37 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.48 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 88.0' Slope= 0.0068 '/'
Inlet Invert= 59.90', Outlet Invert= 59.30'



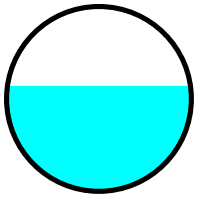
Summary for Reach 5R: DMH2 to Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 5.33" for 100-year event
Inflow = 12.40 cfs @ 11.95 hrs, Volume= 42,711 cf
Outflow = 12.38 cfs @ 11.95 hrs, Volume= 42,709 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.91 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.91 fps, Avg. Travel Time= 0.1 min

Peak Storage= 28 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.99 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 27.0' Slope= 0.0259 '/'
Inlet Invert= 57.50', Outlet Invert= 56.80'



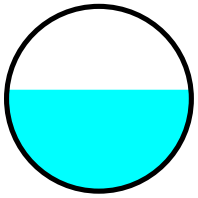
Summary for Reach 8R: DMH4 to DMH3

Inflow Area = 33,139 sf, 59.29% Impervious, Inflow Depth > 4.50" for 100-year event
Inflow = 4.78 cfs @ 11.96 hrs, Volume= 12,416 cf
Outflow = 4.75 cfs @ 11.96 hrs, Volume= 12,414 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.80 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.3 min

Peak Storage= 23 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.19 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 23.0' Slope= 0.0043 '/'
Inlet Invert= 58.80', Outlet Invert= 58.70'



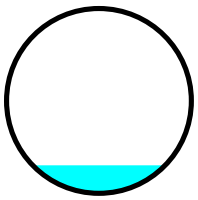
Summary for Reach 10R: DMH5 to DMH4

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 3.68" for 100-year event
Inflow = 0.48 cfs @ 12.36 hrs, Volume= 2,396 cf
Outflow = 0.48 cfs @ 12.37 hrs, Volume= 2,396 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.46 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.59 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.82 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 57.0' Slope= 0.0544 '/'
Inlet Invert= 62.40', Outlet Invert= 59.30'



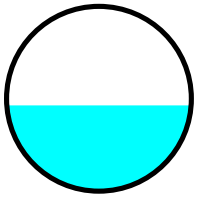
Summary for Reach 14R: DMH9 to DMH8

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 5.22" for 100-year event
Inflow = 1.41 cfs @ 11.95 hrs, Volume= 3,089 cf
Outflow = 1.35 cfs @ 11.97 hrs, Volume= 3,087 cf, Atten= 5%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.90 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 2.0 min

Peak Storage= 50 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.17 cfs

12.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0057 '/'
Inlet Invert= 59.80', Outlet Invert= 59.00'



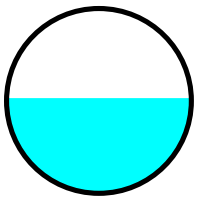
Summary for Reach 16R: DMH8 to Infiltration Chambers #2

Inflow Area = 45,705 sf, 78.96% Impervious, Inflow Depth > 5.40" for 100-year event
Inflow = 8.91 cfs @ 11.95 hrs, Volume= 20,561 cf
Outflow = 8.73 cfs @ 11.96 hrs, Volume= 20,556 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.65 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.82 fps, Avg. Travel Time= 0.8 min

Peak Storage= 129 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.86 cfs

18.0" Round Pipe
n= 0.011 HDPE, smooth interior
Length= 141.0' Slope= 0.0184 '/'
Inlet Invert= 58.50', Outlet Invert= 55.90'



Summary for Reach DP1: Wetlands

Inflow Area = 212,257 sf, 68.19% Impervious, Inflow Depth > 1.67" for 100-year event
Inflow = 8.37 cfs @ 12.11 hrs, Volume= 29,510 cf
Outflow = 8.37 cfs @ 12.11 hrs, Volume= 29,510 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Catch Basin #8

Inflow Area = 25,204 sf, 87.87% Impervious, Inflow Depth > 5.79" for 100-year event
Inflow = 5.30 cfs @ 11.95 hrs, Volume= 12,158 cf
Outflow = 5.30 cfs @ 11.95 hrs, Volume= 12,158 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.30 cfs @ 11.95 hrs, Volume= 12,158 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 58.56' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**18.0" Round Culvert** L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 57.20' / 55.90' S= 0.0325 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.29 cfs @ 11.95 hrs HW=58.56' (Free Discharge)
1=Culvert (Inlet Controls 5.29 cfs @ 3.14 fps)

