Stormwater Management Report

under the
Town of Newbury
Stormwater Management and
Illicit Discharge and
Erosion Control Bylaw

Fields Way
4-Lot Residential Subdivision

Assessor's
Map R-20, Parcel 43A

170 Orchard Street
Newbury, MA

January 4, 2023

Applicant:

Estate of Lewis Bulgaris

Submitted to:

Town of Newbury
Planning Board

Prepared by:

Griffin Engineering Group, LLC
Beverly, MA

TABLE OF CONTENTS

STORMWATER MANAGEMENT CHECKLIST

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.

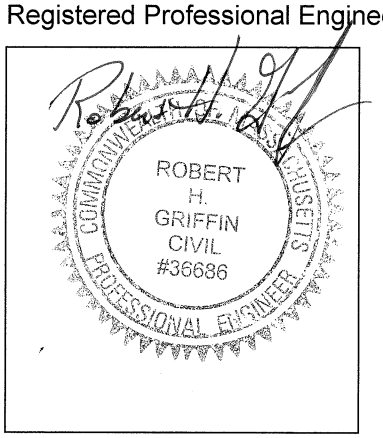
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Robert H. Griffin 10/3/23

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.

ATTACHMENT A

PROJECT
DESCRIPTION

1.0 INTRODUCTION

This stormwater management report was prepared in support of the proposed residential development at 170 Orchard Street (Assessors Map R-20 Lot 43A) in Newbury, MA. The project consists of constructing 500-ft of new road with four (4) new single-family lots.

According to the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management regulations, the proposed construction is exempt from MassDEP Stormwater Management requirements since the proposed development is a small residential subdivision (four or fewer lots). However, the regulations establish a framework for evaluating stormwater management systems that is used by the Town of Newbury in evaluating new development projects. The narrative below compares the proposed construction to the MassDEP Stormwater Management requirements.

1.1 Existing Conditions

The project site is located at 170 Orchard Street (Map R-20, Lot 43A), in Newbury, Massachusetts. The 20.57-acre property is currently vacant, consisting primarily of agricultural fields and woods. A Bordering Vegetated Wetland (BVW) exists on the south-westerly side of the property, fed by a perennial stream. The property is surrounded by residential properties. Orchard Street is to the south. The site generally slopes west-southwest toward the BVW.

1.2 Proposed Conditions

The project involves constructing a new 500-ft long roadway to serve four new single-family residences with associated driveways, utilities, septic systems, stormwater management features, and landscaping. A site plan showing the proposed development and stormwater management features is separately provided.

The project is considered new development under the Stormwater Management regulations. When complete, the project will have created approximately 41,950 square feet of impervious surfaces at the site, consisting of the roadway, driveways, and four residences.

2.0 STORMWATER MANAGEMENT STANDARDS

2.1 Standard 1: No New Untreated Discharges

No new untreated discharges to wetlands or waterways proposed.

2.2 Standard 2: Peak Rate Attenuation

Hydrologic modeling was conducted using the HydroCAD computer model. This model uses an approximation of Soil Conservation Service TR-20 methods to calculate runoff rates and volumes based on descriptions of land use, ground characteristics, and size.

The time of concentration (Tc) for each subcatchment was calculated in HydroCAD using a combination of sheet flow and shallow concentrated flow. Sheet flow uses roughness coefficients (Manning's *n*) and watercourse slope to calculate travel time of stormwater runoff for each subcatchment. Per Town of Newbury regulations, the site was modeled using a maximum of 50-feet of sheet flow. The shallow concentrated flow method was used to determine the velocity factor along the flow path of the runoff and thereby derive a travel time. The time of concentration of each subcatchment is the combination of these travel times. A minimum time of concentration of 6 minutes was used for all subcatchments, for both existing and proposed conditions.

The enclosed drainage calculations indicate a decrease in the post-development peak runoff rates for the 2-, 10-, and 100-year, 24-hour storm events from the site (the HydroCAD drainage calculations for the aforementioned storm events are provided in Attachment F). The design storms were based on rainfall intensities recommended by the Cornell University Regional Climate Center Extreme Precipitation Tables as required by the Town of Newbury. Comparison of pre- and post-development stormwater runoff calculation results are summarized below in Table 1.

Table 1: Comparison of Pre-Development and Post-Development Peak Runoff Rates (1)

Subcatchment	Storm Frequency		
	2-Year	10-Year	100-Year
Pre-Development	4.18	10.85	30.63
Post-Development	3.55	10.71	29.38

1. Flow rates measured in cubic feet per second (cfs).

2.3 Standard 3: Recharge

Site soils are mapped by the United States Department of Agriculture – Soil Conservation Service (SCS) (Essex Co. Massachusetts Southern Part Soil Survey, 1984) as being primarily Belgrade very fine sandy loam. Soil testing performed at the site generally indicated a fine loamy sand over coarse sand. Results were generally consistent with the SCS soil profiles. A 'C' Hydrologic Soil Group (HSG) was assigned to the soils for this analysis.

For C-type soils, the Stormwater Management Guidelines require that a recharge device be provided with a capacity equal to 0.25-inches times the impervious area. The minimum design groundwater recharge volume is 874 cf. This project utilizes Low Impact Development (LID) techniques which involve directing stormwater runoff from the proposed building roofs and portions of the driveways to "qualifying pervious areas". These areas are shown on the attached sketch (Attachment F). The LID credits claimed for this project (Credit 2 & 3) reduce the minimum required recharge volume by 162%, meaning the recharge requirement has been met (and exceeded). Calculations are enclosed (Attachment B).

2.4 Standard 4: Water Quality

The minimum required water quality treatment volume (WQV) for the proposed residential development is one-inch times the area of the impervious surfaces due to the rapid infiltration rate of the underlying sandy soils. Runoff from most of the proposed roadway will be directed into the proposed constructed stormwater wetland. The constructed stormwater wetland is equipped with a sediment forebay to achieve 80% annual TSS removal and was sized to accommodate the WQV. The LID credits described in Section 2.3 were similarly used to reduce the required WQV by 40%. The reader is referred to Water Quality Volume Calculations provided in Attachment B.

As required by the Stormwater Management Standards, a Long-Term Pollution Prevention Plan has been prepared and can be found in Attachment C. In short, the plan identifies suitable practices for source control and pollution prevention measures.

2.5 Standard 5: Land Uses with Higher Potential Pollutant Loads

In accordance with the Stormwater Management Standards, the proposed residential use is not considered a Land Use with Higher Potential Pollutant Loads. Therefore, this standard does not apply to this project.

2.6 Standard 6: Critical Areas

The site does not discharge to any critical areas. Therefore, this standard does not apply to this project.

2.7 Standard 7: Redevelopment and Other Projects Subject to the Standards only to the Maximum Extent Practicable

This project is entirely new development so this standard does not apply.

2.8 Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

The NPDES Construction General Permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be prepared for any project disturbing over 1-acre of land. The proposed project will disturb approximately 5.6-acres of land. In accordance with the Massachusetts Stormwater Management Standards and the General Permit, a SWPPP will be prepared prior to land disturbance commencing.

Construction shall proceed in the following sequence:

Roadway Construction

1. Install Erosion Controls downhill of work areas. Inspection and maintenance of these Erosion Controls is required throughout the project as detailed below.
2. Clear & Grub roadway area.
3. Install construction entrance (rip rap) at Orchard Street for construction vehicles entering and exiting.
4. Bring roadway to rough grade.
5. Install water line and electric, cable and phone utilities.
6. Construct stormwater management features.
7. Fine grade roadway and pave.
8. Perform final landscaping.

Lot Development (Typical of 4 Lots)

1. Install Erosion Controls downhill of work areas. Inspection and maintenance of Erosion Controls is required throughout the project as detailed below.
2. Clear & Grub lot. Stockpile topsoil.
3. Install construction entrance (rip rap) along street line for construction vehicles entering and exiting.
4. Excavate foundation hole. Install foundation and first floor deck.
5. Backfill around the foundation.
6. Install building utilities, and rough grade site. Construct residence.

7. Construct septic system.

8. Install driveway and landscaping.

The proposed project includes a comprehensive set of mitigation measures to protect the surrounding sites from impacts due to construction. Prior to work commencing on-site, there will be a preconstruction conference with the contractor. The purpose of this meeting will be to coordinate the best methods for erosion and sedimentation control and other construction-related issues. The implementation of a comprehensive soil and erosion control plan will occur prior to any construction activities within the project area. In general, the following sequence of events will occur:

- Erosion and sedimentation control devices will be installed along the edge of the down-gradient side of the project area prior to construction as depicted on the site plan. In addition to providing for sedimentation deposition and reducing runoff during storm events, this barrier will limit the work area for the equipment operators.