Summary for Pond 2P: Catch Basin #7

Inflow Area = 10,095 sf, 68.89% Impervious, Inflow Depth > 4.88" for 100-year event
Inflow = 1.92 cfs @ 11.95 hrs, Volume= 4,107 cf
Outflow = 1.92 cfs @ 11.95 hrs, Volume= 4,107 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.92 cfs @ 11.95 hrs, Volume= 4,107 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.41' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 60.00' S= 0.0333 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.91 cfs @ 11.95 hrs HW=61.40' (Free Discharge)
1=Culvert (Inlet Controls 1.91 cfs @ 2.55 fps)

Summary for Pond 3P: Infiltration Chambers #1

Inflow Area = 96,155 sf, 78.44% Impervious, Inflow Depth > 5.33" for 100-year event
Inflow = 12.38 cfs @ 11.95 hrs, Volume= 42,709 cf
Outflow = 2.82 cfs @ 12.25 hrs, Volume= 29,303 cf, Atten= 77%, Lag= 17.7 min
Discarded = 0.31 cfs @ 9.65 hrs, Volume= 19,522 cf
Primary = 2.50 cfs @ 12.25 hrs, Volume= 9,781 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.59' @ 12.25 hrs Surf.Area= 5,565 sf Storage= 18,688 cf

Plug-Flow detention time= 187.9 min calculated for 29,242 cf (68% of inflow)
Center-of-Mass det. time= 90.3 min (862.8 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	7,776 cf	**65.75'W x 84.64'L x 5.50'H Field A** 30,607 cf Overall - 11,166 cf Embedded = 19,441 cf x 40.0% Voids
#2A	55.95'	11,166 cf	**ADS_StormTech MC-3500 c +Cap** x 99 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 9 rows = 280.8 cf
		18,942 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**8.0" Round Culvert** L= 46.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.30' S= 0.0109 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 9.65 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=2.50 cfs @ 12.25 hrs HW=60.59' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.50 cfs @ 7.18 fps)
└**2=Sharp-Crested Rectangular Weir** (Passes 2.50 cfs of 13.99 cfs potential flow)

Summary for Pond 4P: Catch Basin #3

Inflow Area = 24,267 sf, 75.87% Impervious, Inflow Depth > 5.22" for 100-year event
Inflow = 4.83 cfs @ 11.95 hrs, Volume= 10,550 cf
Outflow = 4.83 cfs @ 11.95 hrs, Volume= 10,550 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.83 cfs @ 11.95 hrs, Volume= 10,550 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 63.42' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.30'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.30' / 59.20' S= 0.0550 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=4.80 cfs @ 11.95 hrs HW=63.39' (Free Discharge)
1=Culvert (Inlet Controls 4.80 cfs @ 6.12 fps)

Summary for Pond 5P: Vortsentry #1

Inflow Area = 13,948 sf, 68.83% Impervious, Inflow Depth > 4.88" for 100-year event
Inflow = 2.66 cfs @ 11.95 hrs, Volume= 5,675 cf
Outflow = 2.66 cfs @ 11.95 hrs, Volume= 5,675 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.66 cfs @ 11.95 hrs, Volume= 5,675 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.29' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**12.0" Round Culvert** L= 27.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 57.70' S= 0.0111 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.64 cfs @ 11.95 hrs HW=59.28' (Free Discharge)
1=Culvert (Inlet Controls 2.64 cfs @ 3.36 fps)

Summary for Pond 6P: Catch Basin #1

Inflow Area = 15,089 sf, 90.82% Impervious, Inflow Depth > 5.90" for 100-year event
Inflow = 3.20 cfs @ 11.95 hrs, Volume= 7,425 cf
Outflow = 3.20 cfs @ 11.95 hrs, Volume= 7,425 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.20 cfs @ 11.95 hrs, Volume= 7,425 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.15' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.50' / 58.10' S= 0.0933 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.19 cfs @ 11.95 hrs HW=61.14' (Free Discharge)
1=Culvert (Inlet Controls 3.19 cfs @ 4.07 fps)

Summary for Pond 7P: Catch Basin #5

Inflow Area = 15,219 sf, 63.47% Impervious, Inflow Depth > 4.66" for 100-year event
Inflow = 2.80 cfs @ 11.95 hrs, Volume= 5,914 cf
Outflow = 2.80 cfs @ 11.95 hrs, Volume= 5,914 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.80 cfs @ 11.95 hrs, Volume= 5,914 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.88' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 15.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.30' S= 0.0800 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.78 cfs @ 11.95 hrs HW=61.86' (Free Discharge)
1=Culvert (Inlet Controls 2.78 cfs @ 3.53 fps)