- Erosion and sedimentation control devices will be inspected daily during periods of active construction and bi-weekly during the remainder of the construction period. Sediments will be removed from the barriers as soon as they reach a depth of 6-inches.

- Runoff from the site will be directed through sedimentation control barriers.

- During construction, disturbed areas will be kept to a minimum and vegetative stabilization of these areas will occur as soon as practicable.

- Temporary seeding, mulching, or other suitable stabilization measures will be used to protect exposed critical areas should unprotected soils remain exposed for prolonged periods.

Construction activities shall be monitored on-site by the construction supervisor to ensure that the soil erosion and sediment control features are installed properly, maintained, and to evaluate the need for additional erosion control and/or stabilization measures. The inspector will perform the following tasks:

- Supervise the installation and maintenance of the soil erosion and sediment control features.

- Evaluate the need for additional soil erosion and sediment control features.

- Scheduled inspections of erosion control features, including construction entrance, haybales, and dust control.

- Supervise and monitor temporary and permanent stabilization activities.

2.9 Standard 9: Operation and Maintenance Plan

An Operations & Maintenance plan has been provided (Attachment D). The owner(s) of the new residences on Lots 1 through 4, acting through a homeowner's association, will be the parties responsible for operation and maintenance of the proposed stormwater management devices.

2.10 Standard 10: Illicit Discharges

The submitted Long-Term Pollution Prevention Plan (Attachment C) specifies measures to prevent illicit discharges from entering the stormwater management system. Source control and response plans are also specified to prevent illicit discharges from being conveyed through the stormwater management system.

Consistent with the Massachusetts Stormwater Handbook, a signed Illicit Discharge Compliance Statement will be finalized prior to discharging stormwater to the post-construction stormwater BMP's. A draft copy of the Illicit Discharge Statement is provided (Attachment E).

3.0 SUMMARY

The proposed drainage system and site development plans for the four-lot residential development conforms to the MassDEP Stormwater Management Regulations. The proposed drainage system will treat and remove TSS and other pollutants throughout the project area and minimize erosion. Proper construction and operation and maintenance of the proposed drainage system are critical to its long-term performance. To that end, an Operations and Maintenance Plan and Long-Term Pollution Prevention Plan have been prepared and will be instituted.

ATTACHMENT B

STORMWATER
COMPUTATIONS

- Low Impact Development Calculations
- Water Quality Volume Calculations
- TSS Removal Calculations

Griffin Engineering Group, LLC
495 Cabot Street, 2nd Floor
Beverly, MA 01915

Phone: 978-927-5111; Fax: 978-927-5103

LOW IMPACT DEVELOPMENT (LID) CREDIT CALCULATION

Job Name: 170 Orchard Street
Job No: 2043
Date 1/4/2023
Designer SSM
Checked By: RHG

SITE INFORMATION			
Site Area:	896,228	sf	(20.6 AC)
Proposed Impervious Area:	41,950	sf	(4.7%)
Site Soils Types:	C	HSG	
Recharge Factor:	0.25	in	
Required WQV depth:	1	in	(rapid infiltration rate)
Required Recharge Volume:	**874**	**cf**	(41,950 sf * 0.25 in) / (12 in / ft)
Recharge Area Requiring Treatment:	10,488	sf	(0.25) * (41,950 sf)
Required WQV:	**3,496**	**cf**	(41,950 sf * 1 in) / (12 in / ft)

ROOFTOP CREDIT (LID 2):			
Houses disconnected:	4		(house roofs directed to qualifying areas)
Average house footprint area:	2,092	sf	
Net impervious area reduction:	8,368	sf	(4 * 2,092 sf)

ROADWAY & DRIVEWAY (LID 3):			
Net impervious area reduction:	8,603	sf	(paved areas directed to qualifying areas)

RESULTS			
Impervious area reduction:	16,971	sf	(8,368 sf + 8,603 sf)
Remaining impervious area:	24,979	sf	(41,950 sf - 16,971 sf)
New Required Recharge Volume:	**(540)**	**cf**	(((10,488 sf - 16,971 sf) / 10,488 sf) * 874 sf) (< 0, recharge requirement is met)
New Required Water Quality Volume:	**2,082**	**sf**	(24,979 sf * 1 in) / (12 in / ft)

Percent Reduction Using Credits:

Required Recharge Volume:	162% Reduction
Required Water Quality Volume:	40% Reduction

Note: Ref. Masssachusetts Stormwater Handbook Volume 3, Chapter 1 - Documenting Compliance

Griffin Engineering Group, LLC
495 Cabot Street, 2nd Floor
Beverly, MA 01915

Phone: 978-927-5111; Fax: 978-927-5103

BMP SIZING

Job Name: 170 Orchard Street
Job No: 2043
Date 1/4/2023
Designer SSM
Checked By: RHG

Constructed Stormwater Wetland:

Tributary Impervious Area:	26,001	sf	(ref HydroCAD calculations)
BMP Required WQV:	2,167	cf	(26,001 sf * 1 in) / (12 in / ft)
Total Site Required WQV:	2,082	cf	(see LID Credit calculation)
BMP Design WQV:	2,167	cf	(greater of the two WQVs above)
Provided Storage Volume:	3,827	cf	(below lowest outlet, ref HydroCAD 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: P1a; P1b; P1c P1d; P1e; P1f

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)
Constructed Stormwater Wetland	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 170 Orchard Street

Prepared By:

Date: 1/4/2023

*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

ATTACHMENT C

LONG-TERM
POLLUTION PREVENTION
PLAN

Long-Term Pollution Prevention Plan

Standard #4 of the MA DEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated into the long-term operation and maintenance plan of the projects stormwater management system. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges and to describe suggested practices to reduce pollutants in stormwater discharges.

Good housekeeping practices - The subject property owners are to keep the site in a neat and orderly condition so that pollutants are not conveyed to the stormwater drainage system. Materials swept, blown or washed into the system can decrease the system's effectiveness and could eventually be conveyed into the nearby wetland resource area. Some examples of good housekeeping practices are pavement sweeping, litter control, contained outdoor waste and proper cigarette disposal, and protected material storage areas. The property owners should assign responsibilities to personnel to keep the property in a neat and orderly condition.

Provisions for storing materials and waste products inside or under cover – There are no exterior (un-covered) storage areas associated with the project site.

Requirements for routine inspections and maintenance of stormwater BMP's - Consistent with Standard 9 of the Massachusetts Stormwater Management Regulations, an Operation and Maintenance Plan has been provided in the Stormwater Management Report. The plan details routine inspection and maintenance of the stormwater BMP's along with associated record keeping forms.

Spill prevention and response plans – Sources of potential spill hazards include vehicle fluids and fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the building and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids and fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

1) Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
2) Vehicle fluid and fuel spills shall be remediated according to local and state regulations governing fuel spills.
3) The property owners shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust-pans, mops, rags, gloves, trash bags, and trash containers.
4) Spills of toxic or hazardous materials shall be reported to the Massachusetts Department of Environmental Protection at 1-888-304-1133.

Provisions for maintenance of lawns, garden, and other landscaped areas - It should be a general goal of the subject property owners to achieve a high quality of well-groomed and stable landscape that evolves throughout the changing seasons and overall condition of the property. All landscaped areas are to be maintained with dense vegetative growth or a layer of mulch so as to minimize sediment transport. Litter and waste is to be removed weekly from these areas and disposed of properly.

Requirements for storage and use of fertilizer, herbicides, and pesticides - Fertilizers, herbicides, and pesticides are not to be stored on site or within the buildings. Should use of same become necessary, application should be performed by a state licensed contractor in accordance with the manufacturer's label instruction and when environmental conditions are conducive to product application. Chemical controls should be used as a last resort to organic and biological control methods.

Pet waste management provisions - All pet waste is to be scooped up, sealed in a plastic bag, and disposed of properly in the garbage. Never deposit pet waste in the stormwater management system for it contains high levels of bacteria.

Provisions for operation and management of septic systems – The on-site septic system should be inspected and maintained on a regular basis. Discharge or ponding of effluent at the ground surface may indicate system failure and should be resolved immediately.

Snow disposal and deicing chemicals – The individual property owners will be responsible for the clearing of their individual driveways and building entrances. The owners may be required to use a de-icing agent such as salt or calcium chloride to maintain a safe walking surface. The de-icing agent for the walkways and building entrances should be kept on site within a building (i.e. garage).

ATTACHMENT D

OPERATION
& MAINTENANCE
PLAN

OPERATION & MAINTENANCE PLAN

170 Orchard Street Residential Development

System Owner:

Estate of Lewis Bulgaris (or Successor)

Party Responsible for O&M:

The individual homeowners for each lot will be responsible for the operation and maintenance of their respective on-site stormwater management features as outlined in this Operation and Maintenance (O&M) Plan. Should ownership of the property change, the succeeding owners shall have those responsibilities. A homeowners association (HOA) will contract-out maintenance of common utilities and stormwater BMPs.