Summary for Pond 9P: Catch Basin #6

Inflow Area = 7,825 sf, 38.76% Impervious, Inflow Depth > 3.68" for 100-year event
Inflow = 0.48 cfs @ 12.36 hrs, Volume= 2,396 cf
Outflow = 0.48 cfs @ 12.36 hrs, Volume= 2,396 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.36 hrs, Volume= 2,396 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 63.09' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**12.0" Round Culvert** L= 17.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 62.70' / 62.50' S= 0.0118 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.48 cfs @ 12.36 hrs HW=63.09' (Free Discharge)
1=Culvert (Inlet Controls 0.48 cfs @ 1.68 fps)

Summary for Pond 10P: Catch Basin #11

Inflow Area = 3,797 sf, 38.71% Impervious, Inflow Depth > 3.71" for 100-year event
Inflow = 0.58 cfs @ 11.96 hrs, Volume= 1,174 cf
Outflow = 0.58 cfs @ 11.96 hrs, Volume= 1,174 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.58 cfs @ 11.96 hrs, Volume= 1,174 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 57.43' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**12.0" Round Culvert** L= 73.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 57.00' / 56.60' S= 0.0055 '/' Cc= 0.900
n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.57 cfs @ 11.96 hrs HW=57.43' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.57 cfs @ 1.76 fps)

Summary for Pond 12P: Catch Basin #10

Inflow Area = 7,105 sf, 74.41% Impervious, Inflow Depth > 5.22" for 100-year event
Inflow = 1.41 cfs @ 11.95 hrs, Volume= 3,089 cf
Outflow = 1.41 cfs @ 11.95 hrs, Volume= 3,089 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.41 cfs @ 11.95 hrs, Volume= 3,089 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 61.23' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.50'	**12.0" Round Culvert** L= 32.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 60.50' / 59.90' S= 0.0188 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.41 cfs @ 11.95 hrs HW=61.23' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.41 cfs @ 2.29 fps)

Summary for Pond 13P: Infiltration Chambers #2

Inflow Area = 74,706 sf, 79.92% Impervious, Inflow Depth > 5.44" for 100-year event
Inflow = 14.59 cfs @ 11.96 hrs, Volume= 33,887 cf
Outflow = 6.21 cfs @ 12.07 hrs, Volume= 23,482 cf, Atten= 57%, Lag= 7.1 min
Discarded = 0.24 cfs @ 9.15 hrs, Volume= 15,646 cf
Primary = 5.97 cfs @ 12.07 hrs, Volume= 7,836 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.37' @ 12.07 hrs Surf.Area= 4,352 sf Storage= 14,214 cf

Plug-Flow detention time= 182.6 min calculated for 23,434 cf (69% of inflow)
Center-of-Mass det. time= 85.2 min (849.6 - 764.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.20'	6,100 cf	**51.42'W x 84.64'L x 5.50'H Field A** 23,935 cf Overall - 8,685 cf Embedded = 15,250 cf x 40.0% Voids
#2A	55.95'	8,685 cf	**ADS_StormTech MC-3500 c +Cap** x 77 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 7 rows = 218.4 cf
		14,785 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**12.0" Round Culvert** L= 34.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 57.80' / 57.50' S= 0.0088 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	55.20'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 9.15 hrs HW=55.26' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=5.32 cfs @ 12.07 hrs HW=60.28' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.32 cfs @ 6.77 fps)
└**2=Sharp-Crested Rectangular Weir** (Passes 5.32 cfs of 8.65 cfs potential flow)

Summary for Pond 15P: Catch Basin #9

Inflow Area = 14,941 sf, 47.81% Impervious, Inflow Depth > 4.13" for 100-year event
Inflow = 2.49 cfs @ 11.95 hrs, Volume= 5,137 cf
Outflow = 2.49 cfs @ 11.95 hrs, Volume= 5,137 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.49 cfs @ 11.95 hrs, Volume= 5,137 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 60.50' @ 11.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.30'	**12.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 59.30' / 59.00' S= 0.0375 '/' Cc= 0.900 n= 0.011 HDPE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.46 cfs @ 11.95 hrs HW=60.48' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.46 cfs @ 3.13 fps)