Note: The system inspectors should note that drainage pipes, manholes, and treatment devices are considered "confined spaces" subject to strict OSHA standards regarding safe entry. Confined spaces present inherent hazards to workers. Only appropriately trained staff with appropriate safety equipment and monitors may enter confined spaces, and then only with a specific entry permit. Also, this work may pose hazards to workers, such as soft ground, flowing or standing water, snakes and rodents. Again, only appropriately trained staff with the necessary safety equipment should undertake such work.

Post-Development Operation and Maintenance

The stormwater management system consists of a series of catchbasins, drain manholes, pipes, a constructed stormwater wetland, and several "qualifying pervious areas" (QPAs). Roof runoff is conveyed to the pervious areas via gutters, downspouts, and PVC roof leaders. Stormwater from the proposed roadway is directed into the constructed stormwater wetland via catchbasins and / or culvert pipes.

Inspection of the drainage system components are to be performed by the System Owner or their designee during the first year of operation on a quarterly basis. The inspection frequency can be reduced after the first year to annual inspections provided that the quarterly inspections do not indicate the need for more frequent inspections. If more frequent inspections become appropriate at any time, they should be implemented. Inspections should be documented by taking necessary notes, measurements, photographs, and retaining service receipts. The following inspections are required of the system owner:

Roadway - Remove debris from the roadway as it accumulates, as part of normal site clean-up. Weekly patrolling for litter is recommended. Sand from ice control should be removed monthly via a street sweeper during the winter season. Significant oil leaks should be swept up and disposed of using oil-absorbent material as they are

discovered. Any oil spills or leaks that reach the catchbasins must be reported to the Massachusetts DEP oil spill hotline.

Catchbasins & Drain Manholes - Remove the grate or cover and visually inspect for corrosion and structural damage. Inspect pipe inlets and bottoms for signs of infiltration or inflow. The grate or cover and hoods on the catchbasins should be inspected on a quarterly basis during the first and year and semi-annual thereafter. Cleaning of the catchbasins should be done on a yearly basis and by a vacuum truck or clamshell. While cleaning, if a layer of oil is observed floating on the water surface, place an oil-absorbent pillow on the surface, allow to soak and remove. Repeat this process until the oil layer is removed. Alternatively, have the oil layer pumped out by a licensed disposal contractor and appropriately disposed of. The oil absorbent pillows must be drummed for disposal by a licensed disposal contractor.

Constructed Stormwater Wetland (CSW) – The CSW should be inspected at least quarterly during the first two years, and once a year thereafter. The inspection should determine the amount of sediment accumulation in the forebay and micropool. Check to make sure the plants are healthy and in good condition. Access areas and embankments should be mowed twice a year. The CSW should be inspected after major storms to ensure proper function and stabilization. Water levels should be recorded over several days. Follow the schedule below for maintenance of the CSW.

Schedule	Activity
Annually (Quarterly During First Two Years)	• Inspect inflow area and overflow spillway for sediment accumulation. Remove any accumulated sediment or debris. Silt shall be removed as it accumulates. • Inspect for erosion, subsidence, or cracking of embankments. • Inspect for dead or dying vegetation. Replace vegetation as needed with plants from original plant list.
Regularly (Monthly)	• Remove accumulated trash and debris. • Weed and prune as necessary to prevent invasive species from taking over and to allow the desired vegetation to thrive.
As Needed (Following Construction)	• Water to promote plant growth and survival, especially during the first two years and during dry spells. • Inspect plants following major storm events to ensure proper function and stabilization. Water levels should subside within a day or two after large storms.

Record date, description, and contractor (if applicable) for all structural repairs and plant

replacement.

Qualifying Pervious Areas – During the first year, QPAs should be inspected after major storms to ensure proper function and stabilization. After the first year QPAs should be inspected annually for erosion, sediment accumulation, or subsidence. All trash and debris should be removed from the surrounding area. Silt should be removed as it accumulates.

Snow Storage

The new roadway is designed with 22 feet pavement width and two-foot shoulders throughout. This should provide ample room to maintain travel lanes with snow cast along the edge of the roadway. In the event of significant snow, clearing of snow banks at intersections to provide increased visibility may be necessary. In these instances, snow should be moved less than 100 feet to a more convenient location.

POST-CONSTRUCTION MAINTENANCE INSPECTION FORM

170 Orchard Street Residential Development

Inspections/reports must be completed quarterly for the first year of operation. Inspection frequency can be reduced after the first year to annual inspections provided that the quarterly inspections do not indicate the need for more frequent inspections.

Inspection Type:

☐ **Quarterly Inspection**
☐ **Annual Inspection**
☐ **Emergency Inspection**
(i.e. Ponding, Flooding, and/or Severe Erosion)

Date: _____

Weather Conditions: _____

BMP Inspection Areas	Satisfactory	Unsatisfactory	Comments/Corrective Action Required
Catchbasins, Manholes & Pining			
Constructed Stormwater Wetland			
- Inflow area and Overflow Spillway			
- Erosion, Subsidence, or Cracking of Embankments			
- Dead or Dying Vegetation			
- Prune and Weed Stone Berm			
- Housekeeping / Trash			
Downspouts & Roof Leaders			
Qualifying Pervious Areas			
Other Necessary Controls			

Site Notes:

ATTACHMENT E

ILLICIT
DISCHARGE
STATEMENT

ILLICIT DISCHARGE COMPLIANCE STATEMENT

I verify that no illicit discharges exist from the 170 Orchard Street residential development. Through the implementation of Long-Term Pollution Prevention Plan and Operation and Maintenance Plan, measures are set forth to prevent illicit discharges from entering the stormwater management drainage system.

Signature	Print Name	Date
Title	Company	
Signature	Print Name	Date
Title	Company	

Note: This certification must be signed before stormwater is conveyed to the proposed stormwater drainage system in accordance with Standard 10 of the Massachusetts Stormwater Management Standards.

ATTACHMENT F

STORMWATER
ANALYSIS

- Subcatchment Plans, DR-1 & DR-2
  (Reduced Size, 11x17)
- HydroCAD Calculations
  (2-, 10-, & 100-Year Storm Events)
- Qualifying Pervious Area Sketch
  (Reduced Size, 11x17)

MAP R20 LOT 58
N/F
FRACKIEWICZ & CLIFFORD
21 PEARSON DR.

MAP R20 LOT 57
N/F
GOLDNER & MARTIN
19 PEARSON DR.

MAP R20 LOT 56
N/F
LADD
17 PEARSON DR.

MAP R20 LOT 55
N/F
MAGUIRE
15 PEARSON DR.

MAP R20 LOT 54
N/F
DALEY
13 PEARSON DR.

MAP R20 LOT 53
N/F
PETRIE
11 PEARSON DR.

MAP R20 LOT 52
N/F
AHERN
9 PEARSON DR.

MAP R20 LOT 51
N/F
GODZYK
7 PEARSON DRIVE

MAP R20 LOT 50
N/F
COX
5 PEARSON DR.

MAP R20 LOT 45
N/F
LATAUSKAS
166 ORCHARD ST.

S28°22'55"E
344.66'

S28°07'26"E
32.86'

S28°07'26"E
125.03'

S28°07'26"E
119.46'

S28°07'26"E
81.48'

S29°19'37"E
134.09'

BRUSH/WOODS LINE

OPEN FIELD

MAP R20 LOT 44
N/F
KESSLER
168 ORCHARD ST.

EXIST. HYDRANT

STREET

MAP R21
LOT 27A
N/F
CASSNOVA
& COURIS
165
ORCHARD
ST.

APPROX. LOC. OF EXIST. 10"ø WATER MAIN

MAP R17
LOT 1A
N/F
MACE
171
ORCHARD
ST.

#168

#172

S31°43'21"E
202.93'

N31°43'21"W
263.42'

EXIST. GARAGE

EXIST. DRIVEWAY

FOUNDATION (RUINS)

100' BUFFER ZONE

S42°26'53"W
231.18'

MAP R20 LOT 42
N/F
STRAZZULLA
172 ORCHARD ST.

MATCH LINE A

100' BUFFER ZONE

E1

E2

MAP R20 LOT 43A
UPLAND AREA
737,923± SF (16.94 AC)

WETLAND AREA
158,305± SF (3.63 AC)

TOTAL AREA
896,228± SF (20.57 AC)

BORDERING VEGETATED WETLAND

BRUSH/WOODS LINE

N14°40'50"W
169.02'

S7°28'17"W
175.51'

N07°20'01"W
178.27'

N07°20'01"W
2.73'

N08°56'51"W
399.16'

MAP R20 LOT 120
N/F
REETZ
10 COURSER BROOK DR.

MAP R20 LOT 119
N/F
GOYETTE
8 COURSER BROOK DR.

MAP R20 LOT 38C
N/F
GALLAGHER
57 CENTRAL ST.

MAP R20 LOT 43
N/F
BULGARIS
174 ORCHARD ST.

N

W

E

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

TOWN OF NEWBURY
PLANNING BOARD

DATE:

OWNER & APPLICANT:
ESTATE OF LEWIS BULGARIS
C/O DIANNE YURKAVICH
2 LAVALLEE LANE
NEWBURYPORT, MA 01915

No.	Date	Description

Revisions

Griffin Engineering Group, LLC

495 Cabot Street, 2nd Floor
Beverly, MA 01915

Tel: 978-927-5111
Fax: 978-927-5103

FIELDS WAY
SUBDIVISION

170 ORCHARD ST.
NEWBURY, MA

EXISTING
SUBCATCHMENT
PLAN

Scale: 1"=40'
Job No: 2043
Date: 1/4/23

DR-1

MAP R20 LOT 58
N/F
FRACKIEWICZ & CLIFFORD
21 PEARSON DR.

MAP R20 LOT 57
N/F
GOLDNER & MARTIN
19 PEARSON DR.

MAP R20 LOT 56
N/F
LADD
17 PEARSON DR.

MAP R20 LOT 55
N/F
MAGUIRE
15 PEARSON DR.

MAP R20 LOT 54
N/F
DALEY
13 PEARSON DR.

MAP R20 LOT 53
N/F
PETRIE
11 PEARSON DR.

MAP R20 LOT 52
N/F
AHERN
9 PEARSON DR.

MAP R20 LOT 51
N/F
GODZYK
7 PEARSON DRIVE

MAP R20 LOT 50
N/F
COX
5 PEARSON DR.

MAP R20 LOT 45
N/F
LATAUSKAS
166 ORCHARD ST.

STREET
ORCHARD
(PUBLIC - VAR. WIDTH)

MATCH LINE A

BRUSH/WOODS LINE

BORDERING VEGETATED WETLAND

100' BUFFER ZONE

EXIST. HYDRANT

APPROX. LOC. OF EXIST. 10"ø WATER MAIN

EXIST. GARAGE

EXIST. DRIVEWAY

#168

#172

MAP R20 LOT 42
N/F
STRAZZULLA
172 ORCHARD ST.

MAP R20 LOT 43
N/F
BULGARIS
174 ORCHARD ST.

MAP R20 LOT 120
N/F
REETZ
10 COURSER BROOK DR.

MAP R20 LOT 119
N/F
GOYETTE
8 COURSER BROOK DR.

MAP R20 LOT 38C
N/F
GALLAGHER
57 CENTRAL ST.

P1a P1b P1c P1d P1e P1f P1g P1h

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

OWNER & APPLICANT:
ESTATE OF LEWIS BULGARIS
C/O DIANNE YURKAVICH
2 LAVALLEE LANE
NEWBURYPORT, MA 01915

No.	Date	Description
		Revisions

Griffin Engineering Group, LLC
495 Cabot Street, 2nd Floor
Beverly, MA 01915
Tel: 978-927-5111
Fax: 978-927-5103

FIELDS WAY SUBDIVISION

170 ORCHARD ST.
NEWBURY, MA

PROPOSED SUBCATCHMENT PLAN

Scale: 1"=40'
Job No: 2043
Date: 1/4/23

DR-2

MAP R20 LOT 58
N/F
FRACKIEWICZ & CLIFFORD
21 PEARSON DR.

MAP R20 LOT 57
N/F
GOLDNER & MARTIN
19 PEARSON DR.

MAP R20 LOT 56
N/F
LADD
17 PEARSON DR.

MAP R20 LOT 55
N/F
MAGUIRE
15 PEARSON DR.

MAP R20 LOT 54
N/F
DALEY
13 PEARSON DR.

MAP R20 LOT 53
N/F
PETRIE
11 PEARSON DR.

MAP R20 LOT 52
N/F
AHERN
9 PEARSON DR.

MAP R20 LOT 51
N/F
GODZYK
7 PEARSON DRIVE

MAP R20 LOT 50
N/F
COX
5 PEARSON DR.

MAP R20 LOT 45
N/F
LATAUSKAS
166 ORCHARD ST.

MATCH LINE A

50'
S.A.S.
BUFFER
(TYP.)

3,800± SF

100'
BUFFER
ZONE

BRUSH/WOODS
LINE

BORDERING
VEGETATED
WETLAND

EXIST.
HYDRANT

STREET
ORCHARD
(PUBLIC – VAR. WIDTH)

APPROX. LOC.
OF EXIST. 10"ø
WATER MAIN

#168

#172

EXIST.
GARAGE

EXIST.
DRIVEWAY

GRAVEL

MAP R20 LOT 42
N/F
STRAZZULLA
172 ORCHARD ST.

MAP R20 LOT 120
N/F
REETZ
10 COURSER BROOK DR.

MAP R20 LOT 119
N/F
GOYETTE
8 COURSER BROOK DR.

MAP R20 LOT 38C
N/F
GALLAGHER
57 CENTRAL ST.

MAP R20 LOT 43
N/F
BULGARIS
174 ORCHARD ST.

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

QUALIFYING PERVIOUS AREA

QUALIFYING PERVIOUS AREA (QPA) CALCULATION

CREDIT 2 – RESIDENCES
ROOF AREA = 2,000± SF
MAX. AREA TO SINGLE QPA = 1,000 SF
MIN. QPA LENGTH = 1,000 / 13.3 = 75 FT
MIN. QPA WIDTH = 50± FT
APPROX. QPA AREA = 75 * 50 = 3,750 SF