Appendix VI. Hydrocad Output of Recharge Volumes

Stage-Area-Storage for Pond 3P: Infiltration Chambers #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
55.20	**5,565**	0
55.30	5,565	223
55.40	5,565	445
55.50	5,565	668
55.60	5,565	890
55.70	5,565	1,113
55.80	5,565	1,336
55.90	5,565	1,558
56.00	5,565	1,909
56.10	5,565	2,386
56.20	5,565	2,862
56.30	5,565	3,336
56.40	5,565	3,807
56.50	5,565	4,277
56.60	5,565	4,745
56.70	5,565	5,211
56.80	5,565	5,674
56.90	5,565	6,134
57.00	5,565	6,592
57.10	5,565	7,047
57.20	5,565	7,499
57.30	5,565	7,947
57.40	5,565	8,392
57.50	5,565	8,833
57.60	5,565	9,271
57.70	5,565	9,704
57.80	5,565	10,133
57.90	5,565	10,557
58.00	5,565	10,976
58.10	5,565	11,390
58.20	5,565	11,798
58.30	5,565	12,200
58.40	5,565	12,595
58.50	5,565	12,983
58.60	5,565	13,364
58.70	5,565	13,736
58.80	5,565	14,100
58.90	5,565	14,453
59.00	5,565	14,796
59.10	5,565	15,125
59.20	5,565	15,440
59.30	5,565	15,733
59.40	5,565	16,001
59.50	5,565	16,250
59.60	5,565	16,488
59.70	5,565	16,716
59.80	5,565	16,939
59.90	5,565	17,162
60.00	5,565	17,384
60.10	5,565	17,607
60.20	5,565	17,829
60.30	5,565	18,052
60.40	5,565	18,275
60.50	5,565	18,497
60.60	5,565	18,720
60.70	5,565	**18,942**

Stage-Area-Storage for Pond 13P: Infiltration Chambers #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
55.20	**4,352**	0
55.30	4,352	174
55.40	4,352	348
55.50	4,352	522
55.60	4,352	696
55.70	4,352	870
55.80	4,352	1,044
55.90	4,352	1,218
56.00	4,352	1,492
56.10	4,352	1,864
56.20	4,352	2,235
56.30	4,352	2,605
56.40	4,352	2,973
56.50	4,352	3,339
56.60	4,352	3,704
56.70	4,352	4,067
56.80	4,352	4,428
56.90	4,352	4,787
57.00	4,352	5,144
57.10	4,352	5,499
57.20	4,352	5,851
57.30	4,352	6,201
57.40	4,352	6,548
57.50	4,352	6,892
57.60	4,352	7,233
57.70	4,352	7,571
57.80	4,352	7,906
57.90	4,352	8,236
58.00	4,352	8,563
58.10	4,352	8,886
58.20	4,352	9,204
58.30	4,352	9,518
58.40	4,352	9,826
58.50	4,352	10,129
58.60	4,352	10,426
58.70	4,352	10,717
58.80	4,352	11,000
58.90	4,352	11,276
59.00	4,352	11,544
59.10	4,352	11,801
59.20	4,352	12,046
59.30	4,352	12,275
59.40	4,352	12,484
59.50	4,352	12,679
59.60	4,352	12,866
59.70	4,352	13,044
59.80	4,352	13,218
59.90	4,352	13,392
60.00	4,352	13,566
60.10	4,352	13,740
60.20	4,352	13,914
60.30	4,352	14,088
60.40	4,352	14,262
60.50	4,352	14,436
60.60	4,352	14,611
60.70	4,352	**14,785**

Appendix VII. Stormtech Isolator Row Sizing Chart

StormTech®

Detention • Retention • Water Quality

Division of ADS

STORMTECH ISOLATOR ROW SIZING CHART					
	SC-310	**SC-740**	**DC-780**	**MC-3500**	**MC-4500**
Chamber Area (Sq.Ft.)	20	27.8	27.8	43.2	30.1
Treated Flow Rate per chamber (CFS)	0.11	0.15	0.15	0.24	0.17

NOTE: *Testing of the Isolator Row completed by Tennesse Tech has been verified by NJCAT and it has shown to have a TSS removal efficiency of 84% for SIL-CO-SIL 250*

NJCAT verified Treated Flow Rate (GPM / Sq.Ft.) 2.5

Appendix VIII. Operations and Maintenance Log

40 Sam Fonzo Drive

Operation and Maintenance Log

Inspections for Year:_____

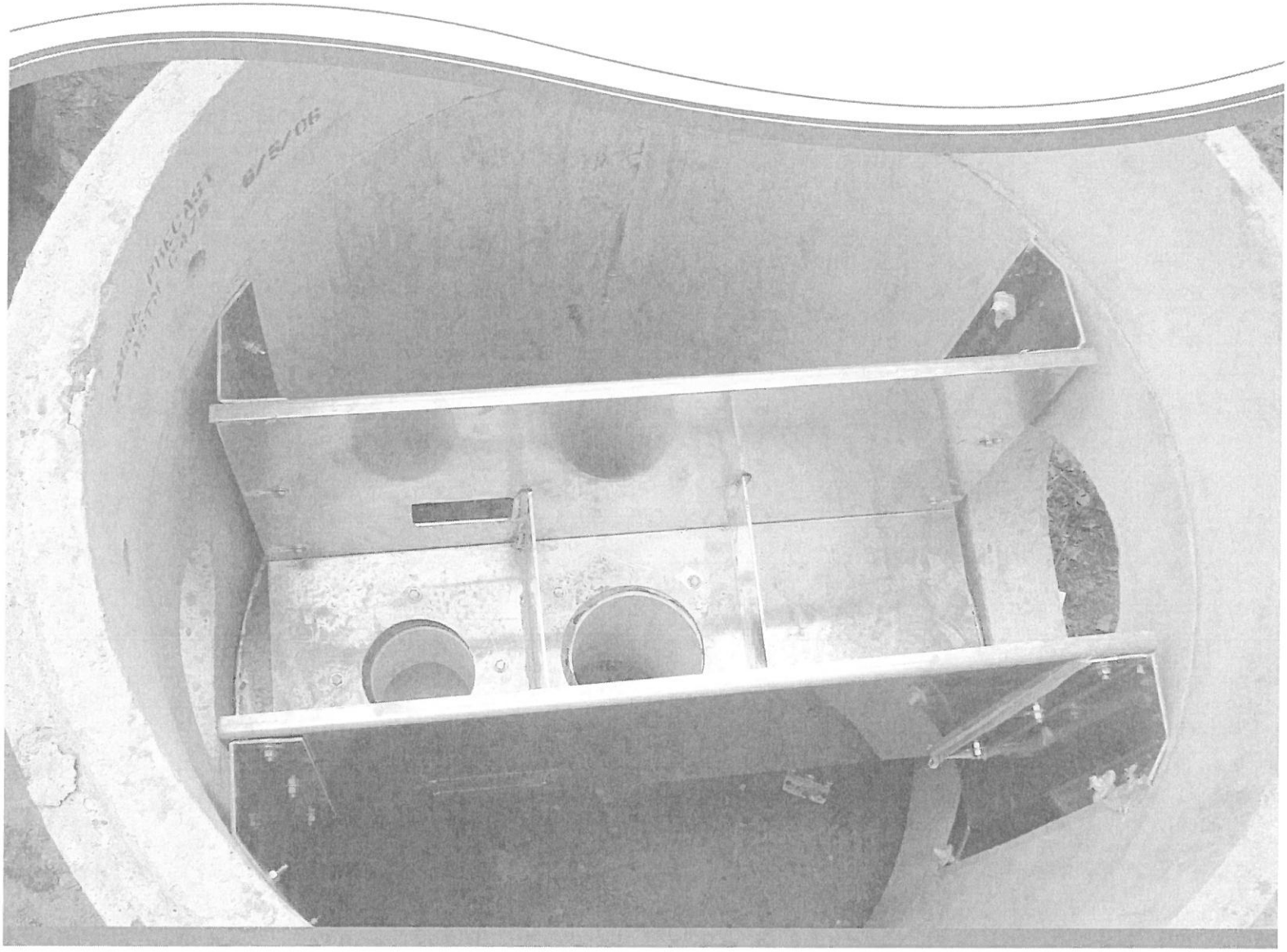
Structural Best Management Practice	Action	Date Completed	Completed By	Comments
Subsurface Chambers – Inspect twice per year. Clean as required	Inspect			
	Inspect			
Roof Drain Leaders – Inspect/clean twice per year.	Inspect/Clean			
	Inspect/Clean			
Vegetated Areas Maintenance – Inspect twice per year. Maintain as required.	Inspect			
	Inspect			
Catch Basins – Inspect twice per year. Clean as required.	Inspect			
	Inspect			
Vortsentry – Inspect twice per year. Clean as required.	Inspect			
	Inspect			
Sweeping – Twice per year.	Clean			

NOTE: See Operations and Maintenance Plan for details of inspection requirements.