CREDIT 3 – DRIVEWAYS
PAVED WIDTH = 20 FT
PAVED LENGTH = 300± SF
APPROX QPA AREA = 20 * 300 = 6,000 SF

REF. MA STORMWATER HANDBOOK

OWNER & APPLICANT:
ESTATE OF LEWIS BULGARIS
C/O DIANNE YURKAVICH
2 LAVALLEE LANE
NEWBURYPORT, MA 01915

No.	Date	Description

Revisions

Griffin Engineering Group, LLC

495 Cabot Street, 2nd Floor
Beverly, MA 01915

Tel: 978-927-5111
Fax: 978-927-5103

FIELDS WAY
SUBDIVISION

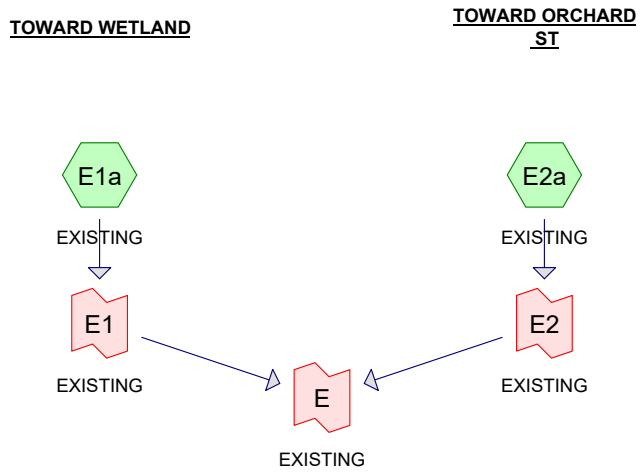
170 ORCHARD ST.
NEWBURY, MA

QUALIFYING
PERVIOUS
AREAS

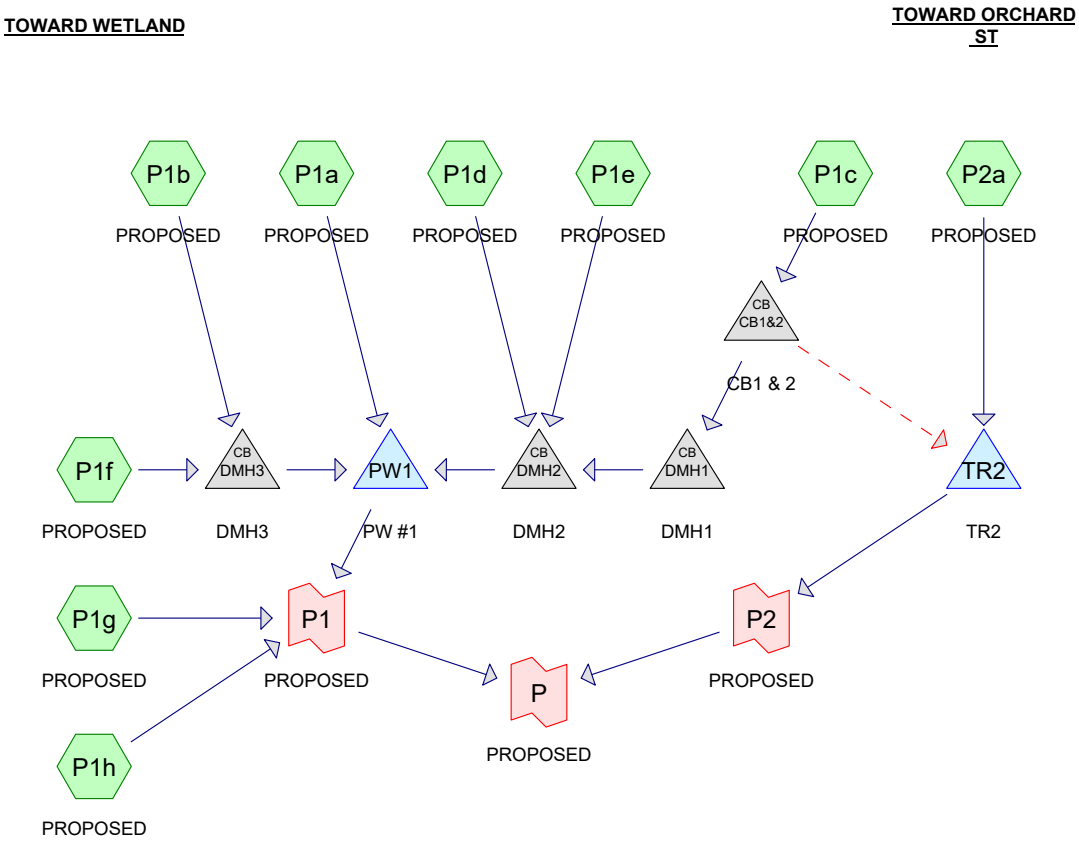
Scale: 1"=40'
Job No: 2043
Date: 1/4/23

DR–3

EXISTING



PROPOSED



Subcat Reach Pond Link

Routing Diagram for MPMCompanies-170OrchardSt
Prepared by Griffin Engineering Group, LLC, Printed 1/3/2023

Summary for Subcatchment E1a: EXISTING

Runoff = 4.12 cfs @ 12.38 hrs, Volume= 23,184 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
333,614	70	Woods, Good, HSG C
333,614		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
10.5	374	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.7	424	Total			

Summary for Subcatchment E2a: EXISTING

Runoff = 0.07 cfs @ 12.20 hrs, Volume= 326 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
4,694	70	Woods, Good, HSG C
4,694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
0.9	40	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	90	Total			

Summary for Subcatchment P1a: PROPOSED

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,212 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
11,421	74	>75% Grass cover, Good, HSG C
1,131	98	Paved parking, HSG C
12,552	76	Weighted Average
11,421		90.99% Pervious Area
1,131		9.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	16	0.0300	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.21"
2.7	34	0.0600	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.1	21	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0					**Direct Entry, 6' (MIN.)**
6.0	71	Total			

Summary for Subcatchment P1b: PROPOSED

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 2,945 cf, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
7,216	74	>75% Grass cover, Good, HSG C
10,401	98	Paved parking, HSG C
17,617	88	Weighted Average
7,216		40.96% Pervious Area
10,401		59.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1c: PROPOSED

Runoff = 0.17 cfs @ 12.08 hrs, Volume= 572 cf, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
2,307	98	Paved parking, HSG C
2,307		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1d: PROPOSED

Runoff = 1.08 cfs @ 12.39 hrs, Volume= 5,938 cf, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
49,295	74	>75% Grass cover, Good, HSG C
2,363	98	Unconnected pavement, HSG C
15,500	70	Woods, Good, HSG C
1,088	98	Unconnected roofs, HSG C
68,246	74	Weighted Average
64,795		94.94% Pervious Area
3,451		5.06% Impervious Area
3,451		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
14.3	570	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.6	620	Total			

Summary for Subcatchment P1e: PROPOSED

Runoff = 0.40 cfs @ 12.26 hrs, Volume= 1,861 cf, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Adj	Description
16,470	74		>75% Grass cover, Good, HSG C
700	98		Unconnected pavement, HSG C
3,133	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
21,391	75	74	Weighted Average, UI Adjusted
19,603			91.64% Pervious Area
1,788			8.36% Impervious Area
1,788			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.3	170	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	220	Total			

Summary for Subcatchment P1f: PROPOSED

Runoff = 1.12 cfs @ 12.15 hrs, Volume= 4,169 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Adj	Description
35,159	74		>75% Grass cover, Good, HSG C
4,913	98		Unconnected pavement, HSG C
2,008	98		Unconnected roofs, HSG C
1,088	98		Unconnected roofs, HSG C
43,168	78	76	Weighted Average, UI Adjusted
35,159			81.45% Pervious Area
8,009			18.55% Impervious Area
8,009			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
6.0	250	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.3	300	Total			

Summary for Subcatchment P1g: PROPOSED

Runoff = 0.88 cfs @ 12.28 hrs, Volume= 4,081 cf, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Adj	Description
26,694	74		>75% Grass cover, Good, HSG C
8,603	98		Unconnected pavement, HSG C
2,788	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
1,004	98		Unconnected roofs, HSG C
40,177	80	77	Weighted Average, UI Adjusted
29,482			73.38% Pervious Area
10,695			26.62% Impervious Area
10,695			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.5	200	0.0350	1.31		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	250	Total			

Summary for Subcatchment P1h: PROPOSED

Runoff = 1.89 cfs @ 12.31 hrs, Volume= 9,553 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
47,534	74	>75% Grass cover, Good, HSG C
73,953	70	Woods, Good, HSG C
1,004	98	Unconnected roofs, HSG C
122,491	72	Weighted Average
121,487		99.18% Pervious Area
1,004		0.82% Impervious Area
1,004		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.7	220	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	66	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.6	336	Total			

Summary for Subcatchment P2a: PROPOSED

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,275 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.21"

Area (sf)	CN	Description
7,205	74	>75% Grass cover, Good, HSG C
3,154	98	Unconnected pavement, HSG C
10,359	81	Weighted Average
7,205		69.55% Pervious Area
3,154		30.45% Impervious Area
3,154		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Pond CB1&2: CB1 & 2

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 2.98" for 2-yr event
Inflow = 0.17 cfs @ 12.08 hrs, Volume= 572 cf
Outflow = 0.17 cfs @ 12.08 hrs, Volume= 572 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.08 hrs, Volume= 572 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.55' @ 12.09 hrs
Flood Elev= 55.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.40'	**10.0" Round Culvert X 2.00** L= 5.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.40' / 53.20' S= 0.0400 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Secondary	55.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.16 cfs @ 12.08 hrs HW=53.55' TW=53.43' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.16 cfs @ 1.91 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=53.40' TW=49.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH1

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 2.98" for 2-yr event
Inflow = 0.17 cfs @ 12.08 hrs, Volume= 572 cf
Outflow = 0.17 cfs @ 12.08 hrs, Volume= 572 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.08 hrs, Volume= 572 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.43' @ 12.09 hrs
Flood Elev= 56.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.20'	**12.0" Round Culvert** L= 150.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.20' / 52.30' S= 0.0060 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=0.16 cfs @ 12.08 hrs HW=53.43' TW=52.76' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.16 cfs @ 1.86 fps)

Summary for Pond DMH2: DMH2

Inflow Area = 91,944 sf, 8.21% Impervious, Inflow Depth = 1.09" for 2-yr event
Inflow = 1.48 cfs @ 12.36 hrs, Volume= 8,372 cf
Outflow = 1.48 cfs @ 12.36 hrs, Volume= 8,372 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.48 cfs @ 12.36 hrs, Volume= 8,372 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.00' @ 12.36 hrs
Flood Elev= 56.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.30'	**12.0" Round Culvert** L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.30' / 52.00' S= 0.0068 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=1.48 cfs @ 12.36 hrs HW=53.00' TW=51.31' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 1.48 cfs @ 3.53 fps)

Summary for Pond DMH3: DMH3

Inflow Area = 60,785 sf, 30.29% Impervious, Inflow Depth = 1.40" for 2-yr event
Inflow = 1.95 cfs @ 12.12 hrs, Volume= 7,114 cf
Outflow = 1.95 cfs @ 12.12 hrs, Volume= 7,114 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.12 hrs, Volume= 7,114 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.34' @ 12.12 hrs
Flood Elev= 55.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.50'	**12.0" Round Culvert** L= 92.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.50' / 52.00' S= 0.0054 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=1.95 cfs @ 12.12 hrs HW=53.34' TW=50.75' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 1.95 cfs @ 3.75 fps)

Summary for Pond PW1: PW #1

Inflow Area = 165,281 sf, 16.39% Impervious, Inflow Depth = 1.21" for 2-yr event
Inflow = 3.18 cfs @ 12.13 hrs, Volume= 16,698 cf
Outflow = 1.56 cfs @ 12.62 hrs, Volume= 12,848 cf, Atten= 51%, Lag= 29.1 min
Primary = 1.56 cfs @ 12.62 hrs, Volume= 12,848 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 51.49' @ 12.62 hrs Surf.Area= 4,597 sf Storage= 5,962 cf
Flood Elev= 54.00' Surf.Area= 7,326 sf Storage= 20,944 cf

Plug-Flow detention time= 181.1 min calculated for 12,848 cf (77% of inflow)
Center-of-Mass det. time= 92.3 min (949.2 - 856.9)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	20,944 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
50.00	3,450	0	0
51.00	4,204	3,827	3,827
52.00	5,015	4,610	8,437
53.00	6,337	5,676	14,113
54.00	7,326	6,832	20,944

Device	Routing	Invert	Outlet Devices
#1	Primary	53.25'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	51.00'	**10.0" Round Culvert X 2.00** L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 51.00' / 50.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.56 cfs @ 12.62 hrs HW=51.49' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 1.56 cfs @ 2.37 fps)

Summary for Pond TR2: TR2

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 1.48" for 2-yr event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,275 cf
Outflow = 0.13 cfs @ 11.98 hrs, Volume= 1,275 cf, Atten= 68%, Lag= 0.0 min
Discarded = 0.13 cfs @ 11.98 hrs, Volume= 1,275 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 49.75' @ 12.44 hrs Surf.Area= 684 sf Storage= 205 cf
Flood Elev= 52.00' Surf.Area= 2,844 sf Storage= 1,957 cf

Plug-Flow detention time= 7.6 min calculated for 1,275 cf (100% of inflow)
Center-of-Mass det. time= 7.6 min (846.9 - 839.4)

Volume	Invert	Avail.Storage	Storage Description
#1	51.00'	705 cf	**3.00'W x 114.00'L x 1.00'H Prismatoid Z=3.0**
#2	49.00'	274 cf	**3.00'W x 114.00'L x 2.00'H Prismatoid**
			684 cf Overall x 40.0% Voids
		979 cf	x 2.00 = 1,957 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	49.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.13 cfs @ 11.98 hrs HW=49.03' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=49.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link E: EXISTING

Inflow Area = 338,308 sf, 0.00% Impervious, Inflow Depth = 0.83" for 2-yr event
Inflow = 4.18 cfs @ 12.38 hrs, Volume= 23,510 cf
Primary = 4.18 cfs @ 12.38 hrs, Volume= 23,510 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E1: EXISTING

Inflow Area = 333,614 sf, 0.00% Impervious, Inflow Depth = 0.83" for 2-yr event
Inflow = 4.12 cfs @ 12.38 hrs, Volume= 23,184 cf
Primary = 4.12 cfs @ 12.38 hrs, Volume= 23,184 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E2: EXISTING

Inflow Area = 4,694 sf, 0.00% Impervious, Inflow Depth = 0.83" for 2-yr event
Inflow = 0.07 cfs @ 12.20 hrs, Volume= 326 cf
Primary = 0.07 cfs @ 12.20 hrs, Volume= 326 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P: PROPOSED

Inflow Area = 338,308 sf, 12.40% Impervious, Inflow Depth = 0.94" for 2-yr event
Inflow = 3.55 cfs @ 12.47 hrs, Volume= 26,482 cf
Primary = 3.55 cfs @ 12.47 hrs, Volume= 26,482 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P1: PROPOSED

Inflow Area = 327,949 sf, 11.83% Impervious, Inflow Depth = 0.97" for 2-yr event
Inflow = 3.55 cfs @ 12.47 hrs, Volume= 26,482 cf
Primary = 3.55 cfs @ 12.47 hrs, Volume= 26,482 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P2: PROPOSED

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1a: EXISTING

Runoff = 10.72 cfs @ 12.37 hrs, Volume= 55,173 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
333,614	70	Woods, Good, HSG C
333,614		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
10.5	374	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.7	424	Total			

Summary for Subcatchment E2a: EXISTING

Runoff = 0.19 cfs @ 12.19 hrs, Volume= 776 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
4,694	70	Woods, Good, HSG C
4,694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
0.9	40	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	90	Total			

Summary for Subcatchment P1a: PROPOSED

Runoff = 0.84 cfs @ 12.09 hrs, Volume= 2,592 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
11,421	74	>75% Grass cover, Good, HSG C
1,131	98	Paved parking, HSG C
12,552	76	Weighted Average
11,421		90.99% Pervious Area
1,131		9.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	16	0.0300	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.21"
2.7	34	0.0600	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.1	21	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0					**Direct Entry, 6' (MIN.)**
6.0	71	Total			

Summary for Subcatchment P1b: PROPOSED

Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,289 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
7,216	74	>75% Grass cover, Good, HSG C
10,401	98	Paved parking, HSG C
17,617	88	Weighted Average
7,216		40.96% Pervious Area
10,401		59.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1c: PROPOSED

Runoff = 0.26 cfs @ 12.08 hrs, Volume= 902 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
2,307	98	Paved parking, HSG C
2,307		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1d: PROPOSED

Runoff = 2.51 cfs @ 12.38 hrs, Volume= 13,129 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
49,295	74	>75% Grass cover, Good, HSG C
2,363	98	Unconnected pavement, HSG C
15,500	70	Woods, Good, HSG C
1,088	98	Unconnected roofs, HSG C
68,246	74	Weighted Average
64,795		94.94% Pervious Area
3,451		5.06% Impervious Area
3,451		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
14.3	570	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.6	620	Total			

Summary for Subcatchment P1e: PROPOSED

Runoff = 0.94 cfs @ 12.24 hrs, Volume= 4,115 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Adj	Description
16,470	74		>75% Grass cover, Good, HSG C
700	98		Unconnected pavement, HSG C
3,133	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
21,391	75	74	Weighted Average, UI Adjusted
19,603			91.64% Pervious Area
1,788			8.36% Impervious Area
1,788			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.3	170	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	220	Total			

Summary for Subcatchment P1f: PROPOSED

Runoff = 2.49 cfs @ 12.14 hrs, Volume= 8,914 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Adj	Description
35,159	74		>75% Grass cover, Good, HSG C
4,913	98		Unconnected pavement, HSG C
2,008	98		Unconnected roofs, HSG C
1,088	98		Unconnected roofs, HSG C
43,168	78	76	Weighted Average, UI Adjusted
35,159			81.45% Pervious Area
8,009			18.55% Impervious Area
8,009			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
6.0	250	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.3	300	Total			

Summary for Subcatchment P1g: PROPOSED

Runoff = 1.92 cfs @ 12.26 hrs, Volume= 8,586 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Adj	Description
26,694	74		>75% Grass cover, Good, HSG C
8,603	98		Unconnected pavement, HSG C
2,788	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
1,004	98		Unconnected roofs, HSG C
40,177	80	77	Weighted Average, UI Adjusted
29,482			73.38% Pervious Area
10,695			26.62% Impervious Area
10,695			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.5	200	0.0350	1.31		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	250	Total			

Summary for Subcatchment P1h: PROPOSED

Runoff = 4.64 cfs @ 12.29 hrs, Volume= 21,886 cf, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
47,534	74	>75% Grass cover, Good, HSG C
73,953	70	Woods, Good, HSG C
1,004	98	Unconnected roofs, HSG C
122,491	72	Weighted Average
121,487		99.18% Pervious Area
1,004		0.82% Impervious Area
1,004		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.7	220	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	66	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.6	336	Total			

Summary for Subcatchment P2a: PROPOSED

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,524 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.93"

Area (sf)	CN	Description
7,205	74	>75% Grass cover, Good, HSG C
3,154	98	Unconnected pavement, HSG C
10,359	81	Weighted Average
7,205		69.55% Pervious Area
3,154		30.45% Impervious Area
3,154		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Pond CB1&2: CB1 & 2

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 4.69" for 10-yr event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 902 cf
Outflow = 0.26 cfs @ 12.08 hrs, Volume= 902 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.08 hrs, Volume= 902 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.74' @ 12.34 hrs
Flood Elev= 55.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.40'	**10.0" Round Culvert X 2.00** L= 5.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.40' / 53.20' S= 0.0400 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Secondary	55.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.25 cfs @ 12.08 hrs HW=53.61' TW=53.52' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.25 cfs @ 1.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=53.40' TW=49.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH1

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 4.69" for 10-yr event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 902 cf
Outflow = 0.26 cfs @ 12.08 hrs, Volume= 902 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.08 hrs, Volume= 902 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.73' @ 12.33 hrs
Flood Elev= 56.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.20'	**12.0" Round Culvert** L= 150.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.20' / 52.30' S= 0.0060 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.08 hrs HW=53.52' TW=53.10' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.26 cfs @ 1.76 fps)