Appendix IX. Vortsentry Operations and Maintenance

URBANGREEN®

VortSentry® HS Guide
Operation, Design, Performance and Maintenance



CONTECH®
ENGINEERED SOLUTIONS

VortSentry® HS

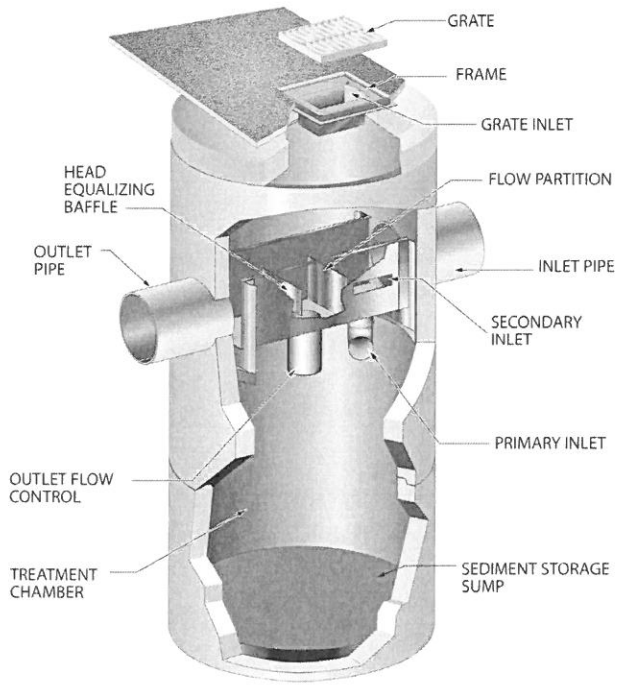
The VortSentry HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofit installations.

Operation Overview

Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.



Design Basics

There are two primary methods of sizing a VortSentry HS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow for a defined particle size. The summation process of the Rational Rainfall Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically, VortSentry HS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a particle gradation with an average particle size (d_{50}) of 240-microns (μm).

Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The VortSentry HS is designed to treat all flows up to the WQQ. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the WQQ is surpassed. At influent rates higher than the WQQ, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the VortSentry HS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. The Rational Rainfall Method is a sizing program Contech uses to estimate a net annual sediment load reduction for a particular VortSentry HS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics. For more information on the Rational Rainfall Method, see *Vortechs Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method*, available at **www.ContechES.com/stormwater**

Treatment Flow Rate

The outlet flow control is sized to allow the WQQ to pass entirely through the treatment chamber at a water surface elevation equal to the crest of the flow partition. The head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber when bypass occurs, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The VortSentry HS is available in three standard configurations: inline (with inlet and outlet pipes at 180° to each other), grated inlet, and a combination of grate and pipe inlets. All three configurations are available in 36-inch (900-mm) through 96-inch (2400-mm) diameter manholes.

The configuration of the system is determined by the suffix of the model name:

- A model name without a suffix denotes a standard pipe inlet (Example HS48).
- A "G" at the end of the model designation denotes a grate inlet (Example HS48G).
- A "GP" at the end of the model designation denotes a combination of grate and pipe inlets (Example HS48GP).

Performance

Full-Scale Laboratory Test Results

Laboratory testing of the VortSentry HS was conducted using F-55 Silica, a commercially available sand product with an average particle size of 240-μm (Table 1). This material was metered into a model HS48 VortSentry HS at an average concentration of between 250-mg/L and 300-mg/L at flow rates ranging from 0.50-cfs to 1.5-cfs (14-L/s to 56-L/s).

US Standard Sieve Size	Particle Size Micron (μm)	Cumulative Passing %
30	600	99.7%
40	425	95.7%
50	300	74.7%
70	212	33.7%
100	150	6.7%
140	106	0.7%

Table 1 : US Silica F-55 Particle Size Distribution

Removal efficiencies at each flow rate were calculated based on net sediment loads passing the influent and effluent sampling points. Results are illustrated in Figure 1.