Summary for Pond DMH2: DMH2

Inflow Area = 91,944 sf, 8.21% Impervious, Inflow Depth = 2.37" for 10-yr event
Inflow = 3.40 cfs @ 12.33 hrs, Volume= 18,147 cf
Outflow = 3.40 cfs @ 12.33 hrs, Volume= 18,147 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.33 hrs, Volume= 18,147 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.73' @ 12.33 hrs
Flood Elev= 56.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.30'	**12.0" Round Culvert** L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.30' / 52.00' S= 0.0068 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=3.40 cfs @ 12.33 hrs HW=53.73' TW=52.09' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.40 cfs @ 4.33 fps)

Summary for Pond DMH3: DMH3

Inflow Area = 60,785 sf, 30.29% Impervious, Inflow Depth = 2.80" for 10-yr event
Inflow = 3.95 cfs @ 12.12 hrs, Volume= 14,203 cf
Outflow = 3.95 cfs @ 12.12 hrs, Volume= 14,203 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.95 cfs @ 12.12 hrs, Volume= 14,203 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 54.40' @ 12.12 hrs
Flood Elev= 55.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.50'	**12.0" Round Culvert** L= 92.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.50' / 52.00' S= 0.0054 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=3.94 cfs @ 12.12 hrs HW=54.40' TW=51.67' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.94 cfs @ 5.02 fps)

Summary for Pond PW1: PW #1

Inflow Area = 165,281 sf, 16.39% Impervious, Inflow Depth = 2.54" for 10-yr event
Inflow = 6.89 cfs @ 12.13 hrs, Volume= 34,941 cf
Outflow = 4.57 cfs @ 12.48 hrs, Volume= 31,090 cf, Atten= 34%, Lag= 21.0 min
Primary = 4.57 cfs @ 12.48 hrs, Volume= 31,090 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 52.17' @ 12.48 hrs Surf.Area= 5,244 sf Storage= 9,327 cf
Flood Elev= 54.00' Surf.Area= 7,326 sf Storage= 20,944 cf

Plug-Flow detention time= 106.4 min calculated for 31,084 cf (89% of inflow)
Center-of-Mass det. time= 54.1 min (891.6 - 837.5)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	20,944 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
50.00	3,450	0	0
51.00	4,204	3,827	3,827
52.00	5,015	4,610	8,437
53.00	6,337	5,676	14,113
54.00	7,326	6,832	20,944

Device	Routing	Invert	Outlet Devices
#1	Primary	53.25'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	51.00'	**10.0" Round Culvert X 2.00** L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 51.00' / 50.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.57 cfs @ 12.48 hrs HW=52.17' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 4.57 cfs @ 4.19 fps)

Summary for Pond TR2: TR2

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 2.92" for 10-yr event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,524 cf
Outflow = 0.28 cfs @ 12.39 hrs, Volume= 2,524 cf, Atten= 66%, Lag= 18.0 min
Discarded = 0.28 cfs @ 12.39 hrs, Volume= 2,524 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 51.06' @ 12.39 hrs Surf.Area= 1,458 sf Storage= 594 cf
Flood Elev= 52.00' Surf.Area= 2,844 sf Storage= 1,957 cf

Plug-Flow detention time= 24.0 min calculated for 2,523 cf (100% of inflow)
Center-of-Mass det. time= 24.0 min (843.7 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1	51.00'	705 cf	**3.00'W x 114.00'L x 1.00'H Prismatoid Z=3.0**
#2	49.00'	274 cf	**3.00'W x 114.00'L x 2.00'H Prismatoid**
			684 cf Overall x 40.0% Voids
		979 cf	x 2.00 = 1,957 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	49.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.28 cfs @ 12.39 hrs HW=51.06' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=49.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link E: EXISTING

Inflow Area = 338,308 sf, 0.00% Impervious, Inflow Depth = 1.98" for 10-yr event
Inflow = 10.85 cfs @ 12.36 hrs, Volume= 55,950 cf
Primary = 10.85 cfs @ 12.36 hrs, Volume= 55,950 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E1: EXISTING

Inflow Area = 333,614 sf, 0.00% Impervious, Inflow Depth = 1.98" for 10-yr event
Inflow = 10.72 cfs @ 12.37 hrs, Volume= 55,173 cf
Primary = 10.72 cfs @ 12.37 hrs, Volume= 55,173 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E2: EXISTING

Inflow Area = 4,694 sf, 0.00% Impervious, Inflow Depth = 1.98" for 10-yr event
Inflow = 0.19 cfs @ 12.19 hrs, Volume= 776 cf
Primary = 0.19 cfs @ 12.19 hrs, Volume= 776 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P: PROPOSED

Inflow Area = 338,308 sf, 12.40% Impervious, Inflow Depth = 2.18" for 10-yr event
Inflow = 10.71 cfs @ 12.31 hrs, Volume= 61,563 cf
Primary = 10.71 cfs @ 12.31 hrs, Volume= 61,563 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P1: PROPOSED

Inflow Area = 327,949 sf, 11.83% Impervious, Inflow Depth = 2.25" for 10-yr event
Inflow = 10.71 cfs @ 12.31 hrs, Volume= 61,563 cf
Primary = 10.71 cfs @ 12.31 hrs, Volume= 61,563 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P2: PROPOSED

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1a: EXISTING

Runoff = 30.25 cfs @ 12.33 hrs, Volume= 151,999 cf, Depth= 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
333,614	70	Woods, Good, HSG C
333,614		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
10.5	374	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.7	424	Total			

Summary for Subcatchment E2a: EXISTING

Runoff = 0.55 cfs @ 12.18 hrs, Volume= 2,139 cf, Depth= 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
4,694	70	Woods, Good, HSG C
4,694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
0.9	40	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	90	Total			

Summary for Subcatchment P1a: PROPOSED

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 6,500 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
11,421	74	>75% Grass cover, Good, HSG C
1,131	98	Paved parking, HSG C
12,552	76	Weighted Average
11,421		90.99% Pervious Area
1,131		9.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	16	0.0300	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.21"
2.7	34	0.0600	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.1	21	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0					**Direct Entry, 6' (MIN.)**
6.0	71	Total			

Summary for Subcatchment P1b: PROPOSED

Runoff = 3.43 cfs @ 12.08 hrs, Volume= 11,297 cf, Depth= 7.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
7,216	74	>75% Grass cover, Good, HSG C
10,401	98	Paved parking, HSG C
17,617	88	Weighted Average
7,216		40.96% Pervious Area
10,401		59.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1c: PROPOSED

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 1,713 cf, Depth= 8.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
2,307	98	Paved parking, HSG C
2,307		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Subcatchment P1d: PROPOSED

Runoff = 6.50 cfs @ 12.36 hrs, Volume= 33,929 cf, Depth= 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
49,295	74	>75% Grass cover, Good, HSG C
2,363	98	Unconnected pavement, HSG C
15,500	70	Woods, Good, HSG C
1,088	98	Unconnected roofs, HSG C
68,246	74	Weighted Average
64,795		94.94% Pervious Area
3,451		5.06% Impervious Area
3,451		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
14.3	570	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.6	620	Total			

Summary for Subcatchment P1e: PROPOSED

Runoff = 2.44 cfs @ 12.23 hrs, Volume= 10,635 cf, Depth= 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Adj	Description
16,470	74		>75% Grass cover, Good, HSG C
700	98		Unconnected pavement, HSG C
3,133	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
21,391	75	74	Weighted Average, UI Adjusted
19,603			91.64% Pervious Area
1,788			8.36% Impervious Area
1,788			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.3	170	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	220	Total			

Summary for Subcatchment P1f: PROPOSED

Runoff = 6.19 cfs @ 12.14 hrs, Volume= 22,356 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Adj	Description
35,159	74		>75% Grass cover, Good, HSG C
4,913	98		Unconnected pavement, HSG C
2,008	98		Unconnected roofs, HSG C
1,088	98		Unconnected roofs, HSG C
43,168	78	76	Weighted Average, UI Adjusted
35,159			81.45% Pervious Area
8,009			18.55% Impervious Area
8,009			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
6.0	250	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.3	300	Total			

Summary for Subcatchment P1g: PROPOSED

Runoff = 4.71 cfs @ 12.24 hrs, Volume= 21,223 cf, Depth= 6.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Adj	Description
26,694	74		>75% Grass cover, Good, HSG C
8,603	98		Unconnected pavement, HSG C
2,788	70		Woods, Good, HSG C
1,088	98		Unconnected roofs, HSG C
1,004	98		Unconnected roofs, HSG C
40,177	80	77	Weighted Average, UI Adjusted
29,482			73.38% Pervious Area
10,695			26.62% Impervious Area
10,695			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.5	200	0.0350	1.31		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	250	Total			