Assuming that sediment in the inlet chamber is ideally mixed, removal rates through the system will decay according to the percentage of flow bypassed. This effect has been observed in the laboratory where the test system is designed to produce a

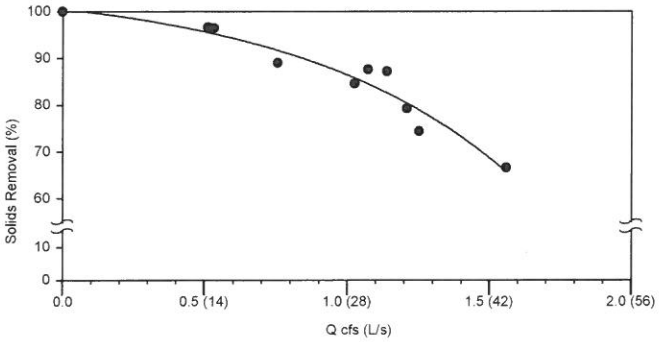


Figure 1: VortSentry HS Removal Efficiencies for 240-μm Particle Gradation

thoroughly mixed inlet stream. All VortSentry HS models have the same aspect ratio regardless of system diameter (i.e. an increase in diameter results in a corresponding increase in depth). Operating rates are expressed volumetrically.

Removal efficiency at each operating rate is calculated according to the average of volumetric and Froude scaling methods and is described by Equation 1.

Equation 1: $$\left(\frac{\text{Diameter Prototype}}{\text{Diameter Model}}\right)^{2.75} = \left(\frac{\text{Flow Rate Prototype}}{\text{Flow Rate Model}}\right)$$

Equation 1 and actual laboratory test results were used to determine the flow rate which would be required for the various VortSentry HS models to remove 80% of solids.

View report at **www.ContechES.com/stormwater**

Maintenance

The VortSentry HS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, i.e., unstable soils or heavy winter sanding will cause the treatment chamber to fill more quickly, but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations of a large volume of sediment. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is available for download at **www.ContechES.com/stormwater**

The VortSentry HS should be cleaned when the sediment has accumulated to a depth of two feet in the treatment chamber. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the distance given in Table 2, the VortSentry HS should be maintained to ensure effective treatment.

Cleaning

Cleaning of the VortSentry HS should be done during dry weather conditions when no flow is entering the system. Cleanout of the VortSentry HS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. All pollutants can be removed from this one access point from the surface with no requirements for Confined Space Entry.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads, which solidify the oils. These are usually much easier to remove from the unit individually, and less expensive to dispose than the oil/water emulsion that may be

created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the VortSentry HS should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

VortSentry HS Model	Diameter		Distance Between Water Surface and Top of Storage Sump		Sediment Storage		Oil Spill Storage	
	in.	m	ft.	m	yd^3	m^3	gal.	liter
HS36	36	0.9	3.6	1.1	0.5	0.4	83	314
HS48	48	1.2	4.7	1.4	0.9	0.7	158	598
HS60	60	1.5	6.0	1.8	1.5	1.1	258	978
HS72	72	1.8	7.1	2.2	2.1	1.6	372	1409
HS84	84	2.1	8.4	2.6	2.9	2.2	649	2458
HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Table 2: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile may be more difficult to feel with the measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Logon to **www.ContechES.com/stormwater** to download the VortSentry HS Inspection and Maintenance Log.

For assistance with maintaining your VortSentry HS, contact us regarding the Contech Maintenance compliance certification program.

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Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit ContechES.com or call 800.338.1122

Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our engineers.

Appendix X. Total Suspended Solids (TSS) Removal Calculations

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: 40 Sam Fonzo Drive

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 1%	**0.01**	**1.00**	**0.01**	**0.99**
Deep Sump and Hooded Catch Basin	**0.25**	**0.99**	**0.25**	**0.74**
Subsurface Infiltration Structure	**0.80**	**0.74**	**0.59**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 40 Sam Fonzo Drive
Prepared By: Vaclav Talacko
Date: 11/2/2017

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

CONTECH®
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VORTSENTRY® HS ESTIMATED NET ANNUAL TSS REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

40 FONZO DRIVE
BEVERLY, MA

Area	0.22 ac	Unit Site Deignation	VSHS
Weighted C	0.9	Rainfall Station #	69
t_c	5 min	Design Ratio[1]	**0.0070**
VSHS Model	HS36	VSHS Treatment Capacity	**0.55 cfs**

Rainfall Intensity[1] (in/hr)	Flow Rate (cfs)	Operating Rate[2] cfs/ft[3]	% Total Rainfall	Rel. Effcy (%)
0.02	0.00	0.00015	10.2%	10.0%
0.04	0.01	0.00030	9.6%	9.5%
0.06	0.01	0.00045	9.4%	9.3%
0.08	0.02	0.00060	7.7%	7.6%
0.10	0.02	0.00075	8.6%	8.4%
0.12	0.02	0.00090	6.3%	6.2%
0.14	0.03	0.00105	4.7%	4.6%
0.16	0.03	0.00120	4.6%	4.5%
0.18	0.04	0.00134	3.5%	3.5%
0.20	0.04	0.00149	4.3%	4.3%
0.25	0.05	0.00187	8.0%	7.8%
0.30	0.06	0.00224	5.6%	5.5%
0.35	0.07	0.00261	4.4%	4.3%
0.40	0.08	0.00299	2.5%	2.5%
0.45	0.09	0.00336	2.5%	2.5%
0.50	0.10	0.00373	1.4%	1.4%
0.75	0.15	0.00560	5.0%	4.9%
1.00	0.20	0.00747	1.0%	1.0%
1.50	0.30	0.01120	0.0%	0.0%
2.00	0.40	0.01494	0.0%	0.0%
3.00	0.59	0.02241	0.4%	0.3%
				97.9%
			% rain falling at >3"/hr =	0.0%
			Removal Efficiency Adjustment[4] =	6.5%
			Predicted Net Annual Load Removal Efficiency =	**91.4%**

1 - Design Ratio = (Total Drainage Area x Runoff Coefficient) / VortSentry HS Treatment Volume
= The Total Drainage Area and Runoff Coefficient are specified by the site engineer.
2 - Operating Rate (cfs/ft^3) = Rainfall Intensity ("/hr) x Design Ratio
3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
4 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Appendix IX. Mounding Analysis

MOUNDING ANALYSIS

A mounding analysis is required when the vertical separation from the bottom of exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge for a 10-year or higher 24-hour storm event. The Hantush method was used for the following calculations. See the attached mounding analysis calculation sheets.

Infiltration Basin #1:

ESHWT =	53.2
Depth to Groundwater =	10.8'
Bottom of System Elevation =	55.2
GW Mound Elevation =	56.5 (at t=1 day)
GW Mound Elevation =	53.6 (at t=3 days)
Finish Grade Elevation =	64.0±

56.5 < 64.0 ← Groundwater Mound does not break out above the ground surface at t=1
53.6 < 55.2 ← Groundwater Mound does not reach bottom of system at t=3 days

Infiltration Basin #2:

ESHWT =	53.2
Depth to Groundwater =	8.8'
Bottom of System Elevation =	55.2
GW Mound Elevation =	56.0 (at t=1 day)
GW Mound Elevation =	53.5 (at t=3 days)
Finish Grade Elevation =	62.0±

56.0 < 62.0 ← Groundwater Mound does not break out above the ground surface at t=1
53.5 < 55.2 ← Groundwater Mound does not reach bottom of system at t=3 days

The information provided in the mounding analysis calculation sheets and as listed above show that the groundwater mounding does not break out onto the ground surface for any of the infiltration basins. Also, the groundwater mound does not reach the bottom of the infiltration basin systems after 72 hours.

Infiltration Basin #1

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\overline{b}$	h_m*	% Change
1	53.2	56.426762094235	6.06534228239661
2	54.813381047117	56.4548331391455	4.97477506570476E-02
3	54.8274165695727	56.455073753275	4.26206431058951E-04
4	54.827536876637	56.4550758154638	3.65279622105419E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
39	.28	53.2	84.64	65.75	4.82	1	56.4550758154638

maximum water-table rise (h_m - h_i) at time t = 1 is 3.25507581546378

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\overline{b}$	h_m*	% Change
1	53.2	53.6098368610888	0.770370039640533
2	53.404918430544	53.6098503999494	2.52544335888061E-05

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
39	.28	53.2	84.64	65.75	4.82	3	53.6098503999494

maximum water-table rise (h_m - h_i) at time t = 3 is
0.409850399949413
decay of mound computed after time t = 1

Infiltration Basin #2

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\overline{b}$	h_m*	% Change
1	53.2	56.0218815007296	5.30428853520601
2	54.610940750364	56.0429221480398	3.75579090643674E-02
3	54.6214610740199	56.043077012283	2.76331492576887E-04
4	54.621538506141	56.0430781520123	2.03366641304825E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
39	.28	53.2	91.81	51.42	4.82	1	56.0430781520123

maximum water-table rise (h_m - h_i) at time t = 1 is 2.84307815201228

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\overline{b}$	h_m*	% Change
1	53.2	53.5479729462834	0.654084485495088
2	53.373986473141	53.5479910419053	3.3793290210582E-05

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
39	.28	53.2	91.81	51.42	4.82	3	53.5479910419053

maximum water-table rise (h_m - h_i) at time t = 3 is
0.347991041905289
decay of mound computed after time t = 1