Summary for Subcatchment P1h: PROPOSED

Runoff = 12.54 cfs @ 12.29 hrs, Volume= 58,355 cf, Depth= 5.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
47,534	74	>75% Grass cover, Good, HSG C
73,953	70	Woods, Good, HSG C
1,004	98	Unconnected roofs, HSG C
122,491	72	Weighted Average
121,487		99.18% Pervious Area
1,004		0.82% Impervious Area
1,004		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.7	220	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	66	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.6	336	Total			

Summary for Subcatchment P2a: PROPOSED

Runoff = 1.85 cfs @ 12.09 hrs, Volume= 5,900 cf, Depth= 6.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.15"

Area (sf)	CN	Description
7,205	74	>75% Grass cover, Good, HSG C
3,154	98	Unconnected pavement, HSG C
10,359	81	Weighted Average
7,205		69.55% Pervious Area
3,154		30.45% Impervious Area
3,154		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6' (MIN.)**

Summary for Pond CB1&2: CB1 & 2

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 8.91" for 100-yr event
Inflow = 0.48 cfs @ 12.08 hrs, Volume= 1,713 cf
Outflow = 0.48 cfs @ 12.08 hrs, Volume= 1,713 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.08 hrs, Volume= 1,583 cf
Secondary = 0.32 cfs @ 12.17 hrs, Volume= 256 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 55.99' @ 12.18 hrs
Flood Elev= 55.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.40'	**10.0" Round Culvert X 2.00** L= 5.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.40' / 53.20' S= 0.0400 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Secondary	55.90'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=54.49' TW=54.61' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 12.17 hrs HW=54.27' TW=51.71' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH1

Inflow Area = 2,307 sf,100.00% Impervious, Inflow Depth = 8.23" for 100-yr event
Inflow = 0.48 cfs @ 12.08 hrs, Volume= 1,583 cf
Outflow = 0.48 cfs @ 12.08 hrs, Volume= 1,583 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.08 hrs, Volume= 1,583 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.77' @ 12.33 hrs
Flood Elev= 56.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.20'	**12.0" Round Culvert** L= 150.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 53.20' / 52.30' S= 0.0060 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=0.48 cfs @ 12.08 hrs HW=54.61' TW=54.58' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.48 cfs @ 0.61 fps)

Summary for Pond DMH2: DMH2

Inflow Area = 91,944 sf, 8.21% Impervious, Inflow Depth = 6.02" for 100-yr event
Inflow = 8.78 cfs @ 12.33 hrs, Volume= 46,147 cf
Outflow = 8.78 cfs @ 12.33 hrs, Volume= 46,147 cf, Atten= 0%, Lag= 0.0 min
Primary = 8.78 cfs @ 12.33 hrs, Volume= 46,147 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.98' @ 12.33 hrs
Flood Elev= 56.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.30'	**12.0" Round Culvert** L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.30' / 52.00' S= 0.0068 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=8.78 cfs @ 12.33 hrs HW=58.98' TW=53.60' (Dynamic Tailwater)
1=Culvert (Inlet Controls 8.78 cfs @ 11.17 fps)

Summary for Pond DMH3: DMH3

Inflow Area = 60,785 sf, 30.29% Impervious, Inflow Depth = 6.64" for 100-yr event
Inflow = 9.20 cfs @ 12.12 hrs, Volume= 33,653 cf
Outflow = 9.20 cfs @ 12.12 hrs, Volume= 33,653 cf, Atten= 0%, Lag= 0.0 min
Primary = 9.20 cfs @ 12.12 hrs, Volume= 33,653 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.60' @ 12.12 hrs
Flood Elev= 55.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	52.50'	**12.0" Round Culvert** L= 92.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 52.50' / 52.00' S= 0.0054 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=9.19 cfs @ 12.12 hrs HW=60.59' TW=52.81' (Dynamic Tailwater)
1=Culvert (Barrel Controls 9.19 cfs @ 11.70 fps)

Summary for Pond PW1: PW #1

Inflow Area = 165,281 sf, 16.39% Impervious, Inflow Depth = 6.27" for 100-yr event
Inflow = 17.01 cfs @ 12.13 hrs, Volume= 86,300 cf
Outflow = 13.27 cfs @ 12.38 hrs, Volume= 82,449 cf, Atten= 22%, Lag= 14.7 min
Primary = 13.27 cfs @ 12.38 hrs, Volume= 82,449 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.61' @ 12.38 hrs Surf.Area= 6,942 sf Storage= 18,175 cf
Flood Elev= 54.00' Surf.Area= 7,326 sf Storage= 20,944 cf

Plug-Flow detention time= 64.8 min calculated for 82,449 cf (96% of inflow)
Center-of-Mass det. time= 39.5 min (853.2 - 813.7)

Volume	Invert	Avail.Storage	Storage Description
#1	50.00'	20,944 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
50.00	3,450	0	0
51.00	4,204	3,827	3,827
52.00	5,015	4,610	8,437
53.00	6,337	5,676	14,113
54.00	7,326	6,832	20,944

Device	Routing	Invert	Outlet Devices
#1	Primary	53.25'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	51.00'	**10.0" Round Culvert X 2.00** L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 51.00' / 50.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=13.26 cfs @ 12.38 hrs HW=53.61' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 5.48 cfs @ 1.52 fps)
└─**2=Culvert** (Inlet Controls 7.78 cfs @ 7.13 fps)

Summary for Pond TR2: TR2

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 7.13" for 100-yr event
Inflow = 1.85 cfs @ 12.09 hrs, Volume= 6,155 cf
Outflow = 0.68 cfs @ 12.42 hrs, Volume= 6,155 cf, Atten= 63%, Lag= 19.9 min
Discarded = 0.52 cfs @ 12.42 hrs, Volume= 6,077 cf
Primary = 0.16 cfs @ 12.42 hrs, Volume= 78 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 51.92' @ 12.42 hrs Surf.Area= 2,725 sf Storage= 1,795 cf
Flood Elev= 52.00' Surf.Area= 2,844 sf Storage= 1,957 cf

Plug-Flow detention time= 32.6 min calculated for 6,155 cf (100% of inflow)
Center-of-Mass det. time= 32.6 min (825.9 - 793.3)

Volume	Invert	Avail.Storage	Storage Description
#1	51.00'	705 cf	**3.00'W x 114.00'L x 1.00'H Prismatoid Z=3.0**
#2	49.00'	274 cf	**3.00'W x 114.00'L x 2.00'H Prismatoid**
			684 cf Overall x 40.0% Voids
		979 cf	x 2.00 = 1,957 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	51.90'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	49.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.52 cfs @ 12.42 hrs HW=51.92' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.16 cfs @ 12.42 hrs HW=51.92' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 0.16 cfs @ 0.36 fps)

Summary for Link E: EXISTING

Inflow Area = 338,308 sf, 0.00% Impervious, Inflow Depth = 5.47" for 100-yr event
Inflow = 30.63 cfs @ 12.33 hrs, Volume= 154,137 cf
Primary = 30.63 cfs @ 12.33 hrs, Volume= 154,137 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E1: EXISTING

Inflow Area = 333,614 sf, 0.00% Impervious, Inflow Depth = 5.47" for 100-yr event
Inflow = 30.25 cfs @ 12.33 hrs, Volume= 151,999 cf
Primary = 30.25 cfs @ 12.33 hrs, Volume= 151,999 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link E2: EXISTING

Inflow Area = 4,694 sf, 0.00% Impervious, Inflow Depth = 5.47" for 100-yr event
Inflow = 0.55 cfs @ 12.18 hrs, Volume= 2,139 cf
Primary = 0.55 cfs @ 12.18 hrs, Volume= 2,139 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P: PROPOSED

Inflow Area = 338,308 sf, 12.40% Impervious, Inflow Depth = 5.75" for 100-yr event
Inflow = 29.38 cfs @ 12.32 hrs, Volume= 162,104 cf
Primary = 29.38 cfs @ 12.32 hrs, Volume= 162,104 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P1: PROPOSED

Inflow Area = 327,949 sf, 11.83% Impervious, Inflow Depth = 5.93" for 100-yr event
Inflow = 29.38 cfs @ 12.32 hrs, Volume= 162,026 cf
Primary = 29.38 cfs @ 12.32 hrs, Volume= 162,026 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link P2: PROPOSED

Inflow Area = 10,359 sf, 30.45% Impervious, Inflow Depth = 0.09" for 100-yr event
Inflow = 0.16 cfs @ 12.42 hrs, Volume= 78 cf
Primary = 0.16 cfs @ 12.42 hrs, Volume= 78 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs