Preliminary Technical Information Report

Cascades Business Park

1490 Coyote Ridge Road
North Bonneville, WA 98639

Prepared for:

Port of Skamania County

212 SW Cascade Avenue
Stevenson, WA 98648

April 2025
PBS Project No. 78260.000

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CERTIFICATE OF ENGINEER

Cascade Business Park

Preliminary Technical Information Report

The technical information and data contained in this report were prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

This document was:
Prepared by:

Allison Wilson

Digitally signed by Richard E Darland
Date: 2025.04.09 17:02:37-07'00'

Reviewed by:

Rich Darland, P.E.

A. PROJECT OVERVIEW

A.1 Site Information

The Port of Skamania County proposes the construction of the Cascade Business Park (Project) at 1490 Coyote Ridge Road in North Bonneville Washington. The site is located on parcel 02072000020500 which currently has Coyote Ridge Road running through the middle of the parcel. To the north of the site is bordered by Evergreen Highway (State Route 14) and to the south is Fort Cascades Drive and the Columbia River. The site will be developed in multiple phases based on available funding for the construction. The first phase, as shown in the project plans (Appendix E), consists of the site grading, storm pond construction, and installation of utilities on the east half of the project site. Along with the first phase, an option of installation of the subbase on the east half of the project and mass grading for the west half of the project is shown. Once funding is available, three industrial buildings with their accompanying asphalt concrete parking lots, cement concrete sidewalks, stormwater facilities, and supporting infrastructure will be constructed. This linework is shown as future in the project plans.

The total disturbed area for the improvements is approximately 10.04 acres of which approximately 7.17 acres are impervious. Once all phases of the site are complete, impervious surfaces include the building roof, asphalt parking area, access roads, and sidewalks.

The site has a central high point and existing runoff either infiltrates or flows to a conveyance ditch to the south along Fort Cascades Drive or Coyote Ridge Road or to the north to an existing conveyance ditch along the properties northern border. Stormwater from Coyote Ridge Road is collected via curb scuppers and inlets and will be conveyed to one of the ditches for discharge from the site. Stormwater run-off from most of the east side of the parcel is collected by a roadside ditch north of Fort Cascades Drive that conveys runoff to the southwest. This stormwater passes through a biofilter swale before being collected and conveyed via a 30-inch diameter culvert and ultimately discharging to the Columbia River. The remaining portion of the site not draining to the roadside ditch along Fort Cascades Drive will be directed to the ditch along the north side of the property. These ditches convene within ¼ mile of the project and is considered to be one Total Discharge Area (TDA).

The Project will meet Skamania County stormwater requirements by using the Department of Ecology 1992 Stormwater Management Manual for the Puget Sound (manual) for the construction of the project's stormwater facilities. This report addresses the collection, conveyance, water quality treatment, flow control, and discharge of stormwater runoff for full build-out conditions of the Cascade Business Park Project.

A.2 Determination of Applicable Minimum Requirements

Table 1: Proposed Project* Surfacing Areas

Surfacing	Area (AC)
Existing Hard Surface	0.50
New Hard Surface	6.67
Replaced Hard Surface	0.50
*Total Land-Disturbing Activity	10.04

*Total land-disturbing activity includes stormwater facilities, catch slopes, pervious and impervious surfaces.

The Project generates more than 5,000 square feet of new impervious surfaces and more than an acre of disturbance. Based on the Flowchart Demonstrating Minimum Requirements in the Stormwater Management Manual for the Puget Sound Basin, all minimum requirements #1 through #11 apply to the proposed Project.

B. MINIMUM REQUIREMENTS

Minimum Requirement #1 – Erosion and Sediment Control

A Stormwater Pollution Prevention Plan (SWPPP), including a narrative and appropriate drawings, will be provided to the contractor at the time of construction. An erosion control plan has been prepared and is included in Appendix E. BMPs proposed for the site have been selected in accordance with the Stormwater Manual (Ecology 1992). The Stormwater Manual BMPs selected to be used during construction include but are not limited to: BMP E1.10 Temporary Seeding of Stripped Areas, BMP E1.45 Top Soils, BMP E2.20 Dust Control, BMP E3.10 Filter Fence, BMP E2.10 Stabilized Construction Entrance, BMP E2.60 Check Dams, BMP E3.30 Storm Drain Inlet Protection, and the proposed ponds can be used for temporary sediment ponds during construction.

Minimum Requirement #2 – Preservation of Natural Drainage Systems

In existing conditions, most of the project site drains north to south with no onsite stormwater system outside of the storm facilities and conveyance associated with Coyote Ridge Road and Fort Cascades Drive. The proposed stormwater management will follow the existing drainage patterns to the maximum extent feasible and utilize detention and flow control structures to meet flow control requirements for impervious and converted vegetation.

Minimum Requirement #3 – Source Control of Pollution

BMP RD.05 Wet Pond, BMP RB.05 Biofiltration Swale, and Bioretention Facilities are proposed to handle runoff treatment for this site. To ensure ongoing functionality and compliance, BMP S2.00 for the maintenance of stormwater drainage and treatment systems will be implemented to the maximum extent feasible.

Additional post-construction BMPs for this site include the following:

- S1.90 Vegetation Management/Integrated Pest Management
- S2.20 Street Sweeping

Minimum Requirement #4 – Runoff Treatment BMPs

Water quality treatment of the site will be provided by a biofiltration swale, wet ponds, and future bioretention facilities. All treatment types are Department of Ecology approved for general pollutants. Hydrologic analysis for the treatment sizing for the wet ponds and biofiltration swale utilize the 1992 Puget Sound Manual approved single event methodology with HydroCAD. The manual recommends the use of the Santa Barbara Urban Hydrograph Method (SBUH). The water quality event is defined as the 6-month storm event or 64% of the 2-year, 24-hour storm event. Based on the figures in Appendix AIII-1.1 Isopluvial Maps for Design Storms in the Puget Sound Manual, the following precipitation was determined for modelling:

Table 2: Design Storm Values

Rain Event	Precipitation (in.)
WQ (64% 2-year)	2.24
2-year	3.50
10-year	5.00
100-year	6.50

Soils on the majority of the site are classified as Pilchuck and have a Hydrologic soil group of C. Table III-1.3 in the Puget Sound Manual was used to determine the curve numbers (CN) in the HydroCAD model. CN value of 85 is used for the predeveloped conditions, CN value of 98 is used for the impervious surfaces and 80 is used for the pervious surfaces of the developed conditions.

BMP RD.05 (Biofiltration Swale) provides treatment for the majority of the South Drive. The off-line biofiltration swale is sized to treat the 6-month, 24-hour design storm, as required by the manual. The swale is located adjacent to the South Drive, sloped at a 1%, a bottom width of 3.5 ft, and depth of 1.75 ft. Since the swale is less than 2%, and underdrain is proposed. The assumed grass length for the biofiltration swale is 6 inches. A manning's number of 0.03 is used for conveyance calculations (*HydroCAD-3 Swale Conveyance*) and 0.24 for water quality calculations (*HydroCAD-1* and *HydroCAD-2*). To be effective, the depth of stormwater during treatment (WQ Storm Event) must not exceed the grass height (0.5ft). As shown in the *HydroCAD-1* model in Appendix C, the maximum depth is 0.40' during the water quality event. During the water quality event, the average residence time for each section of swale is 9 minutes or more. During the 100-year event, the depth of flow reaches 0.75ft; the swale is sized to accommodate this flow with 1ft of freeboard per manual direction. The biofiltration swale plantings will meet the requirements from Appendix AIII-6.1 Table III-6.1 (Ecology 1992). Table 3 below demonstrates the manual requirements and how the swale meets or exceed these requirements.

Table 3: Biofiltration Swale Compliance Comparison

Stormwater Manual Requirement	Project
WQ Minimum Design Depth Flow = 0.33ft	0.40ft
WQ Maximum Design Depth Flow = 0.50ft	
WQ Maximum Flow Velocity = 1.5 fps	0.15fps
Swale Depth = 100-year Depth + 1ft	1.75ft
Swale Length = 200ft	487ft

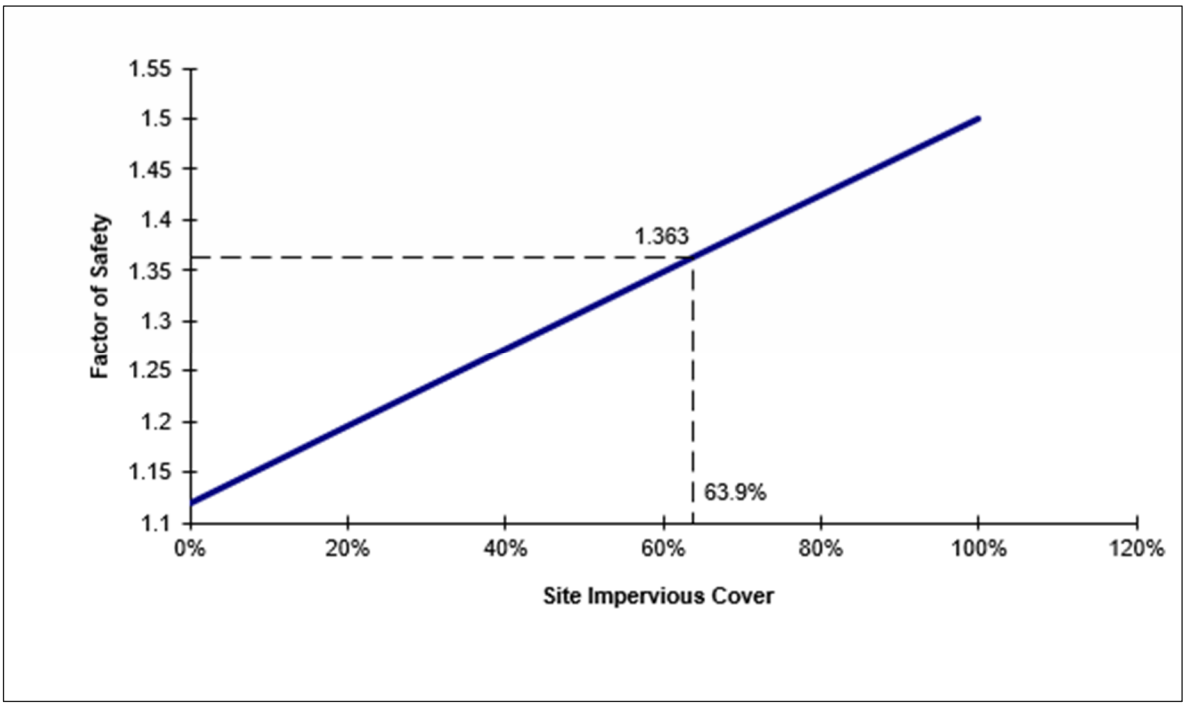
The proposed wet ponds Pond 1, Pond 2, Pond 3, and Pond 6 are sized to provide treatment as well as streambank erosion control. Pond 4 and 5 are designed for streambank erosion control but not treatment; these two ponds will handle the roof runoff from the two future buildings. The wet ponds have detention storage sized to provide a controlled release through a flow control manhole to meet predeveloped flow requirements and to detain the water quality volume, see Minimum Requirement #5. The proposed ponds are sized to meet the standards and specifications for detention ponds (BMP RD.05) in the Stormwater Manual (Ecology 1992). See Appendix C for the HydroCAD models and Minimum Requirement #5 for further sizing description.

Due to site constraints, one method of treatment will meet the current department of ecology stormwater standards. Bioretention isn't included as a method of treatment in the 1992 Stormwater Manual but is a highly effective form of treatment that meets current requirements. A bioretention facility is proposed to treat the west parking lot. This parking lot including surfacing, stormwater facilities, and other utilities will be developed in a future phase. The current Department of Ecology standards require a continuous runoff model to size water quality treatment facilities. Therefore, the bioretention is sized using the Western Washington Hydrology Method (WWHM), see Appendix D. The bioretention is sized to have 1 ft of ponding and 0.5 ft of freeboard with a minimum bottom area of 40 ft by 40 ft. This minimum bottom area fits within the planned center planters for the west parking lot and provides the minimum 91% treatment. The bioretention is included in the HydroCAD models (Appendix C). The model demonstrates the bioretention doesn't exceed the 1ft of ponding during the water quality event.

Minimum Requirement #5 – Streambank Erosion Control

To reduce streambank erosion, the project will utilize detention and flow control structures. The Stormwater Manual (1992) requires the post-developed flow rate meets the predeveloped runoff rates for half of the 2-year 24-hour, 10-year 24-hour, and the 100-year 24-hour storm events. The precipitation data for the HydroCAD models was determined from the isopluvial maps in the manual. Per Figure III-1.1 in the Stormwater Manual (Ecology 1992), a correction factor of 1.36 is determined to apply to the onsite ponds; see Figure 1 below.

Figure 1: Correction Factor



Two models were created to size the proposed ponds. The *HydroCAD-1 Correction Factor Not Applied* model provides the pond flow control orifice sizes and elevations to be constructed. The pond volumes in this model are the design pond volumes and they are smaller than what will be constructed. The *HydroCAD-2 Correction Factor Applied* model provides the actual pond sizes that will be constructed. The pond sizes in this model apply a correction factor of 1.36 to the design pond sizes modelled in *HydroCAD-1*. Per the manual requirements, the orifice sizes and elevations remain the same as the model that uses the smaller pond sizes (*HydroCAD-1*). Table 4 demonstrates the pond sizes before and after the correction factor is applied. Table 5 demonstrates the pre and post-development flows.

Table 4: Pond Size Comparison

	Design Pond	Constructed Pond
	Pond 1	
Bottom Area (SF)	1140	1550
Top Area (SF)	5589	7601
Total Pond Volume (CF)	18733	25477
	Pond 2	
Bottom Area (SF)	900	1224
Top Area (SF)	7777	10576
Total Pond Volume (CF)	21246	28894
	Pond 3	
Bottom Area (SF)	751	1021
Top Area (SF)	3173	4315
Total Pond Volume (CF)	5711	7766
	Pond 4	
Bottom Area (SF)	303	412
Top Area (SF)	1452	1974
Total Pond Volume (CF)	2311	3142
	Pond 5	
Bottom Area (SF)	799	1086
Top Area (SF)	2466	3353
Total Pond Volume (CF)	4833	6572
	Pond 6	
Bottom Area (SF)	903	1228
Top Area (SF)	3555	6574
Total Pond Volume (CF)	10613	14433

Table 5: Pre and Post Development Flow Comparison

	Pre-development (Existing POC)	Post-development (Proposed POC)*	Post-development (Proposed POC)**
Rain Event	(cfs)	(cfs)	(cfs)
WQ (64% 2-year)	1.66	1.05	0.96
2-year	3.80	1.89	1.67
10-year	6.60	3.52	2.72
100-year	9.48	5.63	4.52

***Values don't include pond sizing correction factor**
****Values include pond sizing correction factor**

Minimum Requirement #6 – Wetlands
This project does not propose to discharge runoff directly or indirectly to a wetland or impact existing wetlands; therefore, Minimum Requirement #6 does not apply.

Minimum Requirement #7 – Water Quality Sensitive Areas
The project does not propose to build stormwater BMPs in naturally vegetated buffers; therefore, Minimum Requirement #7 does not apply.

Minimum Requirement #8 – Offsite Analysis and Mitigation
To mitigate off-site impacts from this project, erosion and sediment control BMPs will be implemented during construction. Source control BMPs will be constructed and maintained to the maximum extent feasible, see Minimum Requirement #1 and #3. Minimum Requirement #5 is met, therefore there are no anticipated downstream issues associated with this project.

Minimum Requirement #9 – Basin Planning
Pre and post development basin maps have been prepared to meet this requirement, see Appendix B.

Minimum Requirement #10 – Operation and Maintenance
The owner will operate and maintain the proposed stormwater BMPs per the Stormwater Manual (Ecology 1992) and manufacturer recommendations. See Appendix G for applicable operations and maintenance standards.

Minimum Requirement #11 – Financial Liability
. The Port of Skamania County will ultimately be responsible for the for the maintenance of the site and compliance with the stormwater regulations that this site is design under.

C. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

On-site conveyance collects parking, drive aisles, sidewalk, and roof runoff. The HydroCAD model shows a conservative approach which models the pipes that discharge into the ponds, discharge from the flow control manholes, and discharge to the existing ditch (POC). The proposed system can pass through the 100-year and without foreseen capacity issues. See Appendix C for HydroCAD-3 Conveyance analysis and Appendix C for proposed Stormwater Plans.

At the northern end of the site, an existing ditch facilitates the conveyance of stormwater runoff from SR 14. Along the majority of the northern catchment slope, the bottom width of the existing ditch remains largely unaffected. However, a 40-foot segment located at the northern end of the Private Drive, at the center of the proposed development area, results in a reduction of the ditch's bottom width. The existing ditch is approximately 15 feet in width and 8 feet in depth, with 2:1 side slopes. In contrast, within this 40-foot section, the ditch narrows to 2 feet in width and maintains an 8-foot depth, retaining the 2:1 side slopes. The HydroCAD-4 model evaluates both the existing and proposed conditions over this 40-foot stretch. The proposed modification leads to a minimal increase of 0.3 feet in water surface elevation during the 100-year storm event, which is not expected to cause any downstream impact. The contributing drainage area to the ditch is detailed in the Ditch Sizing Basin Map (Appendix B).

D. SOILS EVALUATION

The USDA SCS Soils Map (Appendix A) identifies the onsite soils as Pilchuck, a very fine sandy loam. A geotechnical report was performed by Hart Crowser dated April 2022, see Appendix F.

E. SPECIAL REPORTS AND STUDIES

No special reports have been completed for this project.

F. MAINTENANCE AND OPERATIONS MANUAL

The Owner will maintain the stormwater facilities. Maintenance of the biofiltration swale and ponds will include the removal of sediment once a year or if sedimentation reached more than 6 inches deep. The swale will require periodical mowing. Maintenance of the outfall structures may be required, including removal of debris that may plug the orifices within the structure. See Appendix G for further information on the maintenance standards for all stormwater facilities onsite, including the Biofiltration Swale, Wet Ponds, and Bioretention Facility.

G. REFERENCES

Washington Department of Ecology. 1992. *Stormwater Management Manual for Puget Sound Basin.*

Washington Department of Ecology. 2024. *Stormwater Management Manual for Western Washington. (SMMWW)*

APPENDICES

Appendix A
USGS Soil Report and Map

United States Department of Agriculture

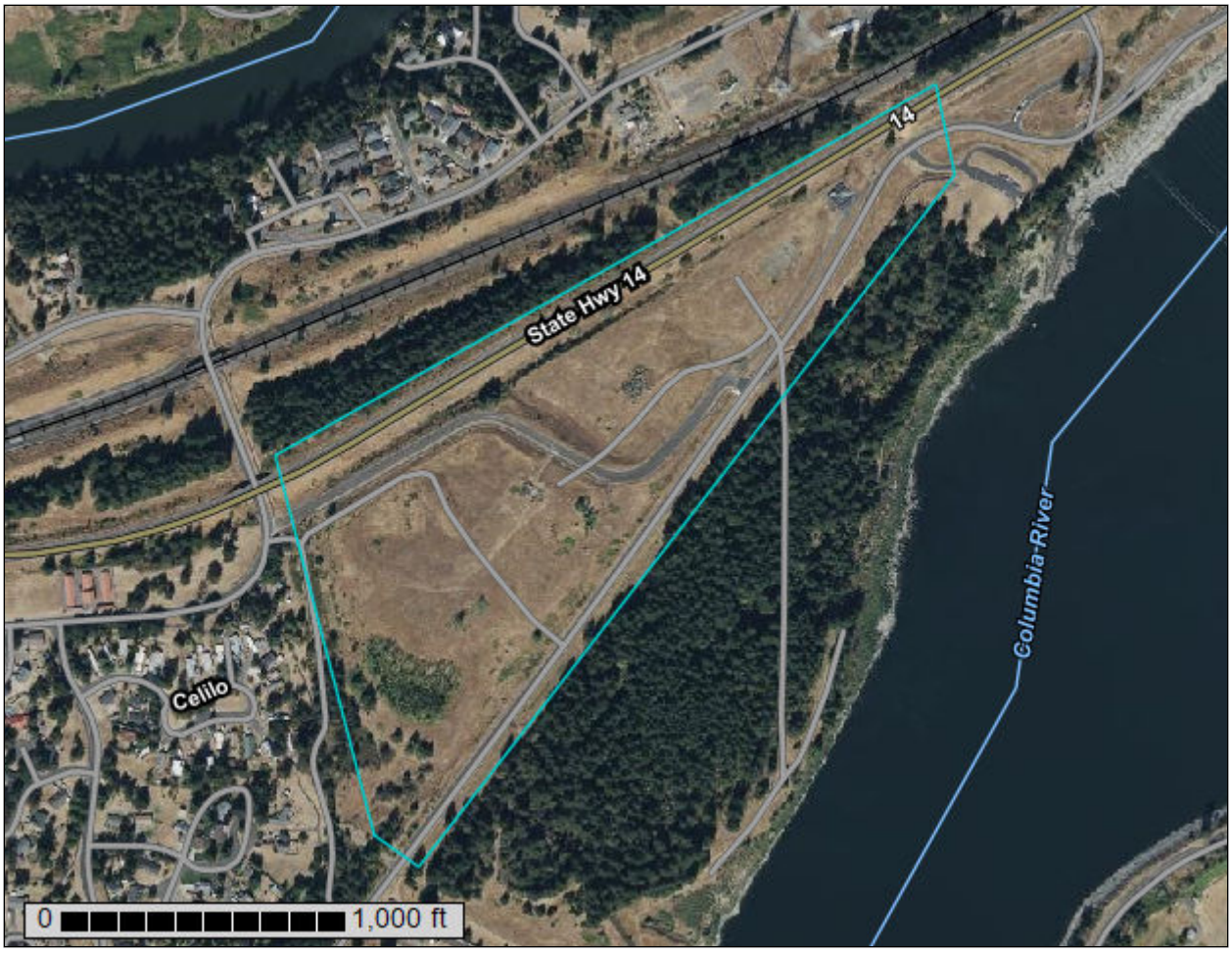
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Skamania County Area, Washington

ASCADE BUISNESS PARK



January 8, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

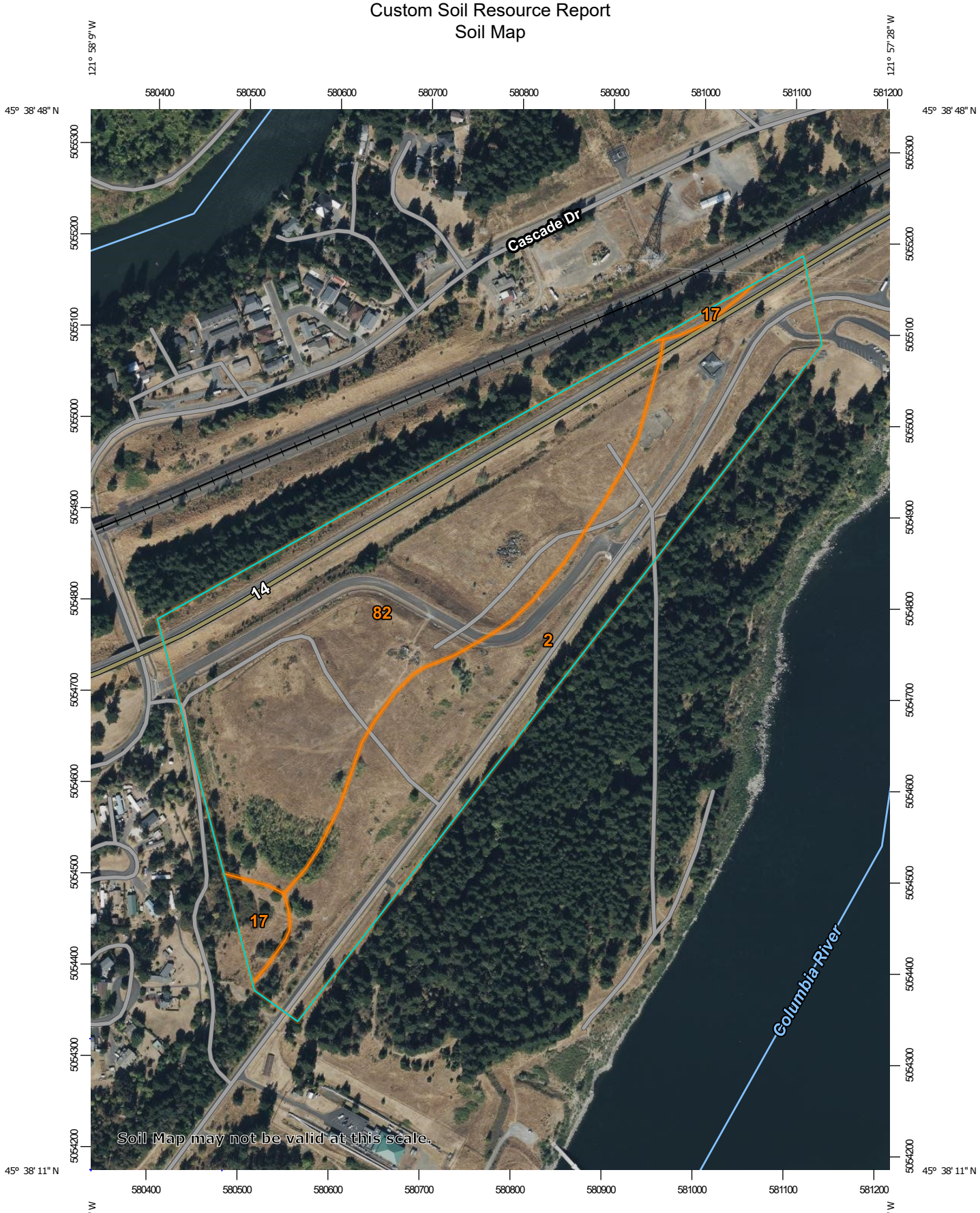
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,660 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Skamania County Area, Washington
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: Sep 16, 2022—Oct 11, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Arents, 0 to 5 percent slopes	24.5	42.8%
17	Bonneville stony sandy loam	1.5	2.5%
82	Pilchuck very fine sandy loam	31.2	54.6%
Totals for Area of Interest		**57.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Skamania County Area, Washington

2—Arents, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1hhrw
Elevation: 0 to 200 feet
Mean annual precipitation: 40 to 80 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Arents and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arents

Setting

Landform: Terraces

Typical profile

H1 - 0 to 24 inches: gravelly sandy loam
H2 - 24 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

17—Bonneville stony sandy loam

Map Unit Setting

National map unit symbol: 1hhrt
Elevation: 50 to 400 feet
Mean annual precipitation: 65 to 75 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bonneville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bonneville

Setting

Landform: Terraces

Typical profile

H1 - 0 to 6 inches: stony sandy loam
H2 - 6 to 12 inches: extremely gravelly coarse sandy loam
H3 - 12 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F002XB004WA - Portland Basin Forest
Forage suitability group: Droughty Soils (G003XF403WA)
Other vegetative classification: Droughty Soils (G003XF403WA)
Hydric soil rating: No

82—Pilchuck very fine sandy loam

Map Unit Setting

National map unit symbol: 1hhv1
Elevation: 0 to 200 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Pilchuck and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pilchuck

Setting

Landform: Flood plains

Typical profile

H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 46 inches: loamy fine sand
H3 - 46 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: F002XA008WA - Puget Lowlands Riparian Forest
Forage suitability group: Droughty Soils (G002XV402WA)
Other vegetative classification: Droughty Soils (G002XV402WA)
Hydric soil rating: No

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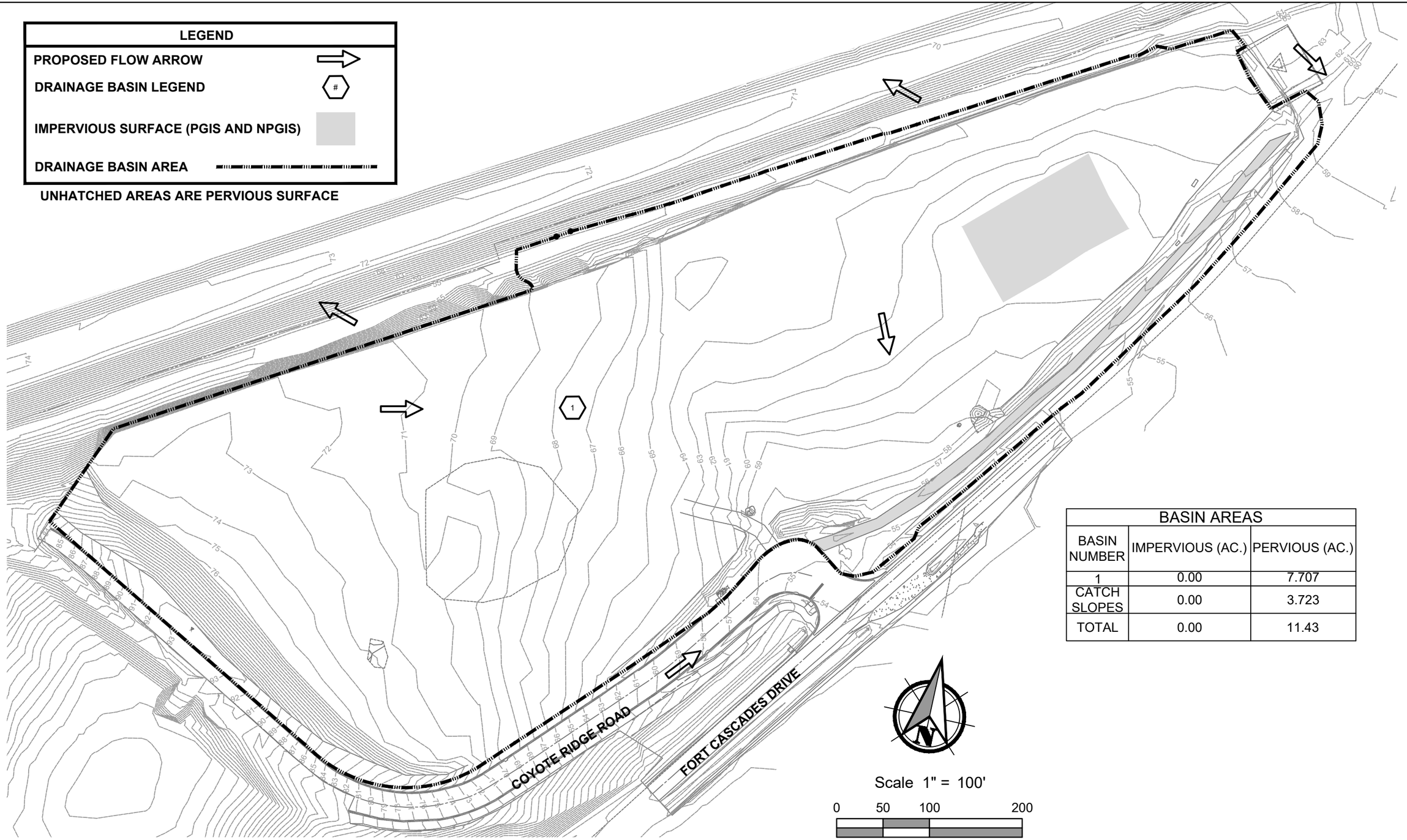
Appendix B
Basin Maps

PRE-DEVELOPMENT BASIN MAP

LEGEND	
PROPOSED FLOW ARROW	
DRAINAGE BASIN LEGEND	#
IMPERVIOUS SURFACE (PGIS AND NPGIS)	
DRAINAGE BASIN AREA	

UNHATCHED AREAS ARE PERVIOUS SURFACE



BASIN AREAS		
BASIN NUMBER	IMPERVIOUS (AC.)	PERVIOUS (AC.)
1	0.00	7.707
CATCH SLOPES	0.00	3.723
TOTAL	0.00	11.43

Scale 1" = 100'

0 50 100 200

POST-DEVELOPMENT BASIN MAP

LEGEND

PROPOSED FLOW ARROW

DRAINAGE BASIN LEGEND (#)

IMPERVIOUS SURFACE (PGIS AND NPGIS)

DRAINAGE BASIN AREA

UNHATCHED AREAS ARE PERVIOUS SURFACE

POND 1
(ADD ALT)

POND 2

POND 3

POND 4

POND 5

POND 6

BIOFILTRATION
SWALE

COYOTE RIDGE ROAD

FORT CASCADES DRIVE

Scale 1" = 100'

0 50 100 200

BASIN AREAS				
	IMPERVIOUS (AC.)			PERVIOUS (AC.)
BASIN NUMBER	RD (PGIS)	SW (NPGIS)	BLDG (NPGIS)	PERV
1	0.67	0.00	0.58	0.00
2	1.17	0.10	0.00	0.04
3	0.16	0.08	0.00	0.09
4	0.25	0.00	0.00	0.09
5	0.19	0.05	0.00	0.00
6	0.19	0.03	0.00	0.01
7	0.32	0.00	0.00	0.00
8	0.42	0.04	0.00	0.00
9A	0.06	0.02	0.00	0.01
9B	0.17	0.03	0.00	0.03
9C	0.16	0.02	0.00	0.00
9D	0.11	0.02	0.00	0.02
9E	0.06	0.00	0.00	0.04
10	0.27	0.00	0.00	0.08
11	0.06	0.00	0.00	0.00
12	0.00	0.00	0.55	0.00
13	0.00	0.00	0.64	0.00
14	0.00	0.00	0.58	0.00
15	0.15	0.00	0.00	0.13
16	0.02	0.00	0.00	0.00
CATCH SLOPES	0.00	0.00	0.00	3.773
TOTAL	4.43	0.39	2.35	4.313

DITCH SIZING BASIN MAP

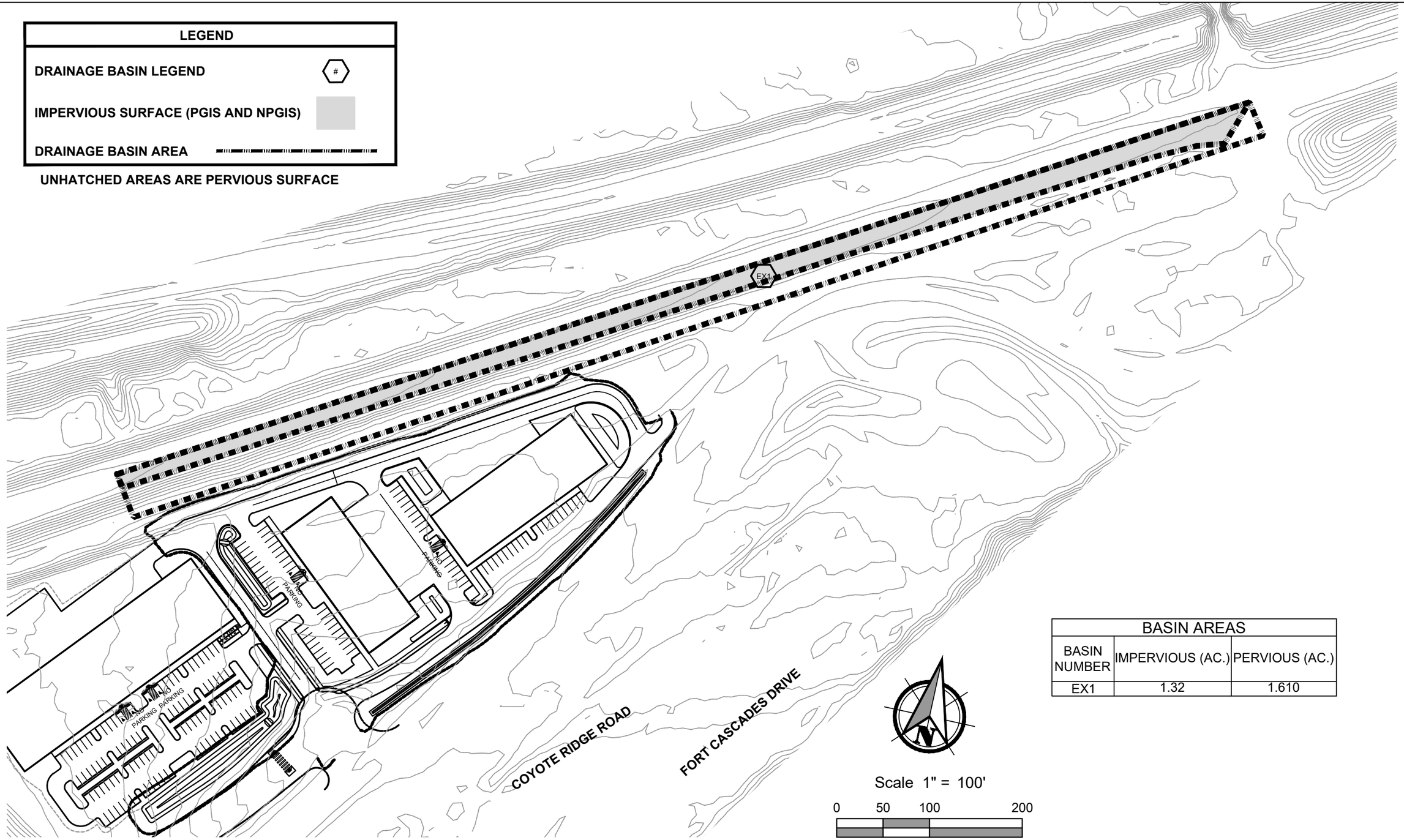
LEGEND

DRAINAGE BASIN LEGEND #

IMPERVIOUS SURFACE (PGIS AND NPGIS)

DRAINAGE BASIN AREA

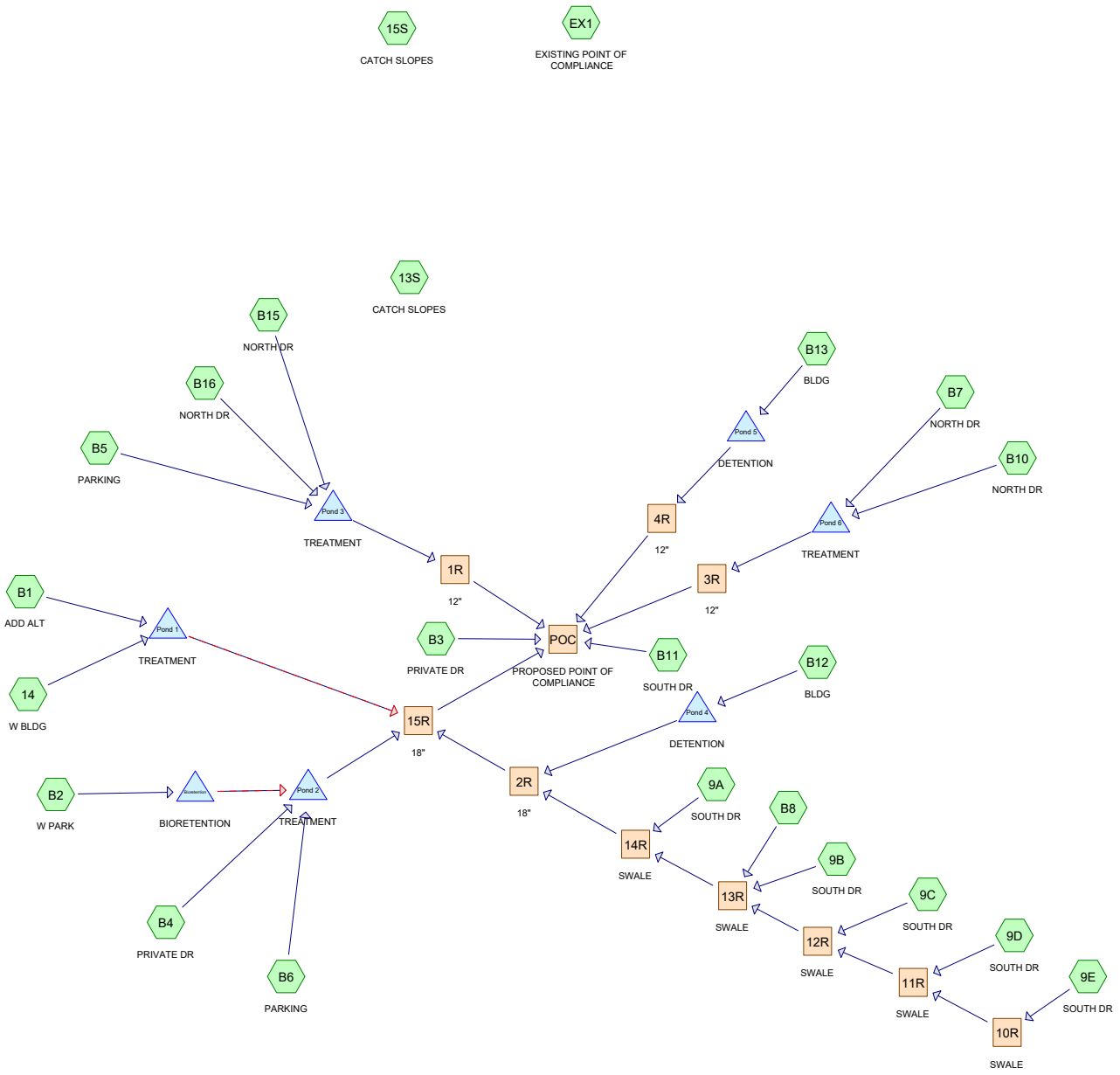
UNHATCHED AREAS ARE PERVIOUS SURFACE



BASIN AREAS		
BASIN NUMBER	IMPERVIOUS (AC.)	PERVIOUS (AC.)
EX1	1.32	1.610

Appendix C
HydroCAD Modeling

HydroCAD-1 Correction Factor Not Applied
For Wet Pond Treatment Sizing, Swale
Treatment Sizing and Pipe Conveyance



Subcat Reach Pond Link

Routing Diagram for 90Percent-Reduced-WQ
Prepared by Apex Companies LLC, Printed 4/8/2025
HydroCAD® 10.20-6a s/n 00668 © 2024 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YEAR	Type IA 24-hr		Default	24.00	1	3.50	2
2	10-YEAR	Type IA 24-hr		Default	24.00	1	5.00	2
3	100-YEAR	Type IA 24-hr		Default	24.00	1	6.50	2
4	WQ-YEAR	Type IA 24-hr		Default	24.00	1	2.24	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.640	98	(B13)
1.710	98	BLDG (14, B1, B12)
3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW (13S)
3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW (15S)
1.170	98	PARKING (B2)
0.407	80	PERV (9A, 9B, 9D, 9E, B10, B2, B3, B4, B6)
0.130	85	PERV (B15)
7.707	85	PERVIOUS (EX1)
3.260	98	RD (9A, 9B, 9C, 9D, 9E, B1, B10, B11, B15, B16, B3, B4, B5, B6, B7, B8)
0.390	98	SW (9A, 9B, 9C, 9D, B2, B3, B5, B6, B8)
22.860	**88**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>3.08"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>3.05"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.058 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 0.049 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>3.04"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.038 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>2.64"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 0.021 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>1.63"
Tc=5.0 min CN=80/0 Runoff=1.39 cfs 0.506 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.48 cfs 0.158 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=85/0 Runoff=1.84 cfs 0.624 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=1.02 cfs 0.340 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=80/98 Runoff=0.25 cfs 0.084 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 0.016 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.45 cfs 0.149 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.52 cfs 0.174 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>2.69"
Tc=0.0 min CN=85/98 Runoff=0.19 cfs 0.063 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>3.27"
Tc=0.0 min CN=0/98 Runoff=0.02 cfs 0.005 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=80/98 Runoff=1.06 cfs 0.351 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>2.82"
Tc=5.0 min CN=80/98 Runoff=0.23 cfs 0.077 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>2.83"
Tc=5.0 min CN=80/98 Runoff=0.24 cfs 0.080 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.20 cfs 0.065 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>3.19"
Tc=5.0 min CN=80/98 Runoff=0.18 cfs 0.061 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.26 cfs 0.087 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.125 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=85/0 Runoff=3.80 cfs 1.292 af

Reach 1R: 12" Avg. Flow Depth=0.16' Max Vel=1.87 fps Inflow=0.15 cfs 0.128 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.15 cfs 0.128 af

Reach 2R: 18" Avg. Flow Depth=0.48' Max Vel=2.33 fps Inflow=1.12 cfs 0.450 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=1.12 cfs 0.450 af

Reach 3R: 12" Avg. Flow Depth=0.10' Max Vel=1.11 fps Inflow=0.05 cfs 0.027 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.05 cfs 0.027 af

Reach 4R: 12" Avg. Flow Depth=0.12' Max Vel=3.96 fps Inflow=0.21 cfs 0.146 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.21 cfs 0.146 af

Reach 10R: SWALE Avg. Flow Depth=0.11' Max Vel=0.14 fps Inflow=0.06 cfs 0.021 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.06 cfs 0.021 af

Reach 11R: SWALE Avg. Flow Depth=0.21' Max Vel=0.19 fps Inflow=0.17 cfs 0.059 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.17 cfs 0.059 af

Reach 12R: SWALE Avg. Flow Depth=0.29' Max Vel=0.24 fps Inflow=0.31 cfs 0.108 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.30 cfs 0.107 af

Reach 13R: SWALE Avg. Flow Depth=0.51' Max Vel=0.32 fps Inflow=0.84 cfs 0.290 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.83 cfs 0.289 af

Reach 14R: SWALE Avg. Flow Depth=0.53' Max Vel=0.33 fps Inflow=0.89 cfs 0.312 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.88 cfs 0.311 af

Reach 15R: 18" Avg. Flow Depth=0.51' Max Vel=2.48 fps Inflow=1.30 cfs 1.054 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=1.30 cfs 1.054 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=1.89 cfs 1.450 af
Outflow=1.89 cfs 1.450 af

Pond Bioretention: BIORETENTION Peak Elev=66.53' Storage=1,434 cf Inflow=1.06 cfs 0.351 af
Outflow=0.82 cfs 0.343 af

Pond Pond 1: TREATMENT Peak Elev=65.00' Storage=9,429 cf Inflow=1.50 cfs 0.497 af
Outflow=0.27 cfs 0.331 af

Pond Pond 2: TREATMENT Peak Elev=58.17' Storage=9,581 cf Inflow=1.21 cfs 0.484 af
Outflow=0.39 cfs 0.274 af

Pond Pond 3: TREATMENT Peak Elev=60.02' Storage=1,135 cf Inflow=0.40 cfs 0.133 af
Outflow=0.15 cfs 0.128 af

Pond Pond 4: DETENTION Peak Elev=60.90' Storage=1,051 cf Inflow=0.45 cfs 0.149 af
Outflow=0.24 cfs 0.139 af

Pond Pond 5: DETENTION Peak Elev=61.70' Storage=2,124 cf Inflow=0.52 cfs 0.174 af
Outflow=0.21 cfs 0.146 af

Pond Pond 6: TREATMENT Peak Elev=60.61' Storage=6,271 cf Inflow=0.51 cfs 0.171 af
Outflow=0.05 cfs 0.027 af

Total Runoff Area = 22.860 ac Runoff Volume = 4.448 af Average Runoff Depth = 2.33"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.023 af, Depth> 3.08"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.058 af, Depth> 3.05"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.15 cfs @ 7.88 hrs, Volume= 0.049 af, Depth> 3.26"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.038 af, Depth> 3.04"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af, Depth> 2.64"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 1.39 cfs @ 7.98 hrs, Volume= 0.506 af, Depth> 1.63"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.48 cfs @ 7.88 hrs, Volume= 0.158 af, Depth> 3.26"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 1.84 cfs @ 7.95 hrs, Volume= 0.624 af, Depth> 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.02 cfs @ 7.88 hrs, Volume= 0.340 af, Depth> 3.26"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.25 cfs @ 7.89 hrs, Volume= 0.084 af, Depth> 2.89"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.05 cfs @ 7.88 hrs, Volume= 0.016 af, Depth> 3.26"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.45 cfs @ 7.88 hrs, Volume= 0.149 af, Depth> 3.26"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.52 cfs @ 7.88 hrs, Volume= 0.174 af, Depth> 3.26"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.19 cfs @ 7.82 hrs, Volume= 0.063 af, Depth> 2.69"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.02 cfs @ 7.78 hrs, Volume= 0.005 af, Depth> 3.27"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 1.06 cfs @ 7.88 hrs, Volume= 0.351 af, Depth> 3.21"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.23 cfs @ 7.89 hrs, Volume= 0.077 af, Depth> 2.82"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.24 cfs @ 7.89 hrs, Volume= 0.080 af, Depth> 2.83"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.20 cfs @ 7.88 hrs, Volume= 0.065 af, Depth> 3.26"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.18 cfs @ 7.88 hrs, Volume= 0.061 af, Depth> 3.19"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.26 cfs @ 7.88 hrs, Volume= 0.087 af, Depth> 3.26"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.38 cfs @ 7.88 hrs, Volume= 0.125 af, Depth> 3.26"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 3.80 cfs @ 7.95 hrs, Volume= 1.292 af, Depth> 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

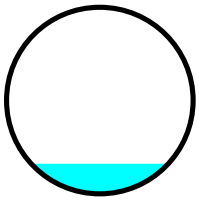
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 2.86" for 2-YEAR event
Inflow = 0.15 cfs @ 8.62 hrs, Volume= 0.128 af
Outflow = 0.15 cfs @ 8.63 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.3 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.87 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 0.5 min

Peak Storage= 3 cf @ 8.63 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



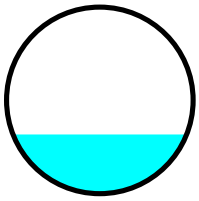
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 3.07" for 2-YEAR event
Inflow = 1.12 cfs @ 8.03 hrs, Volume= 0.450 af
Outflow = 1.12 cfs @ 8.04 hrs, Volume= 0.450 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.33 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 1.3 min

Peak Storage= 52 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.40'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



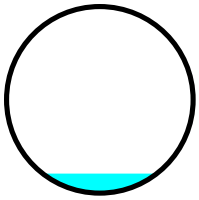
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 0.49" for 2-YEAR event
Inflow = 0.05 cfs @ 22.52 hrs, Volume= 0.027 af
Outflow = 0.05 cfs @ 22.53 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.6 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.11 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 1.1 min

Peak Storage= 3 cf @ 22.53 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 0.61'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



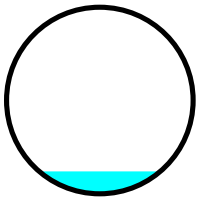
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 2.75" for 2-YEAR event
Inflow = 0.21 cfs @ 8.43 hrs, Volume= 0.146 af
Outflow = 0.21 cfs @ 8.43 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.96 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.73 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 8.43 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.65'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



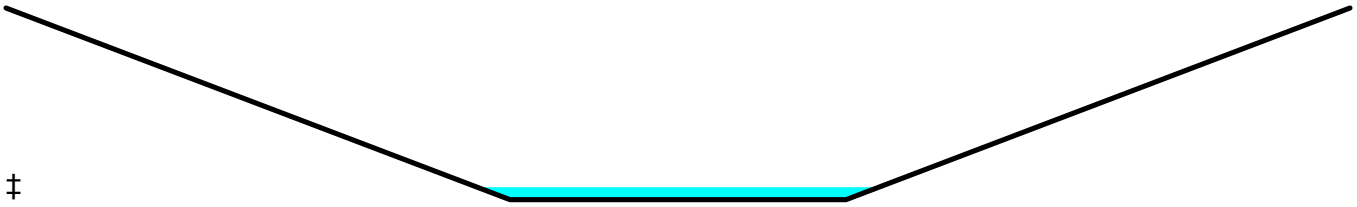
Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 2.64" for 2-YEAR event
Inflow = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af
Outflow = 0.06 cfs @ 8.01 hrs, Volume= 0.021 af, Atten= 5%, Lag= 6.6 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.14 fps, Min. Travel Time= 12.2 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 23.7 min

Peak Storage= 43 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 4.18'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'



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Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 2.87" for 2-YEAR event
Inflow = 0.17 cfs @ 7.95 hrs, Volume= 0.059 af
Outflow = 0.17 cfs @ 8.01 hrs, Volume= 0.059 af, Atten= 3%, Lag= 4.0 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.19 fps, Min. Travel Time= 8.5 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 16.4 min

Peak Storage= 85 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 4.74'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 3.02" for 2-YEAR event
Inflow = 0.31 cfs @ 7.97 hrs, Volume= 0.108 af
Outflow = 0.30 cfs @ 8.02 hrs, Volume= 0.107 af, Atten= 2%, Lag= 2.7 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.24 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 13.2 min

Peak Storage= 126 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 5.24'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 3.12" for 2-YEAR event
Inflow = 0.84 cfs @ 7.95 hrs, Volume= 0.290 af
Outflow = 0.83 cfs @ 8.00 hrs, Volume= 0.289 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.32 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 9.3 min

Peak Storage= 255 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 6.55'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 3.11" for 2-YEAR event
Inflow = 0.89 cfs @ 8.00 hrs, Volume= 0.312 af
Outflow = 0.88 cfs @ 8.03 hrs, Volume= 0.311 af, Atten= 1%, Lag= 1.8 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.33 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 7.9 min

Peak Storage= 232 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 6.66'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

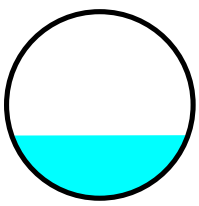
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 2.31" for 2-YEAR event
Inflow = 1.30 cfs @ 8.06 hrs, Volume= 1.054 af
Outflow = 1.30 cfs @ 8.06 hrs, Volume= 1.054 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.48 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.85 fps, Avg. Travel Time= 0.2 min

Peak Storage= 12 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 1.42'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 2.26" for 2-YEAR event
Inflow = 1.89 cfs @ 8.01 hrs, Volume= 1.450 af
Outflow = 1.89 cfs @ 8.01 hrs, Volume= 1.450 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 3.21" for 2-YEAR event
Inflow = 1.06 cfs @ 7.88 hrs, Volume= 0.351 af
Outflow = 0.82 cfs @ 8.07 hrs, Volume= 0.343 af, Atten= 23%, Lag= 11.6 min
Primary = 0.82 cfs @ 8.07 hrs, Volume= 0.343 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.53' @ 8.07 hrs Surf.Area= 3,591 sf Storage= 1,434 cf

Plug-Flow detention time= 45.6 min calculated for 0.343 af (98% of inflow)
Center-of-Mass det. time= 28.3 min (692.1 - 663.8)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.82 cfs @ 8.07 hrs HW=66.53' TW=57.52' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.82 cfs @ 1.95 fps)
└─**2=Orifice/Grate** (Passes < 0.04 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.00 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 1.50 cfs @ 7.88 hrs, Volume= 0.497 af
Outflow = 0.27 cfs @ 11.24 hrs, Volume= 0.331 af, Atten= 82%, Lag= 201.9 min
Primary = 0.27 cfs @ 11.24 hrs, Volume= 0.331 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 65.00' @ 11.24 hrs Surf.Area= 3,777 sf Storage= 9,429 cf

Plug-Flow detention time= 441.2 min calculated for 0.330 af (66% of inflow)
Center-of-Mass det. time= 238.6 min (900.1 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	18,733 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,140	0	0
62.00	1,674	1,407	1,407
63.00	2,290	1,982	3,389
64.00	2,991	2,641	6,030
65.00	3,773	3,382	9,412
66.00	4,640	4,207	13,618
67.00	5,589	5,115	18,733

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.27 cfs @ 11.24 hrs HW=65.00' TW=52.49' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.27 cfs of 7.08 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.64 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.22 cfs @ 4.52 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 3.09" for 2-YEAR event
Inflow = 1.21 cfs @ 8.00 hrs, Volume= 0.484 af
Outflow = 0.39 cfs @ 9.79 hrs, Volume= 0.274 af, Atten= 68%, Lag= 107.6 min
Primary = 0.39 cfs @ 9.79 hrs, Volume= 0.274 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.17' @ 9.79 hrs Surf.Area= 5,013 sf Storage= 9,581 cf

Plug-Flow detention time= 467.4 min calculated for 0.274 af (57% of inflow)
Center-of-Mass det. time= 228.4 min (915.7 - 687.3)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	21,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	900	0	0
56.00	2,252	1,576	1,576
57.00	3,655	2,954	4,530
58.00	4,755	4,205	8,735
59.00	6,245	5,500	14,235
60.00	7,777	7,011	21,246

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.39 cfs @ 9.79 hrs HW=58.17' TW=52.53' (Dynamic Tailwater)
- **1=Orifice/Grate** (Weir Controls 0.37 cfs @ 1.36 fps)
- **2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 1.04 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 2.96" for 2-YEAR event
Inflow = 0.40 cfs @ 7.85 hrs, Volume= 0.133 af
Outflow = 0.15 cfs @ 8.62 hrs, Volume= 0.128 af, Atten= 62%, Lag= 46.5 min
Primary = 0.15 cfs @ 8.62 hrs, Volume= 0.128 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.02' @ 8.62 hrs Surf.Area= 1,475 sf Storage= 1,135 cf

Plug-Flow detention time= 113.9 min calculated for 0.128 af (96% of inflow)
Center-of-Mass det. time= 86.9 min (765.3 - 678.4)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,711 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	751	0	0
60.00	1,458	1,105	1,105
61.00	2,291	1,875	2,979
62.00	3,173	2,732	5,711

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.15 cfs @ 8.62 hrs HW=60.02' TW=59.16' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.10 cfs of 2.73 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.10 cfs @ 4.47 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 2.54 fps)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 0.45 cfs @ 7.88 hrs, Volume= 0.149 af
Outflow = 0.24 cfs @ 8.24 hrs, Volume= 0.139 af, Atten= 46%, Lag= 21.5 min
Primary = 0.24 cfs @ 8.24 hrs, Volume= 0.139 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.90' @ 8.24 hrs Surf.Area= 860 sf Storage= 1,051 cf

Plug-Flow detention time= 103.5 min calculated for 0.139 af (93% of inflow)
Center-of-Mass det. time= 51.6 min (713.1 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	2,311 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	303	0	0
60.00	538	421	421
61.00	895	717	1,137
62.00	1,452	1,174	2,311

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 8.24 hrs HW=60.90' TW=53.04' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.64 fps)
- **2=Orifice/Grate** (Orifice Controls 0.21 cfs @ 4.25 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 0.52 cfs @ 7.88 hrs, Volume= 0.174 af
Outflow = 0.21 cfs @ 8.43 hrs, Volume= 0.146 af, Atten= 60%, Lag= 33.4 min
Primary = 0.21 cfs @ 8.43 hrs, Volume= 0.146 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 61.70' @ 8.43 hrs Surf.Area= 1,710 sf Storage= 2,124 cf

Plug-Flow detention time= 216.6 min calculated for 0.146 af (84% of inflow)
Center-of-Mass det. time= 108.2 min (769.7 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,833 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	799	0	0
61.00	1,325	1,062	1,062
62.00	1,875	1,600	2,662
63.00	2,466	2,171	4,833

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.21 cfs @ 8.43 hrs HW=61.70' TW=60.12' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.21 cfs of 4.14 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 6.05 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.18 cfs @ 3.65 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 3.07" for 2-YEAR event
Inflow = 0.51 cfs @ 7.88 hrs, Volume= 0.171 af
Outflow = 0.05 cfs @ 22.52 hrs, Volume= 0.027 af, Atten= 91%, Lag= 878.1 min
Primary = 0.05 cfs @ 22.52 hrs, Volume= 0.027 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.61' @ 22.52 hrs Surf.Area= 2,690 sf Storage= 6,271 cf

Plug-Flow detention time= 925.9 min calculated for 0.027 af (16% of inflow)
Center-of-Mass det. time= 509.7 min (1,180.6 - 670.9)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	10,613 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	903	0	0
58.00	1,325	1,114	1,114
59.00	1,803	1,564	2,678
60.00	2,336	2,070	4,748
61.00	2,920	2,628	7,376
62.00	3,555	3,238	10,613

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 22.52 hrs HW=60.61' TW=59.28' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.05 cfs of 3.64 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.05 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.11 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>4.55"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.034 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.26 cfs 0.086 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 0.071 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.056 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>4.04"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.033 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=80/0 Runoff=2.64 cfs 0.895 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.69 cfs 0.230 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=85/0 Runoff=3.19 cfs 1.043 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=1.48 cfs 0.495 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>4.33"
Tc=5.0 min CN=80/98 Runoff=0.38 cfs 0.126 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.024 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.65 cfs 0.218 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.76 cfs 0.254 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>4.12"
Tc=0.0 min CN=85/98 Runoff=0.29 cfs 0.096 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>4.76"
Tc=0.0 min CN=0/98 Runoff=0.02 cfs 0.008 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>4.70"
Tc=5.0 min CN=80/98 Runoff=1.53 cfs 0.513 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>4.25"
Tc=5.0 min CN=80/98 Runoff=0.35 cfs 0.117 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>4.26"
Tc=5.0 min CN=80/98 Runoff=0.36 cfs 0.121 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.095 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>4.67"
Tc=5.0 min CN=80/98 Runoff=0.27 cfs 0.090 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.127 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.54 cfs 0.182 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=85/0 Runoff=6.60 cfs 2.158 af

Reach 1R: 12" Avg. Flow Depth=0.19' Max Vel=2.05 fps Inflow=0.21 cfs 0.189 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.21 cfs 0.189 af

Reach 2R: 18" Avg. Flow Depth=0.63' Max Vel=2.69 fps Inflow=1.92 cfs 0.666 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=1.92 cfs 0.665 af

Reach 3R: 12" Avg. Flow Depth=0.16' Max Vel=1.44 fps Inflow=0.12 cfs 0.107 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.12 cfs 0.107 af

Reach 4R: 12" Avg. Flow Depth=0.16' Max Vel=4.76 fps Inflow=0.39 cfs 0.225 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.39 cfs 0.225 af

Reach 10R: SWALE Avg. Flow Depth=0.15' Max Vel=0.16 fps Inflow=0.10 cfs 0.033 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.09 cfs 0.032 af

Reach 11R: SWALE Avg. Flow Depth=0.26' Max Vel=0.22 fps Inflow=0.26 cfs 0.089 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.25 cfs 0.088 af

Reach 12R: SWALE Avg. Flow Depth=0.36' Max Vel=0.27 fps Inflow=0.46 cfs 0.159 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.45 cfs 0.159 af

Reach 13R: SWALE Avg. Flow Depth=0.62' Max Vel=0.36 fps Inflow=1.23 cfs 0.427 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.22 cfs 0.426 af

Reach 14R: SWALE Avg. Flow Depth=0.65' Max Vel=0.37 fps Inflow=1.32 cfs 0.460 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.31 cfs 0.459 af

Reach 15R: 18" Avg. Flow Depth=0.76' Max Vel=3.02 fps Inflow=2.71 cfs 1.665 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=2.71 cfs 1.665 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=3.52 cfs 2.325 af
Outflow=3.52 cfs 2.325 af

Pond Bioretention: BIORETENTION Peak Elev=66.66' Storage=1,933 cf Inflow=1.53 cfs 0.513 af
Outflow=1.19 cfs 0.503 af

Pond Pond 1: TREATMENT Peak Elev=66.01' Storage=13,669 cf Inflow=2.16 cfs 0.725 af
Outflow=0.40 cfs 0.499 af

Pond Pond 2: TREATMENT Peak Elev=58.51' Storage=11,378 cf Inflow=1.77 cfs 0.713 af
Outflow=0.81 cfs 0.501 af

Pond Pond 3: TREATMENT Peak Elev=60.45' Storage=1,836 cf Inflow=0.60 cfs 0.199 af
Outflow=0.21 cfs 0.189 af

Pond Pond 4: DETENTION Peak Elev=61.10' Storage=1,232 cf Inflow=0.65 cfs 0.218 af
Outflow=0.61 cfs 0.207 af

Pond Pond 5: DETENTION Peak Elev=62.05' Storage=2,763 cf Inflow=0.76 cfs 0.254 af
Outflow=0.39 cfs 0.225 af

Pond Pond 6: TREATMENT Peak Elev=60.71' Storage=6,558 cf Inflow=0.75 cfs 0.253 af
Outflow=0.12 cfs 0.107 af

Total Runoff Area = 22.860 ac Runoff Volume = 7.072 af Average Runoff Depth = 3.71"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.10 cfs @ 7.88 hrs, Volume= 0.034 af, Depth> 4.55"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.26 cfs @ 7.88 hrs, Volume= 0.086 af, Depth> 4.51"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.21 cfs @ 7.88 hrs, Volume= 0.071 af, Depth> 4.76"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.056 af, Depth> 4.51"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af, Depth> 4.04"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 2.64 cfs @ 7.95 hrs, Volume= 0.895 af, Depth> 2.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.69 cfs @ 7.88 hrs, Volume= 0.230 af, Depth> 4.76"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 3.19 cfs @ 7.93 hrs, Volume= 1.043 af, Depth> 3.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.48 cfs @ 7.88 hrs, Volume= 0.495 af, Depth> 4.76"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.38 cfs @ 7.89 hrs, Volume= 0.126 af, Depth> 4.33"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.024 af, Depth> 4.76"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.65 cfs @ 7.88 hrs, Volume= 0.218 af, Depth> 4.76"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.76 cfs @ 7.88 hrs, Volume= 0.254 af, Depth> 4.76"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.29 cfs @ 7.81 hrs, Volume= 0.096 af, Depth> 4.12"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.02 cfs @ 7.78 hrs, Volume= 0.008 af, Depth> 4.76"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 1.53 cfs @ 7.88 hrs, Volume= 0.513 af, Depth> 4.70"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.35 cfs @ 7.89 hrs, Volume= 0.117 af, Depth> 4.25"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.36 cfs @ 7.89 hrs, Volume= 0.121 af, Depth> 4.26"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.28 cfs @ 7.88 hrs, Volume= 0.095 af, Depth> 4.76"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.27 cfs @ 7.88 hrs, Volume= 0.090 af, Depth> 4.67"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.38 cfs @ 7.88 hrs, Volume= 0.127 af, Depth> 4.76"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.54 cfs @ 7.88 hrs, Volume= 0.182 af, Depth> 4.76"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 6.60 cfs @ 7.93 hrs, Volume= 2.158 af, Depth> 3.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

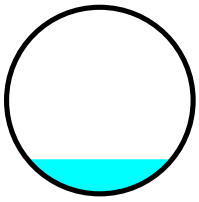
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 4.20" for 10-YEAR event
Inflow = 0.21 cfs @ 8.79 hrs, Volume= 0.189 af
Outflow = 0.21 cfs @ 8.79 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.2 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.05 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 8.79 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.78'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



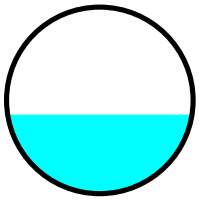
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 4.55" for 10-YEAR event
Inflow = 1.92 cfs @ 8.01 hrs, Volume= 0.666 af
Outflow = 1.92 cfs @ 8.02 hrs, Volume= 0.665 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.69 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 1.1 min

Peak Storage= 77 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.63' , Surface Width= 1.48'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



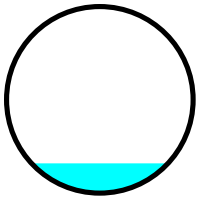
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 1.91" for 10-YEAR event
Inflow = 0.12 cfs @ 13.51 hrs, Volume= 0.107 af
Outflow = 0.12 cfs @ 13.52 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.5 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.44 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 0.8 min

Peak Storage= 5 cf @ 13.52 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



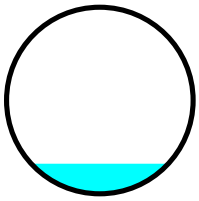
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 4.21" for 10-YEAR event
Inflow = 0.39 cfs @ 8.26 hrs, Volume= 0.225 af
Outflow = 0.39 cfs @ 8.26 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 4.76 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.10 fps, Avg. Travel Time= 0.2 min

Peak Storage= 3 cf @ 8.26 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.74'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 4.04" for 10-YEAR event
Inflow = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af
Outflow = 0.09 cfs @ 8.01 hrs, Volume= 0.032 af, Atten= 4%, Lag= 6.6 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.16 fps, Min. Travel Time= 10.4 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 20.4 min

Peak Storage= 58 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 4.38'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 4.31" for 10-YEAR event
Inflow = 0.26 cfs @ 7.94 hrs, Volume= 0.089 af
Outflow = 0.25 cfs @ 8.01 hrs, Volume= 0.088 af, Atten= 2%, Lag= 4.2 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.22 fps, Min. Travel Time= 7.4 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 14.2 min

Peak Storage= 112 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 5.07'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 4.48" for 10-YEAR event
Inflow = 0.46 cfs @ 7.96 hrs, Volume= 0.159 af
Outflow = 0.45 cfs @ 8.01 hrs, Volume= 0.159 af, Atten= 2%, Lag= 2.9 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.27 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 11.5 min

Peak Storage= 167 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 5.68'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 4.59" for 10-YEAR event
Inflow = 1.23 cfs @ 7.94 hrs, Volume= 0.427 af
Outflow = 1.22 cfs @ 8.00 hrs, Volume= 0.426 af, Atten= 1%, Lag= 3.2 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.36 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.20 fps, Avg. Travel Time= 8.2 min

Peak Storage= 336 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.62' , Surface Width= 7.25'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 4.57" for 10-YEAR event
Inflow = 1.32 cfs @ 7.99 hrs, Volume= 0.460 af
Outflow = 1.31 cfs @ 8.02 hrs, Volume= 0.459 af, Atten= 1%, Lag= 1.7 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.37 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 7.0 min

Peak Storage= 307 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.65' , Surface Width= 7.39'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

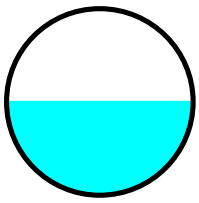
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 3.65" for 10-YEAR event
Inflow = 2.71 cfs @ 8.05 hrs, Volume= 1.665 af
Outflow = 2.71 cfs @ 8.05 hrs, Volume= 1.665 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.02 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.09 fps, Avg. Travel Time= 0.2 min

Peak Storage= 21 cf @ 8.05 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 3.62" for 10-YEAR event
Inflow = 3.52 cfs @ 8.03 hrs, Volume= 2.325 af
Outflow = 3.52 cfs @ 8.03 hrs, Volume= 2.325 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 4.70" for 10-YEAR event
Inflow = 1.53 cfs @ 7.88 hrs, Volume= 0.513 af
Outflow = 1.19 cfs @ 8.07 hrs, Volume= 0.503 af, Atten= 22%, Lag= 11.5 min
Primary = 1.19 cfs @ 8.07 hrs, Volume= 0.503 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.66' @ 8.07 hrs Surf.Area= 4,023 sf Storage= 1,933 cf

Plug-Flow detention time= 40.0 min calculated for 0.503 af (98% of inflow)
Center-of-Mass det. time= 25.2 min (680.9 - 655.7)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.19 cfs @ 8.07 hrs HW=66.66' TW=58.25' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.19 cfs @ 2.18 fps)
└─**2=Orifice/Grate** (Passes < 0.64 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.12 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 2.16 cfs @ 7.88 hrs, Volume= 0.725 af
Outflow = 0.40 cfs @ 11.21 hrs, Volume= 0.499 af, Atten= 82%, Lag= 200.1 min
Primary = 0.40 cfs @ 11.21 hrs, Volume= 0.499 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.01' @ 11.21 hrs Surf.Area= 4,651 sf Storage= 13,669 cf

Plug-Flow detention time= 444.5 min calculated for 0.499 af (69% of inflow)
Center-of-Mass det. time= 251.3 min (904.8 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	18,733 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,140	0	0
62.00	1,674	1,407	1,407
63.00	2,290	1,982	3,389
64.00	2,991	2,641	6,030
65.00	3,773	3,382	9,412
66.00	4,640	4,207	13,618
67.00	5,589	5,115	18,733

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.40 cfs @ 11.21 hrs HW=66.01' TW=52.60' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.40 cfs of 8.03 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 10.78 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.61 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.34 fps)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 4.55" for 10-YEAR event
Inflow = 1.77 cfs @ 8.00 hrs, Volume= 0.713 af
Outflow = 0.81 cfs @ 9.01 hrs, Volume= 0.501 af, Atten= 54%, Lag= 60.4 min
Primary = 0.81 cfs @ 9.01 hrs, Volume= 0.501 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.51' @ 9.01 hrs Surf.Area= 5,522 sf Storage= 11,378 cf

Plug-Flow detention time= 344.0 min calculated for 0.501 af (70% of inflow)
Center-of-Mass det. time= 161.0 min (837.8 - 676.9)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	21,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	900	0	0
56.00	2,252	1,576	1,576
57.00	3,655	2,954	4,530
58.00	4,755	4,205	8,735
59.00	6,245	5,500	14,235
60.00	7,777	7,011	21,246

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.81 cfs @ 9.01 hrs HW=58.51' TW=52.70' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.68 cfs @ 3.45 fps)
- **2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 2.68 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 4.42" for 10-YEAR event
Inflow = 0.60 cfs @ 7.84 hrs, Volume= 0.199 af
Outflow = 0.21 cfs @ 8.79 hrs, Volume= 0.189 af, Atten= 66%, Lag= 56.8 min
Primary = 0.21 cfs @ 8.79 hrs, Volume= 0.189 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.45' @ 8.79 hrs Surf.Area= 1,829 sf Storage= 1,836 cf

Plug-Flow detention time= 126.4 min calculated for 0.189 af (95% of inflow)
Center-of-Mass det. time= 88.2 min (756.9 - 668.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,711 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	751	0	0
60.00	1,458	1,105	1,105
61.00	2,291	1,875	2,979
62.00	3,173	2,732	5,711

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.21 cfs @ 8.79 hrs HW=60.45' TW=59.19' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.12 cfs of 3.68 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.12 cfs @ 5.40 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 4.03 fps)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 0.65 cfs @ 7.88 hrs, Volume= 0.218 af
Outflow = 0.61 cfs @ 8.01 hrs, Volume= 0.207 af, Atten= 6%, Lag= 8.1 min
Primary = 0.61 cfs @ 8.01 hrs, Volume= 0.207 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 61.10' @ 8.01 hrs Surf.Area= 952 sf Storage= 1,232 cf

Plug-Flow detention time= 83.1 min calculated for 0.207 af (95% of inflow)
Center-of-Mass det. time= 44.6 min (698.0 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	2,311 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	303	0	0
60.00	538	421	421
61.00	895	717	1,137
62.00	1,452	1,174	2,311

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.61 cfs @ 8.01 hrs HW=61.10' TW=53.23' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.98 fps)
- **2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.76 fps)
- **3=Orifice/Grate** (Weir Controls 0.34 cfs @ 1.05 fps)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 0.76 cfs @ 7.88 hrs, Volume= 0.254 af
Outflow = 0.39 cfs @ 8.26 hrs, Volume= 0.225 af, Atten= 48%, Lag= 23.3 min
Primary = 0.39 cfs @ 8.26 hrs, Volume= 0.225 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 62.05' @ 8.26 hrs Surf.Area= 1,907 sf Storage= 2,763 cf

Plug-Flow detention time= 183.6 min calculated for 0.225 af (89% of inflow)
Center-of-Mass det. time= 102.0 min (755.4 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,833 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	799	0	0
61.00	1,325	1,062	1,062
62.00	1,875	1,600	2,662
63.00	2,466	2,171	4,833

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.39 cfs @ 8.26 hrs HW=62.05' TW=60.16' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.39 cfs of 4.71 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.62 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.64 fps)
  - **4=Orifice/Grate** (Weir Controls 0.13 cfs @ 0.76 fps)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 4.53" for 10-YEAR event
Inflow = 0.75 cfs @ 7.88 hrs, Volume= 0.253 af
Outflow = 0.12 cfs @ 13.51 hrs, Volume= 0.107 af, Atten= 85%, Lag= 337.6 min
Primary = 0.12 cfs @ 13.51 hrs, Volume= 0.107 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.71' @ 13.51 hrs Surf.Area= 2,752 sf Storage= 6,558 cf

Plug-Flow detention time= 636.9 min calculated for 0.107 af (42% of inflow)
Center-of-Mass det. time= 344.7 min (1,007.4 - 662.6)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	10,613 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	903	0	0
58.00	1,325	1,114	1,114
59.00	1,803	1,564	2,678
60.00	2,336	2,070	4,748
61.00	2,920	2,628	7,376
62.00	3,555	3,238	10,613

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 13.51 hrs HW=60.71' TW=59.34' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.12 cfs of 3.84 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.34 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.57 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>6.03"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.045 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>5.99"
Tc=5.0 min CN=80/98 Runoff=0.34 cfs 0.115 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.094 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>5.98"
Tc=5.0 min CN=80/98 Runoff=0.22 cfs 0.075 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>5.48"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.044 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>4.23"
Tc=5.0 min CN=80/0 Runoff=3.98 cfs 1.311 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.89 cfs 0.302 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>4.77"
Tc=5.0 min CN=85/0 Runoff=4.58 cfs 1.479 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=1.93 cfs 0.651 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>5.79"
Tc=5.0 min CN=80/98 Runoff=0.50 cfs 0.169 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.031 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.85 cfs 0.287 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.99 cfs 0.333 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>5.57"
Tc=0.0 min CN=85/98 Runoff=0.40 cfs 0.130 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>6.26"
Tc=0.0 min CN=0/98 Runoff=0.03 cfs 0.010 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>6.19"
Tc=5.0 min CN=80/98 Runoff=2.00 cfs 0.676 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>5.70"
Tc=5.0 min CN=80/98 Runoff=0.47 cfs 0.157 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>5.72"
Tc=5.0 min CN=80/98 Runoff=0.48 cfs 0.162 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.37 cfs 0.125 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>6.16"
Tc=5.0 min CN=80/98 Runoff=0.35 cfs 0.118 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.49 cfs 0.167 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.71 cfs 0.240 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>4.77"
Tc=5.0 min CN=85/0 Runoff=9.48 cfs 3.061 af

Reach 1R: 12" Avg. Flow Depth=0.20' Max Vel=2.15 fps Inflow=0.24 cfs 0.251 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.24 cfs 0.251 af

Reach 2R: 18" Avg. Flow Depth=0.75' Max Vel=2.90 fps Inflow=2.56 cfs 0.882 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=2.56 cfs 0.882 af

Reach 3R: 12" Avg. Flow Depth=0.21' Max Vel=1.72 fps Inflow=0.21 cfs 0.187 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.21 cfs 0.187 af

Reach 4R: 12" Avg. Flow Depth=0.24' Max Vel=6.06 fps Inflow=0.89 cfs 0.303 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.89 cfs 0.303 af

Reach 10R: SWALE Avg. Flow Depth=0.18' Max Vel=0.18 fps Inflow=0.13 cfs 0.044 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.13 cfs 0.044 af

Reach 11R: SWALE Avg. Flow Depth=0.31' Max Vel=0.25 fps Inflow=0.35 cfs 0.119 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.34 cfs 0.118 af

Reach 12R: SWALE Avg. Flow Depth=0.43' Max Vel=0.29 fps Inflow=0.61 cfs 0.212 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.60 cfs 0.211 af

Reach 13R: SWALE Avg. Flow Depth=0.72' Max Vel=0.39 fps Inflow=1.63 cfs 0.565 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.62 cfs 0.564 af

Reach 14R: SWALE Avg. Flow Depth=0.75' Max Vel=0.40 fps Inflow=1.75 cfs 0.609 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.73 cfs 0.607 af

Reach 15R: 18" Avg. Flow Depth=1.01' Max Vel=3.33 fps Inflow=4.20 cfs 2.296 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=4.20 cfs 2.296 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=5.63 cfs 3.225 af
Outflow=5.63 cfs 3.225 af

Pond Bioretention: BIORETENTION Peak Elev=66.78' Storage=2,435 cf Inflow=2.00 cfs 0.676 af
Outflow=1.55 cfs 0.664 af

Pond Pond 1: TREATMENT Peak Elev=66.20' Storage=14,569 cf Inflow=2.82 cfs 0.953 af
Outflow=1.32 cfs 0.685 af

Pond Pond 2: TREATMENT Peak Elev=58.91' Storage=13,703 cf Inflow=2.32 cfs 0.944 af
Outflow=1.10 cfs 0.729 af

Pond Pond 3: TREATMENT Peak Elev=60.83' Storage=2,600 cf Inflow=0.80 cfs 0.265 af
Outflow=0.24 cfs 0.251 af

Pond Pond 4: DETENTION Peak Elev=61.14' Storage=1,272 cf Inflow=0.85 cfs 0.287 af
Outflow=0.84 cfs 0.275 af

Pond Pond 5: DETENTION Peak Elev=62.15' Storage=2,955 cf Inflow=0.99 cfs 0.333 af
Outflow=0.89 cfs 0.303 af

Pond Pond 6: TREATMENT Peak Elev=60.86' Storage=6,977 cf Inflow=0.99 cfs 0.336 af
Outflow=0.21 cfs 0.187 af

Total Runoff Area = 22.860 ac Runoff Volume = 9.781 af Average Runoff Depth = 5.13"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.13 cfs @ 7.88 hrs, Volume= 0.045 af, Depth> 6.03"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.34 cfs @ 7.88 hrs, Volume= 0.115 af, Depth> 5.99"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.28 cfs @ 7.87 hrs, Volume= 0.094 af, Depth> 6.25"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.22 cfs @ 7.88 hrs, Volume= 0.075 af, Depth> 5.98"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af, Depth> 5.48"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 3.98 cfs @ 7.93 hrs, Volume= 1.311 af, Depth> 4.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.89 cfs @ 7.87 hrs, Volume= 0.302 af, Depth> 6.25"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 4.58 cfs @ 7.91 hrs, Volume= 1.479 af, Depth> 4.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.93 cfs @ 7.87 hrs, Volume= 0.651 af, Depth> 6.25"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.50 cfs @ 7.88 hrs, Volume= 0.169 af, Depth> 5.79"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.09 cfs @ 7.87 hrs, Volume= 0.031 af, Depth> 6.25"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.85 cfs @ 7.87 hrs, Volume= 0.287 af, Depth> 6.25"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.99 cfs @ 7.87 hrs, Volume= 0.333 af, Depth> 6.25"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.40 cfs @ 7.80 hrs, Volume= 0.130 af, Depth> 5.57"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.03 cfs @ 7.78 hrs, Volume= 0.010 af, Depth> 6.26"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 2.00 cfs @ 7.88 hrs, Volume= 0.676 af, Depth> 6.19"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.47 cfs @ 7.89 hrs, Volume= 0.157 af, Depth> 5.70"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.48 cfs @ 7.89 hrs, Volume= 0.162 af, Depth> 5.72"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.37 cfs @ 7.87 hrs, Volume= 0.125 af, Depth> 6.25"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.35 cfs @ 7.88 hrs, Volume= 0.118 af, Depth> 6.16"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.49 cfs @ 7.87 hrs, Volume= 0.167 af, Depth> 6.25"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.71 cfs @ 7.87 hrs, Volume= 0.240 af, Depth> 6.25"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 9.48 cfs @ 7.91 hrs, Volume= 3.061 af, Depth> 4.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

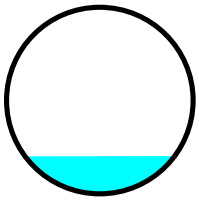
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 5.57" for 100-YEAR event
Inflow = 0.24 cfs @ 8.97 hrs, Volume= 0.251 af
Outflow = 0.24 cfs @ 8.98 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.2 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.15 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.71 fps, Avg. Travel Time= 0.4 min

Peak Storage= 5 cf @ 8.98 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



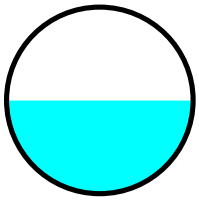
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 6.02" for 100-YEAR event
Inflow = 2.56 cfs @ 8.00 hrs, Volume= 0.882 af
Outflow = 2.56 cfs @ 8.00 hrs, Volume= 0.882 af, Atten= 0%, Lag= 0.4 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.90 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 1.1 min

Peak Storage= 95 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



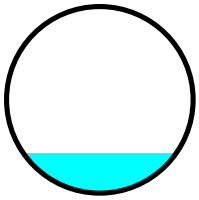
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 3.35" for 100-YEAR event
Inflow = 0.21 cfs @ 10.19 hrs, Volume= 0.187 af
Outflow = 0.21 cfs @ 10.20 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.4 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.72 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 0.7 min

Peak Storage= 7 cf @ 10.20 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



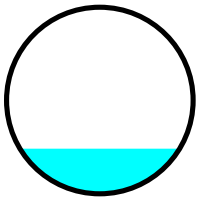
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 5.68" for 100-YEAR event
Inflow = 0.89 cfs @ 8.02 hrs, Volume= 0.303 af
Outflow = 0.89 cfs @ 8.02 hrs, Volume= 0.303 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 6.06 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 5 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 5.48" for 100-YEAR event
Inflow = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af
Outflow = 0.13 cfs @ 8.00 hrs, Volume= 0.044 af, Atten= 3%, Lag= 6.5 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.18 fps, Min. Travel Time= 9.3 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 18.3 min

Peak Storage= 71 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 4.56'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 5.77" for 100-YEAR event
Inflow = 0.35 cfs @ 7.93 hrs, Volume= 0.119 af
Outflow = 0.34 cfs @ 8.00 hrs, Volume= 0.118 af, Atten= 2%, Lag= 4.3 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.25 fps, Min. Travel Time= 6.8 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 12.8 min

Peak Storage= 137 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 5.36'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 5.95" for 100-YEAR event
Inflow = 0.61 cfs @ 7.96 hrs, Volume= 0.212 af
Outflow = 0.60 cfs @ 8.01 hrs, Volume= 0.211 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.29 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 10.4 min

Peak Storage= 204 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.43' , Surface Width= 6.06'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 6.07" for 100-YEAR event
Inflow = 1.63 cfs @ 7.94 hrs, Volume= 0.565 af
Outflow = 1.62 cfs @ 7.99 hrs, Volume= 0.564 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.39 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 7.5 min

Peak Storage= 410 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.72' , Surface Width= 7.84'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 6.05" for 100-YEAR event
Inflow = 1.75 cfs @ 7.98 hrs, Volume= 0.609 af
Outflow = 1.73 cfs @ 8.01 hrs, Volume= 0.607 af, Atten= 1%, Lag= 1.8 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.40 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 6.4 min

Peak Storage= 375 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 8.00'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

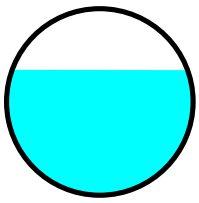
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 5.04" for 100-YEAR event
Inflow = 4.20 cfs @ 8.15 hrs, Volume= 2.296 af
Outflow = 4.20 cfs @ 8.15 hrs, Volume= 2.296 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.33 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.27 fps, Avg. Travel Time= 0.2 min

Peak Storage= 29 cf @ 8.15 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 1.41'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 5.02" for 100-YEAR event
Inflow = 5.63 cfs @ 8.09 hrs, Volume= 3.225 af
Outflow = 5.63 cfs @ 8.09 hrs, Volume= 3.225 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 6.19" for 100-YEAR event
Inflow = 2.00 cfs @ 7.88 hrs, Volume= 0.676 af
Outflow = 1.55 cfs @ 8.07 hrs, Volume= 0.664 af, Atten= 23%, Lag= 11.7 min
Primary = 1.55 cfs @ 8.07 hrs, Volume= 0.664 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.78' @ 8.07 hrs Surf.Area= 4,415 sf Storage= 2,435 cf

Plug-Flow detention time= 36.6 min calculated for 0.664 af (98% of inflow)
Center-of-Mass det. time= 23.3 min (674.2 - 650.9)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.55 cfs @ 8.07 hrs HW=66.78' TW=58.65' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.55 cfs @ 2.37 fps)
└─**2=Orifice/Grate** (Passes < 1.49 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.23 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 2.82 cfs @ 7.87 hrs, Volume= 0.953 af
Outflow = 1.32 cfs @ 8.32 hrs, Volume= 0.685 af, Atten= 53%, Lag= 26.9 min
Primary = 1.32 cfs @ 8.32 hrs, Volume= 0.685 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.20' @ 8.32 hrs Surf.Area= 4,830 sf Storage= 14,569 cf

Plug-Flow detention time= 365.3 min calculated for 0.685 af (72% of inflow)
Center-of-Mass det. time= 186.3 min (834.9 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	18,733 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,140	0	0
62.00	1,674	1,407	1,407
63.00	2,290	1,982	3,389
64.00	2,991	2,641	6,030
65.00	3,773	3,382	9,412
66.00	4,640	4,207	13,618
67.00	5,589	5,115	18,733

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.32 cfs @ 8.32 hrs HW=66.20' TW=53.04' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 1.32 cfs of 8.20 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 10.98 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 6.94 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.92 cfs @ 1.47 fps)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 6.03" for 100-YEAR event
Inflow = 2.32 cfs @ 8.00 hrs, Volume= 0.944 af
Outflow = 1.10 cfs @ 8.95 hrs, Volume= 0.729 af, Atten= 52%, Lag= 56.9 min
Primary = 1.10 cfs @ 8.95 hrs, Volume= 0.729 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.91' @ 8.95 hrs Surf.Area= 6,117 sf Storage= 13,703 cf

Plug-Flow detention time= 288.3 min calculated for 0.729 af (77% of inflow)
Center-of-Mass det. time= 140.7 min (811.3 - 670.5)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	21,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	900	0	0
56.00	2,252	1,576	1,576
57.00	3,655	2,954	4,530
58.00	4,755	4,205	8,735
59.00	6,245	5,500	14,235
60.00	7,777	7,011	21,246

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.10 cfs @ 8.95 hrs HW=58.91' TW=52.89' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.90 cfs @ 4.60 fps)
- **2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 4.05 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 5.90" for 100-YEAR event
Inflow = 0.80 cfs @ 7.84 hrs, Volume= 0.265 af
Outflow = 0.24 cfs @ 8.97 hrs, Volume= 0.251 af, Atten= 69%, Lag= 68.2 min
Primary = 0.24 cfs @ 8.97 hrs, Volume= 0.251 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.83' @ 8.97 hrs Surf.Area= 2,149 sf Storage= 2,600 cf

Plug-Flow detention time= 137.0 min calculated for 0.251 af (94% of inflow)
Center-of-Mass det. time= 95.7 min (758.0 - 662.3)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,711 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	751	0	0
60.00	1,458	1,105	1,105
61.00	2,291	1,875	2,979
62.00	3,173	2,732	5,711

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.24 cfs @ 8.97 hrs HW=60.83' TW=59.20' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.13 cfs of 4.36 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.13 cfs @ 6.14 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 0.11 cfs @ 5.02 fps)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 0.85 cfs @ 7.87 hrs, Volume= 0.287 af
Outflow = 0.84 cfs @ 7.93 hrs, Volume= 0.275 af, Atten= 1%, Lag= 3.6 min
Primary = 0.84 cfs @ 7.93 hrs, Volume= 0.275 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 61.14' @ 7.93 hrs Surf.Area= 975 sf Storage= 1,272 cf

Plug-Flow detention time= 71.3 min calculated for 0.275 af (96% of inflow)
Center-of-Mass det. time= 40.3 min (688.9 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	2,311 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	303	0	0
60.00	538	421	421
61.00	895	717	1,137
62.00	1,452	1,174	2,311

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.84 cfs @ 7.93 hrs HW=61.14' TW=53.34' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 7.05 fps)
- **2=Orifice/Grate** (Orifice Controls 0.24 cfs @ 4.86 fps)
- **3=Orifice/Grate** (Weir Controls 0.56 cfs @ 1.24 fps)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 0.99 cfs @ 7.87 hrs, Volume= 0.333 af
Outflow = 0.89 cfs @ 8.02 hrs, Volume= 0.303 af, Atten= 10%, Lag= 8.9 min
Primary = 0.89 cfs @ 8.02 hrs, Volume= 0.303 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 62.15' @ 8.02 hrs Surf.Area= 1,965 sf Storage= 2,955 cf

Plug-Flow detention time= 159.1 min calculated for 0.303 af (91% of inflow)
Center-of-Mass det. time= 92.6 min (741.3 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,833 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	799	0	0
61.00	1,325	1,062	1,062
62.00	1,875	1,600	2,662
63.00	2,466	2,171	4,833

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 8.02 hrs HW=62.15' TW=60.24' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.89 cfs of 4.86 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.66 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.24 cfs @ 4.88 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.61 cfs @ 1.28 fps)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 6.01" for 100-YEAR event
Inflow = 0.99 cfs @ 7.88 hrs, Volume= 0.336 af
Outflow = 0.21 cfs @ 10.19 hrs, Volume= 0.187 af, Atten= 79%, Lag= 138.7 min
Primary = 0.21 cfs @ 10.19 hrs, Volume= 0.187 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.86' @ 10.19 hrs Surf.Area= 2,839 sf Storage= 6,977 cf

Plug-Flow detention time= 499.7 min calculated for 0.187 af (56% of inflow)
Center-of-Mass det. time= 251.8 min (909.3 - 657.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	10,613 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	903	0	0
58.00	1,325	1,114	1,114
59.00	1,803	1,564	2,678
60.00	2,336	2,070	4,748
61.00	2,920	2,628	7,376
62.00	3,555	3,238	10,613

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.21 cfs @ 10.19 hrs HW=60.86' TW=59.39' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.21 cfs of 4.11 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.72 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.19 cfs @ 2.13 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>1.86"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.014 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.035 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.030 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>1.51"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.012 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>0.71"
Tc=5.0 min CN=80/0 Runoff=0.50 cfs 0.221 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.30 cfs 0.097 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>0.97"
Tc=5.0 min CN=85/0 Runoff=0.80 cfs 0.302 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.64 cfs 0.209 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>1.71"
Tc=5.0 min CN=80/98 Runoff=0.15 cfs 0.050 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 0.010 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.092 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 0.107 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>1.53"
Tc=0.0 min CN=85/98 Runoff=0.11 cfs 0.036 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>2.01"
Tc=0.0 min CN=0/98 Runoff=0.01 cfs 0.003 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>1.97"
Tc=5.0 min CN=80/98 Runoff=0.66 cfs 0.215 af

Subcatchment B3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>1.66"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.046 af

Subcatchment B4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>1.67"
Tc=5.0 min CN=80/98 Runoff=0.14 cfs 0.047 af

Subcatchment B5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.040 af

Subcatchment B6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>1.95"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.037 af

Subcatchment B7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.16 cfs 0.054 af

Subcatchment B8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.24 cfs 0.077 af

Subcatchment EX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>0.97"
Tc=5.0 min CN=85/0 Runoff=1.66 cfs 0.625 af

Reach 1R: 12" Avg. Flow Depth=0.12' Max Vel=1.53 fps Inflow=0.08 cfs 0.077 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.08 cfs 0.077 af

Reach 2R: 18" Avg. Flow Depth=0.38' Max Vel=2.04 fps Inflow=0.71 cfs 0.271 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=0.71 cfs 0.271 af

Reach 3R: 12" Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.00 cfs 0.000 af

Reach 4R: 12" Avg. Flow Depth=0.09' Max Vel=3.33 fps Inflow=0.12 cfs 0.081 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.12 cfs 0.081 af

Reach 10R: SWALE Avg. Flow Depth=0.08' Max Vel=0.11 fps Inflow=0.04 cfs 0.012 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.03 cfs 0.012 af

Reach 11R: SWALE Avg. Flow Depth=0.15' Max Vel=0.16 fps Inflow=0.10 cfs 0.035 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.10 cfs 0.035 af

Reach 12R: SWALE Avg. Flow Depth=0.21' Max Vel=0.20 fps Inflow=0.18 cfs 0.065 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.18 cfs 0.064 af

Reach 13R: SWALE Avg. Flow Depth=0.39' Max Vel=0.28 fps Inflow=0.51 cfs 0.177 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.50 cfs 0.176 af

Reach 14R: SWALE Avg. Flow Depth=0.40' Max Vel=0.28 fps Inflow=0.54 cfs 0.190 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.53 cfs 0.189 af

Reach 15R: 18" Avg. Flow Depth=0.38' Max Vel=2.12 fps Inflow=0.75 cfs 0.514 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=0.75 cfs 0.514 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=1.05 cfs 0.728 af
Outflow=1.05 cfs 0.728 af

Pond Bioretention: BIORETENTION Peak Elev=66.40' Storage=999 cf Inflow=0.66 cfs 0.215 af
Outflow=0.49 cfs 0.209 af

Pond Pond 1: TREATMENT Peak Elev=64.27' Storage=6,876 cf Inflow=0.94 cfs 0.306 af
Outflow=0.14 cfs 0.157 af

Pond Pond 2: TREATMENT Peak Elev=58.08' Storage=9,141 cf Inflow=0.72 cfs 0.293 af
Outflow=0.13 cfs 0.086 af

Pond Pond 3: TREATMENT Peak Elev=59.66' Storage=652 cf Inflow=0.24 cfs 0.079 af
Outflow=0.08 cfs 0.077 af

Pond Pond 4: DETENTION Peak Elev=60.52' Storage=746 cf Inflow=0.28 cfs 0.092 af
Outflow=0.18 cfs 0.082 af

Pond Pond 5: DETENTION Peak Elev=61.27' Storage=1,440 cf Inflow=0.33 cfs 0.107 af
Outflow=0.12 cfs 0.081 af

Pond Pond 6: TREATMENT Peak Elev=59.90' Storage=4,509 cf Inflow=0.31 cfs 0.104 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 22.860 ac Runoff Volume = 2.382 af Average Runoff Depth = 1.25"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.04 cfs @ 7.89 hrs, Volume= 0.014 af, Depth> 1.86"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.11 cfs @ 7.89 hrs, Volume= 0.035 af, Depth> 1.84"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.09 cfs @ 7.88 hrs, Volume= 0.030 af, Depth> 2.01"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.07 cfs @ 7.89 hrs, Volume= 0.023 af, Depth> 1.84"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af, Depth> 1.51"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 0.50 cfs @ 8.00 hrs, Volume= 0.221 af, Depth> 0.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.30 cfs @ 7.88 hrs, Volume= 0.097 af, Depth> 2.01"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 0.80 cfs @ 7.99 hrs, Volume= 0.302 af, Depth> 0.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 0.64 cfs @ 7.88 hrs, Volume= 0.209 af, Depth> 2.01"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.15 cfs @ 7.90 hrs, Volume= 0.050 af, Depth> 1.71"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.03 cfs @ 7.88 hrs, Volume= 0.010 af, Depth> 2.01"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.28 cfs @ 7.88 hrs, Volume= 0.092 af, Depth> 2.01"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.33 cfs @ 7.88 hrs, Volume= 0.107 af, Depth> 2.01"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.11 cfs @ 7.83 hrs, Volume= 0.036 af, Depth> 1.53"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.01 cfs @ 7.79 hrs, Volume= 0.003 af, Depth> 2.01"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 0.66 cfs @ 7.88 hrs, Volume= 0.215 af, Depth> 1.97"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.13 cfs @ 7.90 hrs, Volume= 0.046 af, Depth> 1.66"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.14 cfs @ 7.90 hrs, Volume= 0.047 af, Depth> 1.67"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.12 cfs @ 7.88 hrs, Volume= 0.040 af, Depth> 2.01"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.037 af, Depth> 1.95"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.16 cfs @ 7.88 hrs, Volume= 0.054 af, Depth> 2.01"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.24 cfs @ 7.88 hrs, Volume= 0.077 af, Depth> 2.01"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 1.66 cfs @ 7.99 hrs, Volume= 0.625 af, Depth> 0.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

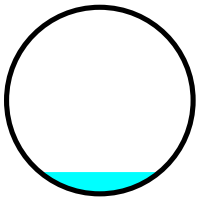
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 1.71" for WQ-YEAR event
Inflow = 0.08 cfs @ 8.93 hrs, Volume= 0.077 af
Outflow = 0.08 cfs @ 8.93 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.3 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.53 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 0.6 min

Peak Storage= 2 cf @ 8.93 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.64'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



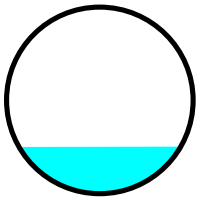
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 1.85" for WQ-YEAR event
Inflow = 0.71 cfs @ 8.04 hrs, Volume= 0.271 af
Outflow = 0.71 cfs @ 8.06 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.04 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 1.5 min

Peak Storage= 38 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 1.30'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



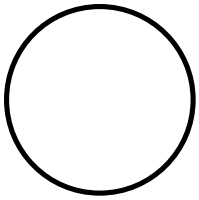
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth = 0.00" for WQ-YEAR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



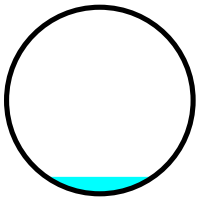
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 1.53" for WQ-YEAR event
Inflow = 0.12 cfs @ 8.74 hrs, Volume= 0.081 af
Outflow = 0.12 cfs @ 8.74 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.33 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 8.74 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 0.58'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 1.51" for WQ-YEAR event
Inflow = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af
Outflow = 0.03 cfs @ 8.02 hrs, Volume= 0.012 af, Atten= 8%, Lag= 6.8 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.11 fps, Min. Travel Time= 15.2 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 28.6 min

Peak Storage= 30 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 3.97'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 1.70" for WQ-YEAR event
Inflow = 0.10 cfs @ 7.96 hrs, Volume= 0.035 af
Outflow = 0.10 cfs @ 8.02 hrs, Volume= 0.035 af, Atten= 5%, Lag= 3.9 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.16 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 19.7 min

Peak Storage= 59 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 4.40'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 1.82" for WQ-YEAR event
Inflow = 0.18 cfs @ 7.99 hrs, Volume= 0.065 af
Outflow = 0.18 cfs @ 8.03 hrs, Volume= 0.064 af, Atten= 4%, Lag= 2.4 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.20 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 15.8 min

Peak Storage= 89 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 4.79'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 1.90" for WQ-YEAR event
Inflow = 0.51 cfs @ 7.96 hrs, Volume= 0.177 af
Outflow = 0.50 cfs @ 8.01 hrs, Volume= 0.176 af, Atten= 1%, Lag= 2.9 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.28 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 11.0 min

Peak Storage= 180 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 5.81'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 1.89" for WQ-YEAR event
Inflow = 0.54 cfs @ 8.00 hrs, Volume= 0.190 af
Outflow = 0.53 cfs @ 8.04 hrs, Volume= 0.189 af, Atten= 2%, Lag= 2.2 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.28 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 9.4 min

Peak Storage= 163 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 5.89'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

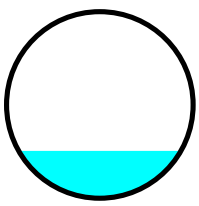
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 1.13" for WQ-YEAR event
Inflow = 0.75 cfs @ 8.06 hrs, Volume= 0.514 af
Outflow = 0.75 cfs @ 8.06 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.12 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 1.31'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 1.13" for WQ-YEAR event
Inflow = 1.05 cfs @ 8.04 hrs, Volume= 0.728 af
Outflow = 1.05 cfs @ 8.04 hrs, Volume= 0.728 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 1.97" for WQ-YEAR event
Inflow = 0.66 cfs @ 7.88 hrs, Volume= 0.215 af
Outflow = 0.49 cfs @ 8.08 hrs, Volume= 0.209 af, Atten= 25%, Lag= 12.0 min
Primary = 0.49 cfs @ 8.08 hrs, Volume= 0.209 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.40' @ 8.08 hrs Surf.Area= 3,167 sf Storage= 999 cf

Plug-Flow detention time= 54.6 min calculated for 0.209 af (97% of inflow)
Center-of-Mass det. time= 33.2 min (710.2 - 677.1)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.49 cfs @ 8.08 hrs HW=66.40' TW=56.76' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.49 cfs @ 1.70 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Exfiltration** (Passes 0.49 cfs of 0.88 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.94 cfs @ 7.88 hrs, Volume= 0.306 af
Outflow = 0.14 cfs @ 13.83 hrs, Volume= 0.157 af, Atten= 85%, Lag= 356.8 min
Primary = 0.14 cfs @ 13.83 hrs, Volume= 0.157 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 64.27' @ 13.83 hrs Surf.Area= 3,205 sf Storage= 6,876 cf

Plug-Flow detention time= 519.5 min calculated for 0.157 af (51% of inflow)
Center-of-Mass det. time= 260.2 min (935.1 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	18,733 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,140	0	0
62.00	1,674	1,407	1,407
63.00	2,290	1,982	3,389
64.00	2,991	2,641	6,030
65.00	3,773	3,382	9,412
66.00	4,640	4,207	13,618
67.00	5,589	5,115	18,733

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.14 cfs @ 13.83 hrs HW=64.27' TW=52.31' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.14 cfs of 6.30 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.71 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.85 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 1.87" for WQ-YEAR event
Inflow = 0.72 cfs @ 8.00 hrs, Volume= 0.293 af
Outflow = 0.13 cfs @ 16.49 hrs, Volume= 0.086 af, Atten= 83%, Lag= 509.4 min
Primary = 0.13 cfs @ 16.49 hrs, Volume= 0.086 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.08' @ 16.49 hrs Surf.Area= 4,881 sf Storage= 9,141 cf

Plug-Flow detention time= 759.2 min calculated for 0.086 af (29% of inflow)
Center-of-Mass det. time= 435.4 min (1,139.3 - 703.9)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	21,246 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	900	0	0
56.00	2,252	1,576	1,576
57.00	3,655	2,954	4,530
58.00	4,755	4,205	8,735
59.00	6,245	5,500	14,235
60.00	7,777	7,011	21,246

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.13 cfs @ 16.49 hrs HW=58.08' TW=52.35' (Dynamic Tailwater)
- **1=Orifice/Grate** (Weir Controls 0.13 cfs @ 0.95 fps)
- **2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.23 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 1.76" for WQ-YEAR event
Inflow = 0.24 cfs @ 7.86 hrs, Volume= 0.079 af
Outflow = 0.08 cfs @ 8.93 hrs, Volume= 0.077 af, Atten= 68%, Lag= 64.4 min
Primary = 0.08 cfs @ 8.93 hrs, Volume= 0.077 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.66' @ 8.93 hrs Surf.Area= 1,219 sf Storage= 652 cf

Plug-Flow detention time= 97.4 min calculated for 0.077 af (97% of inflow)
Center-of-Mass det. time= 77.4 min (770.0 - 692.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,711 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	751	0	0
60.00	1,458	1,105	1,105
61.00	2,291	1,875	2,979
62.00	3,173	2,732	5,711

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.08 cfs @ 8.93 hrs HW=59.66' TW=59.12' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.08 cfs of 1.53 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.08 cfs @ 3.56 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.16 fps)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.28 cfs @ 7.88 hrs, Volume= 0.092 af
Outflow = 0.18 cfs @ 8.15 hrs, Volume= 0.082 af, Atten= 36%, Lag= 16.2 min
Primary = 0.18 cfs @ 8.15 hrs, Volume= 0.082 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.52' @ 8.15 hrs Surf.Area= 723 sf Storage= 746 cf

Plug-Flow detention time= 137.3 min calculated for 0.082 af (89% of inflow)
Center-of-Mass det. time= 63.3 min (738.2 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	2,311 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	303	0	0
60.00	538	421	421
61.00	895	717	1,137
62.00	1,452	1,174	2,311

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 8.15 hrs HW=60.52' TW=52.97' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.93 fps)
- **2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 3.01 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.33 cfs @ 7.88 hrs, Volume= 0.107 af
Outflow = 0.12 cfs @ 8.74 hrs, Volume= 0.081 af, Atten= 64%, Lag= 51.4 min
Primary = 0.12 cfs @ 8.74 hrs, Volume= 0.081 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 61.27' @ 8.74 hrs Surf.Area= 1,474 sf Storage= 1,440 cf

Plug-Flow detention time= 282.3 min calculated for 0.081 af (76% of inflow)
Center-of-Mass det. time= 128.3 min (803.3 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	4,833 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	799	0	0
61.00	1,325	1,062	1,062
62.00	1,875	1,600	2,662
63.00	2,466	2,171	4,833

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 8.74 hrs HW=61.27' TW=60.09' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.12 cfs of 3.32 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.23 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.84 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 1.85" for WQ-YEAR event
Inflow = 0.31 cfs @ 7.89 hrs, Volume= 0.104 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.90' @ 24.00 hrs Surf.Area= 2,281 sf Storage= 4,509 cf

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

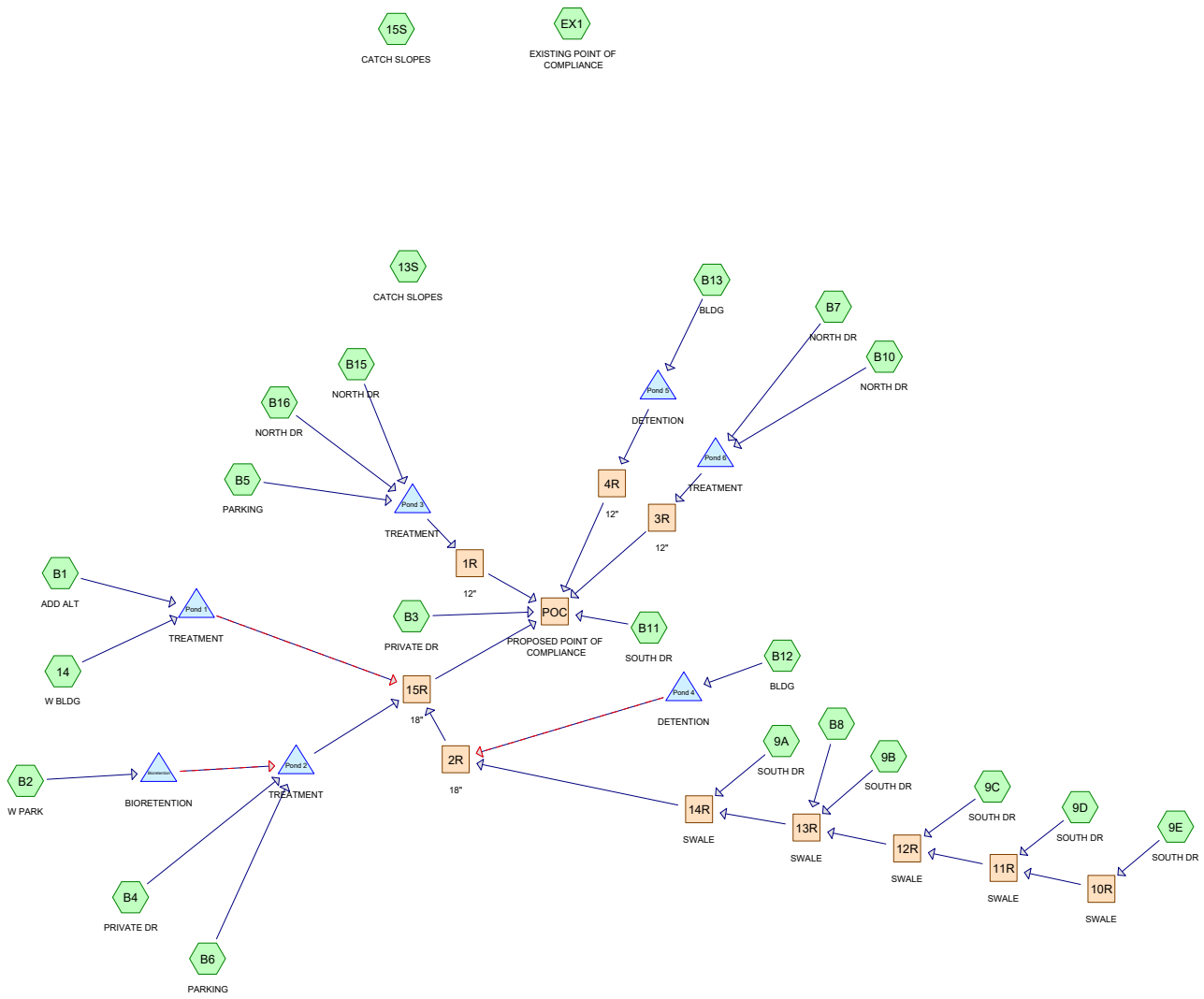
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	10,613 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	903	0	0
58.00	1,325	1,114	1,114
59.00	1,803	1,564	2,678
60.00	2,336	2,070	4,748
61.00	2,920	2,628	7,376
62.00	3,555	3,238	10,613

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.00' TW=59.18' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

HydroCAD-2 Correction Factor Applied
For Pond Volume Verification



Subcat Reach Pond Link

Routing Diagram for 90Percent-Actual-WQ
Prepared by Apex Companies LLC, Printed 4/8/2025
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YEAR	Type IA 24-hr		Default	24.00	1	3.50	2
2	10-YEAR	Type IA 24-hr		Default	24.00	1	5.00	2
3	100-YEAR	Type IA 24-hr		Default	24.00	1	6.50	2
4	WQ-YEAR	Type IA 24-hr		Default	24.00	1	2.24	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.640	98	(B13)
1.710	98	BLDG (14, B1, B12)
3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW (13S)
3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW (15S)
1.170	98	PARKING (B2)
0.407	80	PERV (9A, 9B, 9D, 9E, B10, B2, B3, B4, B6)
0.130	85	PERV (B15)
7.707	85	PERVIOUS (EX1)
3.260	98	RD (9A, 9B, 9C, 9D, 9E, B1, B10, B11, B15, B16, B3, B4, B5, B6, B7, B8)
0.390	98	SW (9A, 9B, 9C, 9D, B2, B3, B5, B6, B8)
22.860	**88**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>3.08"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>3.05"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.058 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 0.049 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>3.04"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.038 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>2.64"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 0.021 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>1.63"
Tc=5.0 min CN=80/0 Runoff=1.39 cfs 0.506 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.48 cfs 0.158 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=85/0 Runoff=1.84 cfs 0.624 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=1.02 cfs 0.340 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=80/98 Runoff=0.25 cfs 0.084 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 0.016 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.45 cfs 0.149 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.52 cfs 0.174 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>2.69"
Tc=0.0 min CN=85/98 Runoff=0.19 cfs 0.063 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>3.27"
Tc=0.0 min CN=0/98 Runoff=0.02 cfs 0.005 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=80/98 Runoff=1.06 cfs 0.351 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>2.82"
Tc=5.0 min CN=80/98 Runoff=0.23 cfs 0.077 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>2.83"
Tc=5.0 min CN=80/98 Runoff=0.24 cfs 0.080 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.20 cfs 0.065 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>3.19"
Tc=5.0 min CN=80/98 Runoff=0.18 cfs 0.061 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.26 cfs 0.087 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.125 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=85/0 Runoff=3.80 cfs 1.292 af

Reach 1R: 12" Avg. Flow Depth=0.15' Max Vel=1.80 fps Inflow=0.13 cfs 0.126 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.13 cfs 0.125 af

Reach 2R: 18" Avg. Flow Depth=0.47' Max Vel=2.31 fps Inflow=1.10 cfs 0.446 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=1.10 cfs 0.446 af

Reach 3R: 12" Avg. Flow Depth=0.06' Max Vel=0.78 fps Inflow=0.02 cfs 0.006 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.02 cfs 0.006 af

Reach 4R: 12" Avg. Flow Depth=0.11' Max Vel=3.77 fps Inflow=0.18 cfs 0.136 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.18 cfs 0.136 af

Reach 10R: SWALE Avg. Flow Depth=0.11' Max Vel=0.14 fps Inflow=0.06 cfs 0.021 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.06 cfs 0.021 af

Reach 11R: SWALE Avg. Flow Depth=0.21' Max Vel=0.19 fps Inflow=0.17 cfs 0.059 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.17 cfs 0.059 af

Reach 12R: SWALE Avg. Flow Depth=0.29' Max Vel=0.24 fps Inflow=0.31 cfs 0.108 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.30 cfs 0.107 af

Reach 13R: SWALE Avg. Flow Depth=0.51' Max Vel=0.32 fps Inflow=0.84 cfs 0.290 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.83 cfs 0.289 af

Reach 14R: SWALE Avg. Flow Depth=0.53' Max Vel=0.33 fps Inflow=0.89 cfs 0.312 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.88 cfs 0.311 af

Reach 15R: 18" Avg. Flow Depth=0.47' Max Vel=2.40 fps Inflow=1.15 cfs 0.915 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=1.15 cfs 0.915 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=1.67 cfs 1.277 af
Outflow=1.67 cfs 1.277 af

Pond Bioretention: BIORETENTION Peak Elev=66.53' Storage=1,434 cf Inflow=1.06 cfs 0.351 af
Outflow=0.82 cfs 0.343 af

Pond Pond 1: TREATMENT Peak Elev=64.62' Storage=10,946 cf Inflow=1.50 cfs 0.497 af
Outflow=0.22 cfs 0.271 af

Pond Pond 2: TREATMENT Peak Elev=58.13' Storage=12,708 cf Inflow=1.21 cfs 0.484 af
Outflow=0.23 cfs 0.198 af

Pond Pond 3: TREATMENT Peak Elev=59.90' Storage=1,312 cf Inflow=0.40 cfs 0.133 af
Outflow=0.13 cfs 0.126 af

Pond Pond 4: DETENTION Peak Elev=60.78' Storage=1,293 cf Inflow=0.45 cfs 0.149 af
Outflow=0.23 cfs 0.135 af

Pond Pond 5: DETENTION Peak Elev=61.52' Storage=2,486 cf Inflow=0.52 cfs 0.174 af
Outflow=0.18 cfs 0.136 af

Pond Pond 6: TREATMENT Peak Elev=60.23' Storage=7,199 cf Inflow=0.51 cfs 0.171 af
Outflow=0.02 cfs 0.006 af

Total Runoff Area = 22.860 ac Runoff Volume = 4.448 af Average Runoff Depth = 2.33"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.023 af, Depth> 3.08"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.058 af, Depth> 3.05"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.15 cfs @ 7.88 hrs, Volume= 0.049 af, Depth> 3.26"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.038 af, Depth> 3.04"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af, Depth> 2.64"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 1.39 cfs @ 7.98 hrs, Volume= 0.506 af, Depth> 1.63"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.48 cfs @ 7.88 hrs, Volume= 0.158 af, Depth> 3.26"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 1.84 cfs @ 7.95 hrs, Volume= 0.624 af, Depth> 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.02 cfs @ 7.88 hrs, Volume= 0.340 af, Depth> 3.26"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.25 cfs @ 7.89 hrs, Volume= 0.084 af, Depth> 2.89"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.05 cfs @ 7.88 hrs, Volume= 0.016 af, Depth> 3.26"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.45 cfs @ 7.88 hrs, Volume= 0.149 af, Depth> 3.26"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.52 cfs @ 7.88 hrs, Volume= 0.174 af, Depth> 3.26"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.19 cfs @ 7.82 hrs, Volume= 0.063 af, Depth> 2.69"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.02 cfs @ 7.78 hrs, Volume= 0.005 af, Depth> 3.27"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 1.06 cfs @ 7.88 hrs, Volume= 0.351 af, Depth> 3.21"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.23 cfs @ 7.89 hrs, Volume= 0.077 af, Depth> 2.82"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.24 cfs @ 7.89 hrs, Volume= 0.080 af, Depth> 2.83"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.20 cfs @ 7.88 hrs, Volume= 0.065 af, Depth> 3.26"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.18 cfs @ 7.88 hrs, Volume= 0.061 af, Depth> 3.19"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.26 cfs @ 7.88 hrs, Volume= 0.087 af, Depth> 3.26"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.38 cfs @ 7.88 hrs, Volume= 0.125 af, Depth> 3.26"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 3.80 cfs @ 7.95 hrs, Volume= 1.292 af, Depth> 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

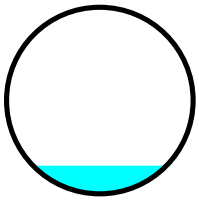
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 2.79" for 2-YEAR event
Inflow = 0.13 cfs @ 8.87 hrs, Volume= 0.126 af
Outflow = 0.13 cfs @ 8.88 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.3 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.80 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 0.5 min

Peak Storage= 3 cf @ 8.88 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 0.71'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



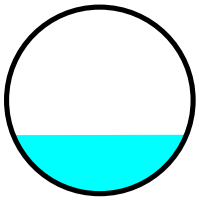
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 3.05" for 2-YEAR event
Inflow = 1.10 cfs @ 8.03 hrs, Volume= 0.446 af
Outflow = 1.10 cfs @ 8.04 hrs, Volume= 0.446 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.31 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 1.3 min

Peak Storage= 51 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 1.39'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



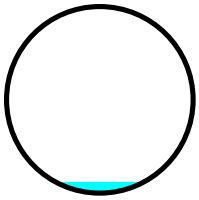
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 0.11" for 2-YEAR event
Inflow = 0.02 cfs @ 24.00 hrs, Volume= 0.006 af
Outflow = 0.02 cfs @ 24.00 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.78 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 1.4 min

Peak Storage= 1 cf @ 24.00 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 0.48'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



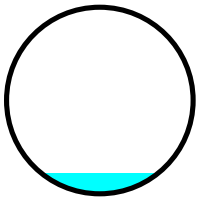
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 2.56" for 2-YEAR event
Inflow = 0.18 cfs @ 8.81 hrs, Volume= 0.136 af
Outflow = 0.18 cfs @ 8.82 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.77 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.67 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 8.82 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



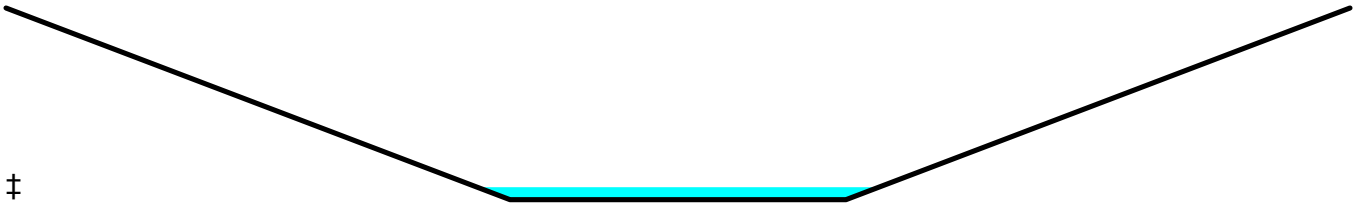
Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 2.64" for 2-YEAR event
Inflow = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af
Outflow = 0.06 cfs @ 8.01 hrs, Volume= 0.021 af, Atten= 5%, Lag= 6.6 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.14 fps, Min. Travel Time= 12.2 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 23.7 min

Peak Storage= 43 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 4.18'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'



‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 2.87" for 2-YEAR event
Inflow = 0.17 cfs @ 7.95 hrs, Volume= 0.059 af
Outflow = 0.17 cfs @ 8.01 hrs, Volume= 0.059 af, Atten= 3%, Lag= 4.0 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.19 fps, Min. Travel Time= 8.5 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 16.4 min

Peak Storage= 85 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 4.74'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 3.02" for 2-YEAR event
Inflow = 0.31 cfs @ 7.97 hrs, Volume= 0.108 af
Outflow = 0.30 cfs @ 8.02 hrs, Volume= 0.107 af, Atten= 2%, Lag= 2.7 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.24 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 13.2 min

Peak Storage= 126 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 5.24'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 3.12" for 2-YEAR event
Inflow = 0.84 cfs @ 7.95 hrs, Volume= 0.290 af
Outflow = 0.83 cfs @ 8.00 hrs, Volume= 0.289 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.32 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 9.3 min

Peak Storage= 255 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 6.55'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 3.11" for 2-YEAR event
Inflow = 0.89 cfs @ 8.00 hrs, Volume= 0.312 af
Outflow = 0.88 cfs @ 8.03 hrs, Volume= 0.311 af, Atten= 1%, Lag= 1.8 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.33 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 7.9 min

Peak Storage= 232 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 6.66'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

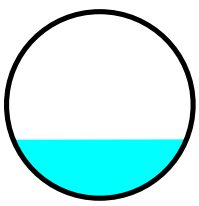
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 2.01" for 2-YEAR event
Inflow = 1.15 cfs @ 8.04 hrs, Volume= 0.915 af
Outflow = 1.15 cfs @ 8.04 hrs, Volume= 0.915 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.40 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.78 fps, Avg. Travel Time= 0.2 min

Peak Storage= 11 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 1.39'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 1.99" for 2-YEAR event
Inflow = 1.67 cfs @ 8.01 hrs, Volume= 1.277 af
Outflow = 1.67 cfs @ 8.01 hrs, Volume= 1.277 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 3.21" for 2-YEAR event
Inflow = 1.06 cfs @ 7.88 hrs, Volume= 0.351 af
Outflow = 0.82 cfs @ 8.07 hrs, Volume= 0.343 af, Atten= 23%, Lag= 11.6 min
Primary = 0.82 cfs @ 8.07 hrs, Volume= 0.343 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.53' @ 8.07 hrs Surf.Area= 3,591 sf Storage= 1,434 cf

Plug-Flow detention time= 45.6 min calculated for 0.343 af (98% of inflow)
Center-of-Mass det. time= 28.3 min (692.1 - 663.8)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.82 cfs @ 8.07 hrs HW=66.53' TW=57.09' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.82 cfs @ 1.95 fps)
└─**2=Orifice/Grate** (Passes < 0.04 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.00 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 1.50 cfs @ 7.88 hrs, Volume= 0.497 af
Outflow = 0.22 cfs @ 14.20 hrs, Volume= 0.271 af, Atten= 86%, Lag= 379.4 min
Primary = 0.22 cfs @ 14.20 hrs, Volume= 0.271 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 64.62' @ 14.20 hrs Surf.Area= 4,731 sf Storage= 10,946 cf

Plug-Flow detention time= 525.3 min calculated for 0.271 af (54% of inflow)
Center-of-Mass det. time= 275.4 min (936.9 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	25,474 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,550	0	0
62.00	2,276	1,913	1,913
63.00	3,114	2,695	4,608
64.00	4,067	3,591	8,199
65.00	5,131	4,599	12,798
66.00	6,310	5,721	18,518
67.00	7,601	6,956	25,474

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.22 cfs @ 14.20 hrs HW=64.62' TW=52.44' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.22 cfs of 6.68 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.17 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.17 cfs @ 3.40 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 3.09" for 2-YEAR event
Inflow = 1.21 cfs @ 8.00 hrs, Volume= 0.484 af
Outflow = 0.23 cfs @ 13.39 hrs, Volume= 0.198 af, Atten= 81%, Lag= 323.3 min
Primary = 0.23 cfs @ 13.39 hrs, Volume= 0.198 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.13' @ 13.39 hrs Surf.Area= 6,722 sf Storage= 12,708 cf

Plug-Flow detention time= 633.2 min calculated for 0.198 af (41% of inflow)
Center-of-Mass det. time= 343.8 min (1,031.1 - 687.3)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	28,891 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	1,224	0	0
56.00	3,062	2,143	2,143
57.00	4,970	4,016	6,159
58.00	6,466	5,718	11,877
59.00	8,493	7,480	19,357
60.00	10,576	9,535	28,891

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 13.39 hrs HW=58.13' TW=52.44' (Dynamic Tailwater)
- **1=Orifice/Grate** (Weir Controls 0.23 cfs @ 1.16 fps)
- **2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.73 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 2.96" for 2-YEAR event
Inflow = 0.40 cfs @ 7.85 hrs, Volume= 0.133 af
Outflow = 0.13 cfs @ 8.87 hrs, Volume= 0.126 af, Atten= 67%, Lag= 61.5 min
Primary = 0.13 cfs @ 8.87 hrs, Volume= 0.126 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.90' @ 8.87 hrs Surf.Area= 1,888 sf Storage= 1,312 cf

Plug-Flow detention time= 154.8 min calculated for 0.126 af (94% of inflow)
Center-of-Mass det. time= 112.2 min (790.6 - 678.4)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	7,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	1,021	0	0
60.00	1,982	1,502	1,502
61.00	3,115	2,549	4,050
62.00	4,315	3,715	7,765

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.13 cfs @ 8.87 hrs HW=59.90' TW=59.15' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.13 cfs of 2.41 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.09 cfs @ 4.17 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.92 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 0.45 cfs @ 7.88 hrs, Volume= 0.149 af
Outflow = 0.23 cfs @ 8.28 hrs, Volume= 0.135 af, Atten= 50%, Lag= 24.2 min
Primary = 0.23 cfs @ 8.28 hrs, Volume= 0.135 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.78' @ 8.28 hrs Surf.Area= 1,111 sf Storage= 1,293 cf

Plug-Flow detention time= 137.0 min calculated for 0.135 af (90% of inflow)
Center-of-Mass det. time= 67.7 min (729.2 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,141 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	412	0	0
60.00	731	572	572
61.00	1,217	974	1,546
62.00	1,974	1,596	3,141

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 8.28 hrs HW=60.78' TW=53.02' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.43 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 3.91 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 3.26" for 2-YEAR event
Inflow = 0.52 cfs @ 7.88 hrs, Volume= 0.174 af
Outflow = 0.18 cfs @ 8.81 hrs, Volume= 0.136 af, Atten= 66%, Lag= 56.2 min
Primary = 0.18 cfs @ 8.81 hrs, Volume= 0.136 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 61.52' @ 8.81 hrs Surf.Area= 2,192 sf Storage= 2,486 cf

Plug-Flow detention time= 279.2 min calculated for 0.136 af (78% of inflow)
Center-of-Mass det. time= 137.2 min (798.7 - 661.5)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	6,572 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	1,086	0	0
61.00	1,802	1,444	1,444
62.00	2,550	2,176	3,620
63.00	3,353	2,952	6,572

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 8.81 hrs HW=61.52' TW=60.11' (Dynamic Tailwater)
- **2=Orifice/Grate** (Passes 0.18 cfs of 3.82 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.72 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.15 cfs @ 3.03 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 3.07" for 2-YEAR event
Inflow = 0.51 cfs @ 7.88 hrs, Volume= 0.171 af
Outflow = 0.02 cfs @ 24.00 hrs, Volume= 0.006 af, Atten= 97%, Lag= 967.0 min
Primary = 0.02 cfs @ 24.00 hrs, Volume= 0.006 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.23' @ 24.00 hrs Surf.Area= 3,357 sf Storage= 7,199 cf

Plug-Flow detention time= 1,149.3 min calculated for 0.006 af (3% of inflow)
Center-of-Mass det. time= 605.7 min (1,276.6 - 670.9)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	14,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	1,228	0	0
58.00	1,802	1,515	1,515
59.00	2,452	2,127	3,642
60.00	3,176	2,814	6,456
61.00	3,971	3,574	10,030
62.00	4,834	4,403	14,432

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 24.00 hrs HW=60.23' TW=59.24' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.02 cfs of 2.80 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 2.76 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>4.55"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.034 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.26 cfs 0.086 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 0.071 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.056 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>4.04"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.033 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>2.89"
Tc=5.0 min CN=80/0 Runoff=2.64 cfs 0.895 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.69 cfs 0.230 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=85/0 Runoff=3.19 cfs 1.043 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=1.48 cfs 0.495 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>4.33"
Tc=5.0 min CN=80/98 Runoff=0.38 cfs 0.126 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.024 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.65 cfs 0.218 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.76 cfs 0.254 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>4.12"
Tc=0.0 min CN=85/98 Runoff=0.29 cfs 0.096 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>4.76"
Tc=0.0 min CN=0/98 Runoff=0.02 cfs 0.008 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>4.70"
Tc=5.0 min CN=80/98 Runoff=1.53 cfs 0.513 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>4.25"
Tc=5.0 min CN=80/98 Runoff=0.35 cfs 0.117 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>4.26"
Tc=5.0 min CN=80/98 Runoff=0.36 cfs 0.121 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.095 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>4.67"
Tc=5.0 min CN=80/98 Runoff=0.27 cfs 0.090 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.127 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.54 cfs 0.182 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=85/0 Runoff=6.60 cfs 2.158 af

Reach 1R: 12" Avg. Flow Depth=0.18' Max Vel=1.99 fps Inflow=0.19 cfs 0.184 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.19 cfs 0.184 af

Reach 2R: 18" Avg. Flow Depth=0.60' Max Vel=2.63 fps Inflow=1.75 cfs 0.662 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=1.75 cfs 0.661 af

Reach 3R: 12" Avg. Flow Depth=0.13' Max Vel=1.30 fps Inflow=0.08 cfs 0.054 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.08 cfs 0.054 af

Reach 4R: 12" Avg. Flow Depth=0.13' Max Vel=4.14 fps Inflow=0.25 cfs 0.214 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.25 cfs 0.214 af

Reach 10R: SWALE Avg. Flow Depth=0.15' Max Vel=0.16 fps Inflow=0.10 cfs 0.033 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.09 cfs 0.032 af

Reach 11R: SWALE Avg. Flow Depth=0.26' Max Vel=0.22 fps Inflow=0.26 cfs 0.089 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.25 cfs 0.088 af

Reach 12R: SWALE Avg. Flow Depth=0.36' Max Vel=0.27 fps Inflow=0.46 cfs 0.159 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.45 cfs 0.159 af

Reach 13R: SWALE Avg. Flow Depth=0.62' Max Vel=0.36 fps Inflow=1.23 cfs 0.427 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.22 cfs 0.426 af

Reach 14R: SWALE Avg. Flow Depth=0.65' Max Vel=0.37 fps Inflow=1.32 cfs 0.460 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.31 cfs 0.459 af

Reach 15R: 18" Avg. Flow Depth=0.64' Max Vel=2.79 fps Inflow=1.99 cfs 1.515 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=1.99 cfs 1.515 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=2.72 cfs 2.107 af
Outflow=2.72 cfs 2.107 af

Pond Bioretention: BIORETENTION Peak Elev=66.66' Storage=1,933 cf Inflow=1.53 cfs 0.513 af
Outflow=1.19 cfs 0.503 af

Pond Pond 1: TREATMENT Peak Elev=65.44' Storage=15,188 cf Inflow=2.16 cfs 0.725 af
Outflow=0.33 cfs 0.430 af

Pond Pond 2: TREATMENT Peak Elev=58.28' Storage=13,751 cf Inflow=1.77 cfs 0.713 af
Outflow=0.56 cfs 0.424 af

Pond Pond 3: TREATMENT Peak Elev=60.28' Storage=2,094 cf Inflow=0.60 cfs 0.199 af
Outflow=0.19 cfs 0.184 af

Pond Pond 4: DETENTION Peak Elev=61.07' Storage=1,637 cf Inflow=0.65 cfs 0.218 af
Outflow=0.47 cfs 0.203 af

Pond Pond 5: DETENTION Peak Elev=61.92' Storage=3,412 cf Inflow=0.76 cfs 0.254 af
Outflow=0.25 cfs 0.214 af

Pond Pond 6: TREATMENT Peak Elev=60.66' Storage=8,740 cf Inflow=0.75 cfs 0.253 af
Outflow=0.08 cfs 0.054 af

Total Runoff Area = 22.860 ac Runoff Volume = 7.072 af Average Runoff Depth = 3.71"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.10 cfs @ 7.88 hrs, Volume= 0.034 af, Depth> 4.55"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.26 cfs @ 7.88 hrs, Volume= 0.086 af, Depth> 4.51"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.21 cfs @ 7.88 hrs, Volume= 0.071 af, Depth> 4.76"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.056 af, Depth> 4.51"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af, Depth> 4.04"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 2.64 cfs @ 7.95 hrs, Volume= 0.895 af, Depth> 2.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.69 cfs @ 7.88 hrs, Volume= 0.230 af, Depth> 4.76"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 3.19 cfs @ 7.93 hrs, Volume= 1.043 af, Depth> 3.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.48 cfs @ 7.88 hrs, Volume= 0.495 af, Depth> 4.76"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.38 cfs @ 7.89 hrs, Volume= 0.126 af, Depth> 4.33"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.024 af, Depth> 4.76"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.65 cfs @ 7.88 hrs, Volume= 0.218 af, Depth> 4.76"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.76 cfs @ 7.88 hrs, Volume= 0.254 af, Depth> 4.76"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.29 cfs @ 7.81 hrs, Volume= 0.096 af, Depth> 4.12"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.02 cfs @ 7.78 hrs, Volume= 0.008 af, Depth> 4.76"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 1.53 cfs @ 7.88 hrs, Volume= 0.513 af, Depth> 4.70"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.35 cfs @ 7.89 hrs, Volume= 0.117 af, Depth> 4.25"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.36 cfs @ 7.89 hrs, Volume= 0.121 af, Depth> 4.26"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.28 cfs @ 7.88 hrs, Volume= 0.095 af, Depth> 4.76"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.27 cfs @ 7.88 hrs, Volume= 0.090 af, Depth> 4.67"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.38 cfs @ 7.88 hrs, Volume= 0.127 af, Depth> 4.76"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.54 cfs @ 7.88 hrs, Volume= 0.182 af, Depth> 4.76"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 6.60 cfs @ 7.93 hrs, Volume= 2.158 af, Depth> 3.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

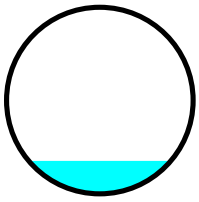
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 4.08" for 10-YEAR event
Inflow = 0.19 cfs @ 8.95 hrs, Volume= 0.184 af
Outflow = 0.19 cfs @ 8.95 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.3 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.99 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.56 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 8.95 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



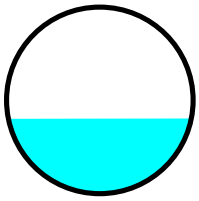
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 4.52" for 10-YEAR event
Inflow = 1.75 cfs @ 8.06 hrs, Volume= 0.662 af
Outflow = 1.75 cfs @ 8.06 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.63 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 1.1 min

Peak Storage= 72 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 1.47'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



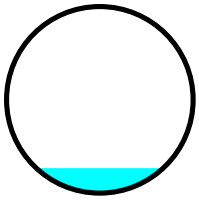
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 0.97" for 10-YEAR event
Inflow = 0.08 cfs @ 20.22 hrs, Volume= 0.054 af
Outflow = 0.08 cfs @ 20.23 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.5 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.30 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 1.0 min

Peak Storage= 4 cf @ 20.23 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.68'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



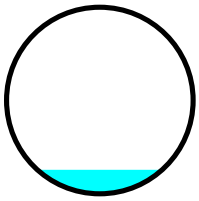
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 4.02" for 10-YEAR event
Inflow = 0.25 cfs @ 8.90 hrs, Volume= 0.214 af
Outflow = 0.25 cfs @ 8.90 hrs, Volume= 0.214 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 4.14 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.05 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 8.90 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.67'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 4.04" for 10-YEAR event
Inflow = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af
Outflow = 0.09 cfs @ 8.01 hrs, Volume= 0.032 af, Atten= 4%, Lag= 6.6 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.16 fps, Min. Travel Time= 10.4 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 20.4 min

Peak Storage= 58 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 4.38'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 4.31" for 10-YEAR event
Inflow = 0.26 cfs @ 7.94 hrs, Volume= 0.089 af
Outflow = 0.25 cfs @ 8.01 hrs, Volume= 0.088 af, Atten= 2%, Lag= 4.2 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.22 fps, Min. Travel Time= 7.4 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 14.2 min

Peak Storage= 112 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 5.07'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 4.48" for 10-YEAR event
Inflow = 0.46 cfs @ 7.96 hrs, Volume= 0.159 af
Outflow = 0.45 cfs @ 8.01 hrs, Volume= 0.159 af, Atten= 2%, Lag= 2.9 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.27 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 11.5 min

Peak Storage= 167 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 5.68'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 4.59" for 10-YEAR event
Inflow = 1.23 cfs @ 7.94 hrs, Volume= 0.427 af
Outflow = 1.22 cfs @ 8.00 hrs, Volume= 0.426 af, Atten= 1%, Lag= 3.2 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.36 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.20 fps, Avg. Travel Time= 8.2 min

Peak Storage= 336 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.62' , Surface Width= 7.25'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 4.57" for 10-YEAR event
Inflow = 1.32 cfs @ 7.99 hrs, Volume= 0.460 af
Outflow = 1.31 cfs @ 8.02 hrs, Volume= 0.459 af, Atten= 1%, Lag= 1.7 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.37 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 7.0 min

Peak Storage= 307 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.65' , Surface Width= 7.39'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

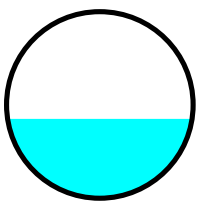
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 3.32" for 10-YEAR event
Inflow = 1.99 cfs @ 8.07 hrs, Volume= 1.515 af
Outflow = 1.99 cfs @ 8.07 hrs, Volume= 1.515 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.79 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 8.07 hrs
Average Depth at Peak Storage= 0.64' , Surface Width= 1.48'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 3.28" for 10-YEAR event
Inflow = 2.72 cfs @ 8.05 hrs, Volume= 2.107 af
Outflow = 2.72 cfs @ 8.05 hrs, Volume= 2.107 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 4.70" for 10-YEAR event
Inflow = 1.53 cfs @ 7.88 hrs, Volume= 0.513 af
Outflow = 1.19 cfs @ 8.07 hrs, Volume= 0.503 af, Atten= 22%, Lag= 11.5 min
Primary = 1.19 cfs @ 8.07 hrs, Volume= 0.503 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.66' @ 8.07 hrs Surf.Area= 4,023 sf Storage= 1,933 cf

Plug-Flow detention time= 40.0 min calculated for 0.503 af (98% of inflow)
Center-of-Mass det. time= 25.2 min (680.9 - 655.7)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.19 cfs @ 8.07 hrs HW=66.66' TW=57.73' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.19 cfs @ 2.18 fps)
└─**2=Orifice/Grate** (Passes < 0.64 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.12 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 2.16 cfs @ 7.88 hrs, Volume= 0.725 af
Outflow = 0.33 cfs @ 13.41 hrs, Volume= 0.430 af, Atten= 85%, Lag= 332.0 min
Primary = 0.33 cfs @ 13.41 hrs, Volume= 0.430 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 65.44' @ 13.41 hrs Surf.Area= 5,654 sf Storage= 15,188 cf

Plug-Flow detention time= 506.9 min calculated for 0.429 af (59% of inflow)
Center-of-Mass det. time= 273.1 min (926.5 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	25,474 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,550	0	0
62.00	2,276	1,913	1,913
63.00	3,114	2,695	4,608
64.00	4,067	3,591	8,199
65.00	5,131	4,599	12,798
66.00	6,310	5,721	18,518
67.00	7,601	6,956	25,474

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.33 cfs @ 13.41 hrs HW=65.44' TW=52.52' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.33 cfs of 7.51 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 10.15 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.27 cfs @ 5.53 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 4.55" for 10-YEAR event
Inflow = 1.77 cfs @ 8.00 hrs, Volume= 0.713 af
Outflow = 0.56 cfs @ 9.76 hrs, Volume= 0.424 af, Atten= 68%, Lag= 105.9 min
Primary = 0.56 cfs @ 9.76 hrs, Volume= 0.424 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.28' @ 9.76 hrs Surf.Area= 7,029 sf Storage= 13,751 cf

Plug-Flow detention time= 447.0 min calculated for 0.424 af (59% of inflow)
Center-of-Mass det. time= 217.4 min (894.3 - 676.9)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	28,891 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	1,224	0	0
56.00	3,062	2,143	2,143
57.00	4,970	4,016	6,159
58.00	6,466	5,718	11,877
59.00	8,493	7,480	19,357
60.00	10,576	9,535	28,891

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.56 cfs @ 9.76 hrs HW=58.28' TW=52.61' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.54 fps)
- **2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.51 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 4.42" for 10-YEAR event
Inflow = 0.60 cfs @ 7.84 hrs, Volume= 0.199 af
Outflow = 0.19 cfs @ 8.95 hrs, Volume= 0.184 af, Atten= 69%, Lag= 66.6 min
Primary = 0.19 cfs @ 8.95 hrs, Volume= 0.184 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.28' @ 8.95 hrs Surf.Area= 2,296 sf Storage= 2,094 cf

Plug-Flow detention time= 164.5 min calculated for 0.184 af (92% of inflow)
Center-of-Mass det. time= 108.1 min (776.7 - 668.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	7,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	1,021	0	0
60.00	1,982	1,502	1,502
61.00	3,115	2,549	4,050
62.00	4,315	3,715	7,765

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.19 cfs @ 8.95 hrs HW=60.28' TW=59.18' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.19 cfs of 3.33 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.11 cfs @ 5.05 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 3.52 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 0.65 cfs @ 7.88 hrs, Volume= 0.218 af
Outflow = 0.47 cfs @ 8.09 hrs, Volume= 0.203 af, Atten= 27%, Lag= 13.1 min
Primary = 0.47 cfs @ 8.09 hrs, Volume= 0.203 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 61.07' @ 8.09 hrs Surf.Area= 1,273 sf Storage= 1,637 cf

Plug-Flow detention time= 112.5 min calculated for 0.203 af (93% of inflow)
Center-of-Mass det. time= 60.9 min (714.3 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,141 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	412	0	0
60.00	731	572	572
61.00	1,217	974	1,546
62.00	1,974	1,596	3,141

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.47 cfs @ 8.09 hrs HW=61.07' TW=53.20' (Dynamic Tailwater)
├─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.93 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.69 fps)
└─**3=Orifice/Grate** (Weir Controls 0.21 cfs @ 0.89 fps)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 4.76" for 10-YEAR event
Inflow = 0.76 cfs @ 7.88 hrs, Volume= 0.254 af
Outflow = 0.25 cfs @ 8.90 hrs, Volume= 0.214 af, Atten= 68%, Lag= 61.6 min
Primary = 0.25 cfs @ 8.90 hrs, Volume= 0.214 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 61.92' @ 8.90 hrs Surf.Area= 2,488 sf Storage= 3,412 cf

Plug-Flow detention time= 243.4 min calculated for 0.214 af (84% of inflow)
Center-of-Mass det. time= 135.4 min (788.8 - 653.4)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	6,572 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	1,086	0	0
61.00	1,802	1,444	1,444
62.00	2,550	2,176	3,620
63.00	3,353	2,952	6,572

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.25 cfs @ 8.90 hrs HW=61.92' TW=60.13' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.25 cfs of 4.50 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.44 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.21 cfs @ 4.29 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 4.53" for 10-YEAR event
Inflow = 0.75 cfs @ 7.88 hrs, Volume= 0.253 af
Outflow = 0.08 cfs @ 20.22 hrs, Volume= 0.054 af, Atten= 89%, Lag= 740.2 min
Primary = 0.08 cfs @ 20.22 hrs, Volume= 0.054 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.66' @ 20.22 hrs Surf.Area= 3,704 sf Storage= 8,740 cf

Plug-Flow detention time= 887.6 min calculated for 0.054 af (21% of inflow)
Center-of-Mass det. time= 502.1 min (1,164.7 - 662.6)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	14,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	1,228	0	0
58.00	1,802	1,515	1,515
59.00	2,452	2,127	3,642
60.00	3,176	2,814	6,456
61.00	3,971	3,574	10,030
62.00	4,834	4,403	14,432

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 20.22 hrs HW=60.66' TW=59.31' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.08 cfs of 3.75 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.21 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.38 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>6.03"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.045 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>5.99"
Tc=5.0 min CN=80/98 Runoff=0.34 cfs 0.115 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.094 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>5.98"
Tc=5.0 min CN=80/98 Runoff=0.22 cfs 0.075 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>5.48"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.044 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>4.23"
Tc=5.0 min CN=80/0 Runoff=3.98 cfs 1.311 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.89 cfs 0.302 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>4.77"
Tc=5.0 min CN=85/0 Runoff=4.58 cfs 1.479 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=1.93 cfs 0.651 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>5.79"
Tc=5.0 min CN=80/98 Runoff=0.50 cfs 0.169 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.031 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.85 cfs 0.287 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.99 cfs 0.333 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>5.57"
Tc=0.0 min CN=85/98 Runoff=0.40 cfs 0.130 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>6.26"
Tc=0.0 min CN=0/98 Runoff=0.03 cfs 0.010 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>6.19"
Tc=5.0 min CN=80/98 Runoff=2.00 cfs 0.676 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>5.70"
Tc=5.0 min CN=80/98 Runoff=0.47 cfs 0.157 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>5.72"
Tc=5.0 min CN=80/98 Runoff=0.48 cfs 0.162 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.37 cfs 0.125 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>6.16"
Tc=5.0 min CN=80/98 Runoff=0.35 cfs 0.118 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.49 cfs 0.167 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.71 cfs 0.240 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>4.77"
Tc=5.0 min CN=85/0 Runoff=9.48 cfs 3.061 af

Reach 1R: 12" Avg. Flow Depth=0.19' Max Vel=2.10 fps Inflow=0.22 cfs 0.245 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.22 cfs 0.245 af

Reach 2R: 18" Avg. Flow Depth=0.75' Max Vel=2.90 fps Inflow=2.55 cfs 0.878 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=2.55 cfs 0.877 af

Reach 3R: 12" Avg. Flow Depth=0.18' Max Vel=1.54 fps Inflow=0.14 cfs 0.134 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.14 cfs 0.134 af

Reach 4R: 12" Avg. Flow Depth=0.20' Max Vel=5.41 fps Inflow=0.60 cfs 0.292 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.60 cfs 0.292 af

Reach 10R: SWALE Avg. Flow Depth=0.18' Max Vel=0.18 fps Inflow=0.13 cfs 0.044 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.13 cfs 0.044 af

Reach 11R: SWALE Avg. Flow Depth=0.31' Max Vel=0.25 fps Inflow=0.35 cfs 0.119 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.34 cfs 0.118 af

Reach 12R: SWALE Avg. Flow Depth=0.43' Max Vel=0.29 fps Inflow=0.61 cfs 0.212 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.60 cfs 0.211 af

Reach 13R: SWALE Avg. Flow Depth=0.72' Max Vel=0.39 fps Inflow=1.63 cfs 0.565 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.62 cfs 0.564 af

Reach 14R: SWALE Avg. Flow Depth=0.75' Max Vel=0.40 fps Inflow=1.75 cfs 0.609 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=1.73 cfs 0.607 af

Reach 15R: 18" Avg. Flow Depth=0.86' Max Vel=3.17 fps Inflow=3.35 cfs 2.104 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=3.35 cfs 2.104 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=4.52 cfs 2.962 af
Outflow=4.52 cfs 2.962 af

Pond Bioretention: BIORETENTION Peak Elev=66.78' Storage=2,435 cf Inflow=2.00 cfs 0.676 af
Outflow=1.55 cfs 0.664 af

Pond Pond 1: TREATMENT Peak Elev=66.07' Storage=18,943 cf Inflow=2.82 cfs 0.953 af
Outflow=0.57 cfs 0.575 af

Pond Pond 2: TREATMENT Peak Elev=58.61' Storage=16,206 cf Inflow=2.32 cfs 0.944 af
Outflow=0.89 cfs 0.652 af

Pond Pond 3: TREATMENT Peak Elev=60.62' Storage=2,942 cf Inflow=0.80 cfs 0.265 af
Outflow=0.22 cfs 0.245 af

Pond Pond 4: DETENTION Peak Elev=61.14' Storage=1,724 cf Inflow=0.85 cfs 0.287 af
Outflow=0.82 cfs 0.271 af

Pond Pond 5: DETENTION Peak Elev=62.10' Storage=3,884 cf Inflow=0.99 cfs 0.333 af
Outflow=0.60 cfs 0.292 af

Pond Pond 6: TREATMENT Peak Elev=60.75' Storage=9,059 cf Inflow=0.99 cfs 0.336 af
Outflow=0.14 cfs 0.134 af

Total Runoff Area = 22.860 ac Runoff Volume = 9.781 af Average Runoff Depth = 5.13"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.13 cfs @ 7.88 hrs, Volume= 0.045 af, Depth> 6.03"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.34 cfs @ 7.88 hrs, Volume= 0.115 af, Depth> 5.99"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.28 cfs @ 7.87 hrs, Volume= 0.094 af, Depth> 6.25"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.22 cfs @ 7.88 hrs, Volume= 0.075 af, Depth> 5.98"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af, Depth> 5.48"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 3.98 cfs @ 7.93 hrs, Volume= 1.311 af, Depth> 4.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.89 cfs @ 7.87 hrs, Volume= 0.302 af, Depth> 6.25"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 4.58 cfs @ 7.91 hrs, Volume= 1.479 af, Depth> 4.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 1.93 cfs @ 7.87 hrs, Volume= 0.651 af, Depth> 6.25"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.50 cfs @ 7.88 hrs, Volume= 0.169 af, Depth> 5.79"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.09 cfs @ 7.87 hrs, Volume= 0.031 af, Depth> 6.25"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.85 cfs @ 7.87 hrs, Volume= 0.287 af, Depth> 6.25"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.99 cfs @ 7.87 hrs, Volume= 0.333 af, Depth> 6.25"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.40 cfs @ 7.80 hrs, Volume= 0.130 af, Depth> 5.57"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.03 cfs @ 7.78 hrs, Volume= 0.010 af, Depth> 6.26"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 2.00 cfs @ 7.88 hrs, Volume= 0.676 af, Depth> 6.19"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.47 cfs @ 7.89 hrs, Volume= 0.157 af, Depth> 5.70"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.48 cfs @ 7.89 hrs, Volume= 0.162 af, Depth> 5.72"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.37 cfs @ 7.87 hrs, Volume= 0.125 af, Depth> 6.25"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.35 cfs @ 7.88 hrs, Volume= 0.118 af, Depth> 6.16"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.49 cfs @ 7.87 hrs, Volume= 0.167 af, Depth> 6.25"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.71 cfs @ 7.87 hrs, Volume= 0.240 af, Depth> 6.25"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 9.48 cfs @ 7.91 hrs, Volume= 3.061 af, Depth> 4.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

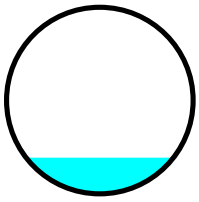
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 5.44" for 100-YEAR event
Inflow = 0.22 cfs @ 9.11 hrs, Volume= 0.245 af
Outflow = 0.22 cfs @ 9.11 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.2 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.10 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 9.11 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.79'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



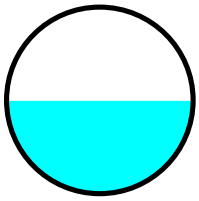
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 5.99" for 100-YEAR event
Inflow = 2.55 cfs @ 8.01 hrs, Volume= 0.878 af
Outflow = 2.55 cfs @ 8.01 hrs, Volume= 0.877 af, Atten= 0%, Lag= 0.4 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.90 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 1.1 min

Peak Storage= 95 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



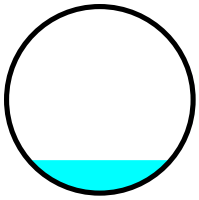
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 2.39" for 100-YEAR event
Inflow = 0.14 cfs @ 14.62 hrs, Volume= 0.134 af
Outflow = 0.14 cfs @ 14.63 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.5 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.54 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 0.7 min

Peak Storage= 6 cf @ 14.63 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



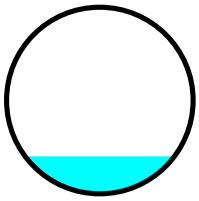
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 5.48" for 100-YEAR event
Inflow = 0.60 cfs @ 8.17 hrs, Volume= 0.292 af
Outflow = 0.60 cfs @ 8.17 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 5.41 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.34 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 8.17 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 5.48" for 100-YEAR event
Inflow = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af
Outflow = 0.13 cfs @ 8.00 hrs, Volume= 0.044 af, Atten= 3%, Lag= 6.5 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.18 fps, Min. Travel Time= 9.3 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 18.3 min

Peak Storage= 71 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 4.56'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 5.77" for 100-YEAR event
Inflow = 0.35 cfs @ 7.93 hrs, Volume= 0.119 af
Outflow = 0.34 cfs @ 8.00 hrs, Volume= 0.118 af, Atten= 2%, Lag= 4.3 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.25 fps, Min. Travel Time= 6.8 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 12.8 min

Peak Storage= 137 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 5.36'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 5.95" for 100-YEAR event
Inflow = 0.61 cfs @ 7.96 hrs, Volume= 0.212 af
Outflow = 0.60 cfs @ 8.01 hrs, Volume= 0.211 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.29 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 10.4 min

Peak Storage= 204 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.43' , Surface Width= 6.06'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 6.07" for 100-YEAR event
Inflow = 1.63 cfs @ 7.94 hrs, Volume= 0.565 af
Outflow = 1.62 cfs @ 7.99 hrs, Volume= 0.564 af, Atten= 1%, Lag= 3.1 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.39 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 7.5 min

Peak Storage= 410 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.72' , Surface Width= 7.84'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 6.05" for 100-YEAR event
Inflow = 1.75 cfs @ 7.98 hrs, Volume= 0.609 af
Outflow = 1.73 cfs @ 8.01 hrs, Volume= 0.607 af, Atten= 1%, Lag= 1.8 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.40 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 6.4 min

Peak Storage= 375 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 8.00'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

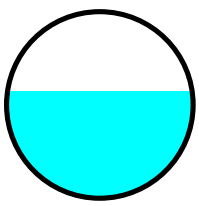
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 4.62" for 100-YEAR event
Inflow = 3.35 cfs @ 8.04 hrs, Volume= 2.104 af
Outflow = 3.35 cfs @ 8.04 hrs, Volume= 2.104 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.17 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.23 fps, Avg. Travel Time= 0.2 min

Peak Storage= 24 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.86' , Surface Width= 1.48'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 4.61" for 100-YEAR event
Inflow = 4.52 cfs @ 8.05 hrs, Volume= 2.962 af
Outflow = 4.52 cfs @ 8.05 hrs, Volume= 2.962 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 6.19" for 100-YEAR event
Inflow = 2.00 cfs @ 7.88 hrs, Volume= 0.676 af
Outflow = 1.55 cfs @ 8.07 hrs, Volume= 0.664 af, Atten= 23%, Lag= 11.7 min
Primary = 1.55 cfs @ 8.07 hrs, Volume= 0.664 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.78' @ 8.07 hrs Surf.Area= 4,415 sf Storage= 2,435 cf

Plug-Flow detention time= 36.6 min calculated for 0.664 af (98% of inflow)
Center-of-Mass det. time= 23.3 min (674.2 - 650.9)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.55 cfs @ 8.07 hrs HW=66.78' TW=58.26' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.55 cfs @ 2.37 fps)
└─**2=Orifice/Grate** (Passes < 1.49 cfs potential flow)
└─**3=Exfiltration** (Passes < 1.23 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 2.82 cfs @ 7.87 hrs, Volume= 0.953 af
Outflow = 0.57 cfs @ 10.41 hrs, Volume= 0.575 af, Atten= 80%, Lag= 152.4 min
Primary = 0.57 cfs @ 10.41 hrs, Volume= 0.575 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.07' @ 10.41 hrs Surf.Area= 6,396 sf Storage= 18,943 cf

Plug-Flow detention time= 484.4 min calculated for 0.574 af (60% of inflow)
Center-of-Mass det. time= 253.8 min (902.5 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	25,474 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,550	0	0
62.00	2,276	1,913	1,913
63.00	3,114	2,695	4,608
64.00	4,067	3,591	8,199
65.00	5,131	4,599	12,798
66.00	6,310	5,721	18,518
67.00	7,601	6,956	25,474

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.57 cfs @ 10.41 hrs HW=66.07' TW=52.72' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.57 cfs of 8.08 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 10.84 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.33 cfs @ 6.71 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.18 cfs @ 0.85 fps)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 6.03" for 100-YEAR event
Inflow = 2.32 cfs @ 8.00 hrs, Volume= 0.944 af
Outflow = 0.89 cfs @ 9.29 hrs, Volume= 0.652 af, Atten= 62%, Lag= 77.4 min
Primary = 0.89 cfs @ 9.29 hrs, Volume= 0.652 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.61' @ 9.29 hrs Surf.Area= 7,704 sf Storage= 16,206 cf

Plug-Flow detention time= 369.3 min calculated for 0.651 af (69% of inflow)
Center-of-Mass det. time= 180.0 min (850.5 - 670.5)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	28,891 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	1,224	0	0
56.00	3,062	2,143	2,143
57.00	4,970	4,016	6,159
58.00	6,466	5,718	11,877
59.00	8,493	7,480	19,357
60.00	10,576	9,535	28,891

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 9.29 hrs HW=58.61' TW=52.73' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.74 cfs @ 3.76 fps)
- **2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 3.07 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 5.90" for 100-YEAR event
Inflow = 0.80 cfs @ 7.84 hrs, Volume= 0.265 af
Outflow = 0.22 cfs @ 9.11 hrs, Volume= 0.245 af, Atten= 72%, Lag= 76.2 min
Primary = 0.22 cfs @ 9.11 hrs, Volume= 0.245 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.62' @ 9.11 hrs Surf.Area= 2,682 sf Storage= 2,942 cf

Plug-Flow detention time= 175.8 min calculated for 0.245 af (92% of inflow)
Center-of-Mass det. time= 118.6 min (780.9 - 662.3)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	7,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	1,021	0	0
60.00	1,982	1,502	1,502
61.00	3,115	2,549	4,050
62.00	4,315	3,715	7,765

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.22 cfs @ 9.11 hrs HW=60.62' TW=59.19' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.22 cfs of 4.00 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.13 cfs @ 5.75 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.10 cfs @ 4.50 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 0.85 cfs @ 7.87 hrs, Volume= 0.287 af
Outflow = 0.82 cfs @ 7.99 hrs, Volume= 0.271 af, Atten= 4%, Lag= 7.2 min
Primary = 0.82 cfs @ 7.99 hrs, Volume= 0.271 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 61.14' @ 7.99 hrs Surf.Area= 1,323 sf Storage= 1,724 cf

Plug-Flow detention time= 96.7 min calculated for 0.271 af (94% of inflow)
Center-of-Mass det. time= 55.0 min (703.7 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,141 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	412	0	0
60.00	731	572	572
61.00	1,217	974	1,546
62.00	1,974	1,596	3,141

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.82 cfs @ 7.99 hrs HW=61.14' TW=53.35' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 7.04 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.24 cfs @ 4.85 fps)
  └─**3=Orifice/Grate** (Weir Controls 0.54 cfs @ 1.23 fps)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 6.25" for 100-YEAR event
Inflow = 0.99 cfs @ 7.87 hrs, Volume= 0.333 af
Outflow = 0.60 cfs @ 8.17 hrs, Volume= 0.292 af, Atten= 39%, Lag= 17.8 min
Primary = 0.60 cfs @ 8.17 hrs, Volume= 0.292 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 62.10' @ 8.17 hrs Surf.Area= 2,632 sf Storage= 3,884 cf

Plug-Flow detention time= 216.7 min calculated for 0.292 af (88% of inflow)
Center-of-Mass det. time= 128.0 min (776.7 - 648.7)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	6,572 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	1,086	0	0
61.00	1,802	1,444	1,444
62.00	2,550	2,176	3,620
63.00	3,353	2,952	6,572

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.60 cfs @ 8.17 hrs HW=62.10' TW=60.20' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.60 cfs of 4.79 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.64 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.76 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.33 cfs @ 1.04 fps)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 6.01" for 100-YEAR event
Inflow = 0.99 cfs @ 7.88 hrs, Volume= 0.336 af
Outflow = 0.14 cfs @ 14.62 hrs, Volume= 0.134 af, Atten= 86%, Lag= 404.3 min
Primary = 0.14 cfs @ 14.62 hrs, Volume= 0.134 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.75' @ 14.62 hrs Surf.Area= 3,772 sf Storage= 9,059 cf

Plug-Flow detention time= 667.8 min calculated for 0.134 af (40% of inflow)
Center-of-Mass det. time= 367.5 min (1,024.9 - 657.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	14,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	1,228	0	0
58.00	1,802	1,515	1,515
59.00	2,452	2,127	3,642
60.00	3,176	2,814	6,456
61.00	3,971	3,574	10,030
62.00	4,834	4,403	14,432

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.14 cfs @ 14.62 hrs HW=60.75' TW=59.36' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.14 cfs of 3.91 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.44 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 1.70 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>1.86"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.014 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.035 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.030 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>1.51"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.012 af

Subcatchment13S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>0.71"
Tc=5.0 min CN=80/0 Runoff=0.50 cfs 0.221 af

Subcatchment14: W BLDG Runoff Area=0.580 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.30 cfs 0.097 af

Subcatchment15S: CATCH SLOPES Runoff Area=3.723 ac 0.00% Impervious Runoff Depth>0.97"
Tc=5.0 min CN=85/0 Runoff=0.80 cfs 0.302 af

SubcatchmentB1: ADD ALT Runoff Area=1.250 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.64 cfs 0.209 af

SubcatchmentB10: NORTH DR Runoff Area=0.350 ac 77.14% Impervious Runoff Depth>1.71"
Tc=5.0 min CN=80/98 Runoff=0.15 cfs 0.050 af

SubcatchmentB11: SOUTH DR Runoff Area=0.060 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 0.010 af

SubcatchmentB12: BLDG Runoff Area=0.550 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.092 af

SubcatchmentB13: BLDG Runoff Area=0.640 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.33 cfs 0.107 af

SubcatchmentB15: NORTH DR Runoff Area=0.280 ac 53.57% Impervious Runoff Depth>1.53"
Tc=0.0 min CN=85/98 Runoff=0.11 cfs 0.036 af

SubcatchmentB16: NORTH DR Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>2.01"
Tc=0.0 min CN=0/98 Runoff=0.01 cfs 0.003 af

SubcatchmentB2: W PARK Runoff Area=1.310 ac 96.95% Impervious Runoff Depth>1.97"
Tc=5.0 min CN=80/98 Runoff=0.66 cfs 0.215 af

SubcatchmentB3: PRIVATE DR Runoff Area=0.330 ac 72.73% Impervious Runoff Depth>1.66"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.046 af

SubcatchmentB4: PRIVATE DR Runoff Area=0.340 ac 73.53% Impervious Runoff Depth>1.67"
Tc=5.0 min CN=80/98 Runoff=0.14 cfs 0.047 af

SubcatchmentB5: PARKING Runoff Area=0.240 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.12 cfs 0.040 af

SubcatchmentB6: PARKING Runoff Area=0.230 ac 95.65% Impervious Runoff Depth>1.95"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.037 af

SubcatchmentB7: NORTH DR Runoff Area=0.320 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.16 cfs 0.054 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.24 cfs 0.077 af

SubcatchmentEX1: EXISTING POINT OF Runoff Area=7.707 ac 0.00% Impervious Runoff Depth>0.97"
Tc=5.0 min CN=85/0 Runoff=1.66 cfs 0.625 af

Reach 1R: 12" Avg. Flow Depth=0.11' Max Vel=1.49 fps Inflow=0.07 cfs 0.076 af
12.0" Round Pipe n=0.012 L=42.0' S=0.0050 '/' Capacity=2.73 cfs Outflow=0.07 cfs 0.076 af

Reach 2R: 18" Avg. Flow Depth=0.37' Max Vel=2.02 fps Inflow=0.69 cfs 0.268 af
18.0" Round Pipe n=0.012 L=108.0' S=0.0020 '/' Capacity=5.14 cfs Outflow=0.69 cfs 0.268 af

Reach 3R: 12" Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.012 L=60.0' S=0.0030 '/' Capacity=2.11 cfs Outflow=0.00 cfs 0.000 af

Reach 4R: 12" Avg. Flow Depth=0.07' Max Vel=2.92 fps Inflow=0.08 cfs 0.072 af
12.0" Round Pipe n=0.012 L=34.0' S=0.0321 '/' Capacity=6.91 cfs Outflow=0.08 cfs 0.072 af

Reach 10R: SWALE Avg. Flow Depth=0.08' Max Vel=0.11 fps Inflow=0.04 cfs 0.012 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.03 cfs 0.012 af

Reach 11R: SWALE Avg. Flow Depth=0.15' Max Vel=0.16 fps Inflow=0.10 cfs 0.035 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.10 cfs 0.035 af

Reach 12R: SWALE Avg. Flow Depth=0.21' Max Vel=0.20 fps Inflow=0.18 cfs 0.065 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.18 cfs 0.064 af

Reach 13R: SWALE Avg. Flow Depth=0.39' Max Vel=0.28 fps Inflow=0.51 cfs 0.177 af
n=0.240 L=100.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.50 cfs 0.176 af

Reach 14R: SWALE Avg. Flow Depth=0.40' Max Vel=0.28 fps Inflow=0.54 cfs 0.190 af
n=0.240 L=87.0' S=0.0100 '/' Capacity=9.80 cfs Outflow=0.53 cfs 0.189 af

Reach 15R: 18" Avg. Flow Depth=0.37' Max Vel=2.10 fps Inflow=0.72 cfs 0.382 af
18.0" Round Pipe n=0.012 L=23.0' S=0.0022 '/' Capacity=5.31 cfs Outflow=0.72 cfs 0.382 af

Reach POC: PROPOSED POINT OF COMPLIANCE Inflow=0.96 cfs 0.586 af
Outflow=0.96 cfs 0.586 af

Pond Bioretention: BIORETENTION Peak Elev=66.40' Storage=999 cf Inflow=0.66 cfs 0.215 af
Outflow=0.49 cfs 0.209 af

Pond Pond 1: TREATMENT Peak Elev=64.18' Storage=8,961 cf Inflow=0.94 cfs 0.306 af
Outflow=0.10 cfs 0.103 af

Pond Pond 2: TREATMENT Peak Elev=58.06' Storage=12,276 cf Inflow=0.72 cfs 0.293 af
Outflow=0.08 cfs 0.012 af

Pond Pond 3: TREATMENT Peak Elev=59.57' Storage=735 cf Inflow=0.24 cfs 0.079 af
Outflow=0.07 cfs 0.076 af

Pond Pond 4: DETENTION Peak Elev=60.42' Storage=920 cf Inflow=0.28 cfs 0.092 af
Outflow=0.16 cfs 0.079 af

Pond Pond 5: DETENTION Peak Elev=61.17' Storage=1,758 cf Inflow=0.33 cfs 0.107 af
Outflow=0.08 cfs 0.072 af

Pond Pond 6: TREATMENT Peak Elev=59.34' Storage=4,509 cf Inflow=0.31 cfs 0.104 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 22.860 ac Runoff Volume = 2.382 af Average Runoff Depth = 1.25"
68.64% Pervious = 15.690 ac 31.36% Impervious = 7.170 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.04 cfs @ 7.89 hrs, Volume= 0.014 af, Depth> 1.86"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.11 cfs @ 7.89 hrs, Volume= 0.035 af, Depth> 1.84"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.09 cfs @ 7.88 hrs, Volume= 0.030 af, Depth> 2.01"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.07 cfs @ 7.89 hrs, Volume= 0.023 af, Depth> 1.84"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af, Depth> 1.51"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment 13S: CATCH SLOPES

Runoff = 0.50 cfs @ 8.00 hrs, Volume= 0.221 af, Depth> 0.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	3.723	80	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	80	100.00% Pervious Area

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

Summary for Subcatchment 14: W BLDG

Runoff = 0.30 cfs @ 7.88 hrs, Volume= 0.097 af, Depth> 2.01"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.580	98	BLDG
	0.580	98	100.00% Impervious Area

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

Summary for Subcatchment 15S: CATCH SLOPES

Runoff = 0.80 cfs @ 7.99 hrs, Volume= 0.302 af, Depth> 0.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	3.723	85	OFFSITE/DISTURBED PERVIOUS FLOW
	3.723	85	100.00% Pervious Area

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

Summary for Subcatchment B1: ADD ALT

Runoff = 0.64 cfs @ 7.88 hrs, Volume= 0.209 af, Depth> 2.01"
Routed to Pond Pond 1 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.670	98	RD
*	0.580	98	BLDG
	1.250	98	Weighted Average
	1.250	98	100.00% Impervious Area

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

Summary for Subcatchment B10: NORTH DR

Runoff = 0.15 cfs @ 7.90 hrs, Volume= 0.050 af, Depth> 1.71"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.270	98	RD
*	0.080	80	PERV
	0.350	94	Weighted Average
	0.080	80	22.86% Pervious Area
	0.270	98	77.14% Impervious Area

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

Summary for Subcatchment B11: SOUTH DR

Runoff = 0.03 cfs @ 7.88 hrs, Volume= 0.010 af, Depth> 2.01"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
	0.060	98	100.00% Impervious Area

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

Summary for Subcatchment B12: BLDG

Runoff = 0.28 cfs @ 7.88 hrs, Volume= 0.092 af, Depth> 2.01"
Routed to Pond Pond 4 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.550	98	BLDG
	0.550	98	100.00% Impervious Area

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

Summary for Subcatchment B13: BLDG

Runoff = 0.33 cfs @ 7.88 hrs, Volume= 0.107 af, Depth> 2.01"
Routed to Pond Pond 5 : DETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.640	98	
	0.640	98	100.00% Impervious Area

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

Summary for Subcatchment B15: NORTH DR

Runoff = 0.11 cfs @ 7.83 hrs, Volume= 0.036 af, Depth> 1.53"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.150	98	RD
*	0.130	85	PERV
	0.280	92	Weighted Average
	0.130	85	46.43% Pervious Area
	0.150	98	53.57% Impervious Area

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

Summary for Subcatchment B16: NORTH DR

Runoff = 0.01 cfs @ 7.79 hrs, Volume= 0.003 af, Depth> 2.01"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.020	98	RD
	0.020	98	100.00% Impervious Area

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

Summary for Subcatchment B2: W PARK

Runoff = 0.66 cfs @ 7.88 hrs, Volume= 0.215 af, Depth> 1.97"
Routed to Pond Bioretention : BIORETENTION

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	1.170	98	PARKING
*	0.100	98	SW
*	0.040	80	PERV
	1.310	97	Weighted Average
	0.040	80	3.05% Pervious Area
	1.270	98	96.95% Impervious Area

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

Summary for Subcatchment B3: PRIVATE DR

Runoff = 0.13 cfs @ 7.90 hrs, Volume= 0.046 af, Depth> 1.66"
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.080	98	SW
*	0.090	80	PERV
	0.330	93	Weighted Average
	0.090	80	27.27% Pervious Area
	0.240	98	72.73% Impervious Area

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

Summary for Subcatchment B4: PRIVATE DR

Runoff = 0.14 cfs @ 7.90 hrs, Volume= 0.047 af, Depth> 1.67"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.090	80	PERV
*	0.250	98	RD
	0.340	93	Weighted Average
	0.090	80	26.47% Pervious Area
	0.250	98	73.53% Impervious Area

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

Summary for Subcatchment B5: PARKING

Runoff = 0.12 cfs @ 7.88 hrs, Volume= 0.040 af, Depth> 2.01"
Routed to Pond Pond 3 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.190	98	RD
*	0.050	98	SW
	0.240	98	Weighted Average
	0.240	98	100.00% Impervious Area

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

Summary for Subcatchment B6: PARKING

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.037 af, Depth> 1.95"
Routed to Pond Pond 2 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.030	98	SW
*	0.190	98	RD
*	0.010	80	PERV
	0.230	97	Weighted Average
	0.010	80	4.35% Pervious Area
	0.220	98	95.65% Impervious Area

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

Summary for Subcatchment B7: NORTH DR

Runoff = 0.16 cfs @ 7.88 hrs, Volume= 0.054 af, Depth> 2.01"
Routed to Pond Pond 6 : TREATMENT

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.320	98	RD
	0.320	98	100.00% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.24 cfs @ 7.88 hrs, Volume= 0.077 af, Depth> 2.01"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Subcatchment EX1: EXISTING POINT OF COMPLIANCE

Runoff = 1.66 cfs @ 7.99 hrs, Volume= 0.625 af, Depth> 0.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	7.707	85	PERVIOUS
	7.707	85	100.00% Pervious Area

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

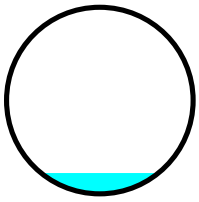
Summary for Reach 1R: 12"

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 1.69" for WQ-YEAR event
Inflow = 0.07 cfs @ 9.07 hrs, Volume= 0.076 af
Outflow = 0.07 cfs @ 9.08 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.3 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.49 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 0.6 min

Peak Storage= 2 cf @ 9.08 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.73 cfs

12.0" Round Pipe
n= 0.012
Length= 42.0' Slope= 0.0050 '/'
Inlet Invert= 59.00', Outlet Invert= 58.79'



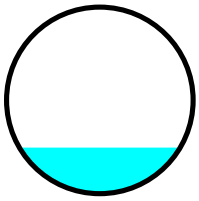
Summary for Reach 2R: 18"

Inflow Area = 1.757 ac, 94.48% Impervious, Inflow Depth > 1.83" for WQ-YEAR event
Inflow = 0.69 cfs @ 8.05 hrs, Volume= 0.268 af
Outflow = 0.69 cfs @ 8.06 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.02 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 1.5 min

Peak Storage= 37 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 1.29'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.14 cfs

18.0" Round Pipe
n= 0.012
Length= 108.0' Slope= 0.0020 '/'
Inlet Invert= 52.60', Outlet Invert= 52.38'



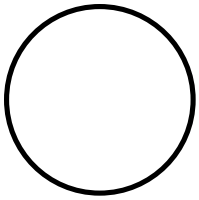
Summary for Reach 3R: 12"

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth = 0.00" for WQ-YEAR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.11 cfs

12.0" Round Pipe
n= 0.012
Length= 60.0' Slope= 0.0030 '/'
Inlet Invert= 59.18', Outlet Invert= 59.00'



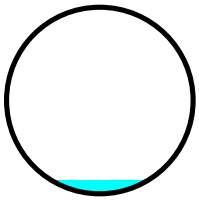
Summary for Reach 4R: 12"

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 1.35" for WQ-YEAR event
Inflow = 0.08 cfs @ 9.82 hrs, Volume= 0.072 af
Outflow = 0.08 cfs @ 9.82 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.92 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 9.82 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 0.52'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.91 cfs

12.0" Round Pipe
n= 0.012
Length= 34.0' Slope= 0.0321 '/'
Inlet Invert= 60.00', Outlet Invert= 58.91'



Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 1.51" for WQ-YEAR event
Inflow = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af
Outflow = 0.03 cfs @ 8.02 hrs, Volume= 0.012 af, Atten= 8%, Lag= 6.8 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.11 fps, Min. Travel Time= 15.2 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 28.6 min

Peak Storage= 30 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 3.97'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 1.70" for WQ-YEAR event
Inflow = 0.10 cfs @ 7.96 hrs, Volume= 0.035 af
Outflow = 0.10 cfs @ 8.02 hrs, Volume= 0.035 af, Atten= 5%, Lag= 3.9 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.16 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 19.7 min

Peak Storage= 59 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 4.40'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 1.82" for WQ-YEAR event
Inflow = 0.18 cfs @ 7.99 hrs, Volume= 0.065 af
Outflow = 0.18 cfs @ 8.03 hrs, Volume= 0.064 af, Atten= 4%, Lag= 2.4 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.20 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 15.8 min

Peak Storage= 89 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 4.79'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 1.90" for WQ-YEAR event
Inflow = 0.51 cfs @ 7.96 hrs, Volume= 0.177 af
Outflow = 0.50 cfs @ 8.01 hrs, Volume= 0.176 af, Atten= 1%, Lag= 2.9 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.28 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 11.0 min

Peak Storage= 180 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 5.81'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 1.89" for WQ-YEAR event
Inflow = 0.54 cfs @ 8.00 hrs, Volume= 0.190 af
Outflow = 0.53 cfs @ 8.04 hrs, Volume= 0.189 af, Atten= 2%, Lag= 2.2 min
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.28 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 9.4 min

Peak Storage= 163 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 5.89'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 9.80 cfs

3.50' x 1.75' deep channel, n= 0.240
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

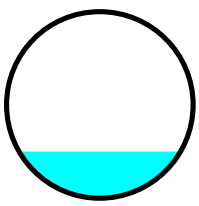
Summary for Reach 15R: 18"

Inflow Area = 5.467 ac, 95.66% Impervious, Inflow Depth > 0.84" for WQ-YEAR event
Inflow = 0.72 cfs @ 8.06 hrs, Volume= 0.382 af
Outflow = 0.72 cfs @ 8.06 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.1 min
Routed to Reach POC : PROPOSED POINT OF COMPLIANCE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.10 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 1.30'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.31 cfs

18.0" Round Pipe
n= 0.012
Length= 23.0' Slope= 0.0022 '/'
Inlet Invert= 52.08', Outlet Invert= 52.03'



Summary for Reach POC: PROPOSED POINT OF COMPLIANCE

Inflow Area = 7.707 ac, 93.03% Impervious, Inflow Depth > 0.91" for WQ-YEAR event
Inflow = 0.96 cfs @ 8.01 hrs, Volume= 0.586 af
Outflow = 0.96 cfs @ 8.01 hrs, Volume= 0.586 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Summary for Pond Bioretention: BIORETENTION

Inflow Area = 1.310 ac, 96.95% Impervious, Inflow Depth > 1.97" for WQ-YEAR event
Inflow = 0.66 cfs @ 7.88 hrs, Volume= 0.215 af
Outflow = 0.49 cfs @ 8.08 hrs, Volume= 0.209 af, Atten= 25%, Lag= 12.0 min
Primary = 0.49 cfs @ 8.08 hrs, Volume= 0.209 af
Routed to Pond Pond 2 : TREATMENT

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 66.40' @ 8.08 hrs Surf.Area= 3,167 sf Storage= 999 cf

Plug-Flow detention time= 54.6 min calculated for 0.209 af (97% of inflow)
Center-of-Mass det. time= 33.2 min (710.2 - 677.1)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	3,504 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	1,857	0	0
67.00	5,151	3,504	3,504

Device	Routing	Invert	Outlet Devices
#1	Primary	66.00'	**12.0" Round Culvert** L= 67.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.00' / 65.67' S= 0.0049 '/' Cc= 0.900 n= 0.010, Flow Area= 0.79 sf
#2	Device 1	66.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	66.00'	**12.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.49 cfs @ 8.08 hrs HW=66.40' TW=56.44' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.49 cfs @ 1.70 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Exfiltration** (Passes 0.49 cfs of 0.88 cfs potential flow)

Summary for Pond Pond 1: TREATMENT

Inflow Area = 1.830 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.94 cfs @ 7.88 hrs, Volume= 0.306 af
Outflow = 0.10 cfs @ 19.92 hrs, Volume= 0.103 af, Atten= 89%, Lag= 722.5 min
Primary = 0.10 cfs @ 19.92 hrs, Volume= 0.103 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 64.18' @ 19.92 hrs Surf.Area= 4,262 sf Storage= 8,961 cf

Plug-Flow detention time= 621.2 min calculated for 0.103 af (34% of inflow)
Center-of-Mass det. time= 308.8 min (983.8 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	25,474 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,550	0	0
62.00	2,276	1,913	1,913
63.00	3,114	2,695	4,608
64.00	4,067	3,591	8,199
65.00	5,131	4,599	12,798
66.00	6,310	5,721	18,518
67.00	7,601	6,956	25,474

Device	Routing	Invert	Outlet Devices
#1	Device 2	61.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	61.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	64.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	66.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.10 cfs @ 19.92 hrs HW=64.18' TW=52.28' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.10 cfs of 6.19 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.59 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.46 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 2: TREATMENT

Inflow Area = 1.880 ac, 92.55% Impervious, Inflow Depth > 1.87" for WQ-YEAR event
Inflow = 0.72 cfs @ 8.00 hrs, Volume= 0.293 af
Outflow = 0.08 cfs @ 24.00 hrs, Volume= 0.012 af, Atten= 89%, Lag= 959.9 min
Primary = 0.08 cfs @ 24.00 hrs, Volume= 0.012 af
Routed to Reach 15R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 58.06' @ 24.00 hrs Surf.Area= 6,590 sf Storage= 12,276 cf

Plug-Flow detention time= 1,180.7 min calculated for 0.012 af (4% of inflow)
Center-of-Mass det. time= 675.6 min (1,379.5 - 703.9)

Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	28,891 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.00	1,224	0	0
56.00	3,062	2,143	2,143
57.00	4,970	4,016	6,159
58.00	6,466	5,718	11,877
59.00	8,493	7,480	19,357
60.00	10,576	9,535	28,891

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	58.08'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 24.00 hrs HW=58.06' TW=52.30' (Dynamic Tailwater)
- **1=Orifice/Grate** (Weir Controls 0.08 cfs @ 0.81 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 3: TREATMENT

Inflow Area = 0.540 ac, 75.93% Impervious, Inflow Depth > 1.76" for WQ-YEAR event
Inflow = 0.24 cfs @ 7.86 hrs, Volume= 0.079 af
Outflow = 0.07 cfs @ 9.07 hrs, Volume= 0.076 af, Atten= 70%, Lag= 73.0 min
Primary = 0.07 cfs @ 9.07 hrs, Volume= 0.076 af
Routed to Reach 1R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.57' @ 9.07 hrs Surf.Area= 1,567 sf Storage= 735 cf

Plug-Flow detention time= 127.4 min calculated for 0.076 af (96% of inflow)
Center-of-Mass det. time= 98.5 min (791.0 - 692.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	7,765 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	1,021	0	0
60.00	1,982	1,502	1,502
61.00	3,115	2,549	4,050
62.00	4,315	3,715	7,765

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.00'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	59.66'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.07 cfs @ 9.07 hrs HW=59.57' TW=59.11' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.07 cfs of 1.18 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.07 cfs @ 3.25 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 4: DETENTION

Inflow Area = 0.550 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.28 cfs @ 7.88 hrs, Volume= 0.092 af
Outflow = 0.16 cfs @ 8.22 hrs, Volume= 0.079 af, Atten= 43%, Lag= 20.1 min
Primary = 0.16 cfs @ 8.22 hrs, Volume= 0.079 af
Routed to Reach 2R : 18"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 60.42' @ 8.22 hrs Surf.Area= 935 sf Storage= 920 cf

Plug-Flow detention time= 180.7 min calculated for 0.079 af (86% of inflow)
Center-of-Mass det. time= 82.0 min (757.0 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,141 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	412	0	0
60.00	731	572	572
61.00	1,217	974	1,546
62.00	1,974	1,596	3,141

Device	Routing	Invert	Outlet Devices
#1	Primary	59.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 8.22 hrs HW=60.42' TW=52.95' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.74 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 2.61 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 5: DETENTION

Inflow Area = 0.640 ac,100.00% Impervious, Inflow Depth > 2.01" for WQ-YEAR event
Inflow = 0.33 cfs @ 7.88 hrs, Volume= 0.107 af
Outflow = 0.08 cfs @ 9.82 hrs, Volume= 0.072 af, Atten= 77%, Lag= 116.4 min
Primary = 0.08 cfs @ 9.82 hrs, Volume= 0.072 af
Routed to Reach 4R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 61.17' @ 9.82 hrs Surf.Area= 1,928 sf Storage= 1,758 cf

Plug-Flow detention time= 370.8 min calculated for 0.072 af (67% of inflow)
Center-of-Mass det. time= 172.9 min (847.8 - 675.0)

Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	6,572 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	1,086	0	0
61.00	1,802	1,444	1,444
62.00	2,550	2,176	3,620
63.00	3,353	2,952	6,572

Device	Routing	Invert	Outlet Devices
#1	Device 2	60.00'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	60.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	61.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	62.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 9.82 hrs HW=61.17' TW=60.07' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Passes 0.08 cfs of 3.09 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.04 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.40 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond Pond 6: TREATMENT

Inflow Area = 0.670 ac, 88.06% Impervious, Inflow Depth > 1.85" for WQ-YEAR event
Inflow = 0.31 cfs @ 7.89 hrs, Volume= 0.104 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 3R : 12"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.34' @ 24.00 hrs Surf.Area= 2,696 sf Storage= 4,509 cf

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

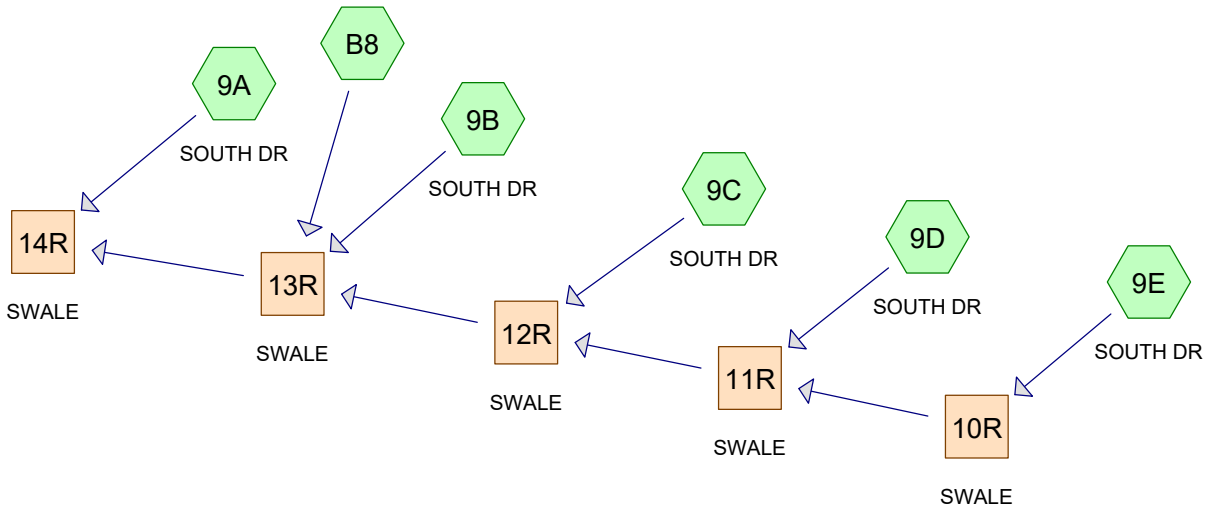
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	14,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	1,228	0	0
58.00	1,802	1,515	1,515
59.00	2,452	2,127	3,642
60.00	3,176	2,814	6,456
61.00	3,971	3,574	10,030
62.00	4,834	4,403	14,432

Device	Routing	Invert	Outlet Devices
#1	Device 2	59.90'	**1.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	59.18'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	60.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	61.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.00' TW=59.18' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

HydroCAD-3 Swale Conveyance



Subcat Reach Pond Link

Routing Diagram for 90Percent-SwaleConveyance
Prepared by Apex Companies LLC, Printed 4/8/2025
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YEAR	Type IA 24-hr		Default	24.00	1	3.50	2
2	10-YEAR	Type IA 24-hr		Default	24.00	1	5.00	2
3	100-YEAR	Type IA 24-hr		Default	24.00	1	6.50	2
4	WQ-YEAR	Type IA 24-hr		Default	24.00	1	2.24	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.097	80	PERV (9A, 9B, 9D, 9E)
0.980	98	RD (9A, 9B, 9C, 9D, 9E, B8)
0.130	98	SW (9A, 9B, 9C, 9D, B8)
1.207	**97**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>3.08"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>3.05"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.058 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.15 cfs 0.049 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>3.04"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.038 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>2.64"
Tc=5.0 min CN=80/98 Runoff=0.06 cfs 0.021 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=0/98 Runoff=0.38 cfs 0.125 af

Reach 10R: SWALE Avg. Flow Depth=0.03' Max Vel=0.51 fps Inflow=0.06 cfs 0.021 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.06 cfs 0.021 af

Reach 11R: SWALE Avg. Flow Depth=0.06' Max Vel=0.76 fps Inflow=0.18 cfs 0.059 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.18 cfs 0.059 af

Reach 12R: SWALE Avg. Flow Depth=0.09' Max Vel=0.95 fps Inflow=0.32 cfs 0.108 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.32 cfs 0.108 af

Reach 13R: SWALE Avg. Flow Depth=0.16' Max Vel=1.35 fps Inflow=0.87 cfs 0.291 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.87 cfs 0.291 af

Reach 14R: SWALE Avg. Flow Depth=0.17' Max Vel=1.39 fps Inflow=0.94 cfs 0.314 af
n=0.030 L=87.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.94 cfs 0.314 af

Total Runoff Area = 1.207 ac Runoff Volume = 0.315 af Average Runoff Depth = 3.13"
8.04% Pervious = 0.097 ac 91.96% Impervious = 1.110 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.023 af, Depth> 3.08"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.058 af, Depth> 3.05"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.15 cfs @ 7.88 hrs, Volume= 0.049 af, Depth> 3.26"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.038 af, Depth> 3.04"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af, Depth> 2.64"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.38 cfs @ 7.88 hrs, Volume= 0.125 af, Depth> 3.26"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YEAR Rainfall=3.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 2.64" for 2-YEAR event
Inflow = 0.06 cfs @ 7.90 hrs, Volume= 0.021 af
Outflow = 0.06 cfs @ 7.94 hrs, Volume= 0.021 af, Atten= 0%, Lag= 2.4 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.51 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 5.0 min

Peak Storage= 12 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 3.70'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 2.88" for 2-YEAR event
Inflow = 0.18 cfs @ 7.91 hrs, Volume= 0.059 af
Outflow = 0.18 cfs @ 7.93 hrs, Volume= 0.059 af, Atten= 0%, Lag= 1.4 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.76 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 4.3 min

Peak Storage= 23 cf @ 7.93 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 3.88'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 3.04" for 2-YEAR event
Inflow = 0.32 cfs @ 7.91 hrs, Volume= 0.108 af
Outflow = 0.32 cfs @ 7.92 hrs, Volume= 0.108 af, Atten= 0%, Lag= 1.1 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.95 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 3.5 min

Peak Storage= 34 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 4.04'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 3.13" for 2-YEAR event
Inflow = 0.87 cfs @ 7.90 hrs, Volume= 0.291 af
Outflow = 0.87 cfs @ 7.91 hrs, Volume= 0.291 af, Atten= 0%, Lag= 0.8 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.35 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 2.4 min

Peak Storage= 64 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 4.47'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 3.12" for 2-YEAR event
Inflow = 0.94 cfs @ 7.91 hrs, Volume= 0.314 af
Outflow = 0.94 cfs @ 7.92 hrs, Volume= 0.314 af, Atten= 0%, Lag= 0.7 min
Routed to nonexistent node 2R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.39 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 2.1 min

Peak Storage= 59 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 4.51'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>4.55"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.034 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.26 cfs 0.086 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.21 cfs 0.071 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>4.51"
Tc=5.0 min CN=80/98 Runoff=0.17 cfs 0.056 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>4.04"
Tc=5.0 min CN=80/98 Runoff=0.10 cfs 0.033 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>4.76"
Tc=5.0 min CN=0/98 Runoff=0.54 cfs 0.182 af

Reach 10R: SWALE Avg. Flow Depth=0.04' Max Vel=0.61 fps Inflow=0.10 cfs 0.033 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.10 cfs 0.033 af

Reach 11R: SWALE Avg. Flow Depth=0.08' Max Vel=0.88 fps Inflow=0.26 cfs 0.089 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.26 cfs 0.089 af

Reach 12R: SWALE Avg. Flow Depth=0.11' Max Vel=1.09 fps Inflow=0.48 cfs 0.160 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.48 cfs 0.160 af

Reach 13R: SWALE Avg. Flow Depth=0.20' Max Vel=1.54 fps Inflow=1.28 cfs 0.429 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=1.27 cfs 0.428 af

Reach 14R: SWALE Avg. Flow Depth=0.21' Max Vel=1.58 fps Inflow=1.38 cfs 0.462 af
n=0.030 L=87.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=1.38 cfs 0.462 af

Total Runoff Area = 1.207 ac Runoff Volume = 0.463 af Average Runoff Depth = 4.61"
8.04% Pervious = 0.097 ac 91.96% Impervious = 1.110 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.10 cfs @ 7.88 hrs, Volume= 0.034 af, Depth> 4.55"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.26 cfs @ 7.88 hrs, Volume= 0.086 af, Depth> 4.51"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.21 cfs @ 7.88 hrs, Volume= 0.071 af, Depth> 4.76"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.17 cfs @ 7.88 hrs, Volume= 0.056 af, Depth> 4.51"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af, Depth> 4.04"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.54 cfs @ 7.88 hrs, Volume= 0.182 af, Depth> 4.76"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YEAR Rainfall=5.00"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 4.04" for 10-YEAR event
Inflow = 0.10 cfs @ 7.90 hrs, Volume= 0.033 af
Outflow = 0.10 cfs @ 7.93 hrs, Volume= 0.033 af, Atten= 0%, Lag= 1.7 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.61 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 4.8 min

Peak Storage= 16 cf @ 7.93 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 3.76'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 4.32" for 10-YEAR event
Inflow = 0.26 cfs @ 7.90 hrs, Volume= 0.089 af
Outflow = 0.26 cfs @ 7.92 hrs, Volume= 0.089 af, Atten= 0%, Lag= 1.2 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.88 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 3.7 min

Peak Storage= 30 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 3.98'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

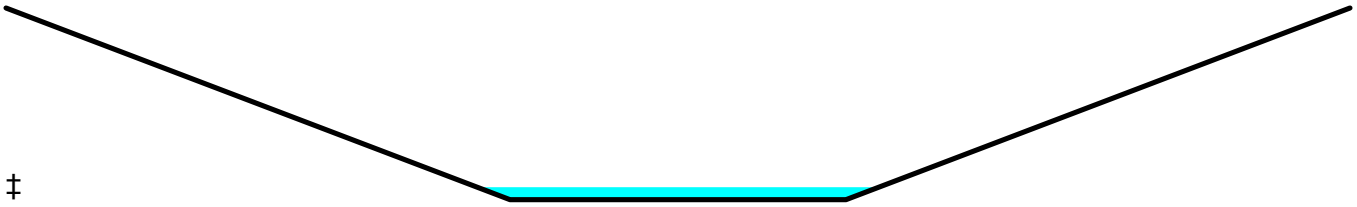
Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 4.50" for 10-YEAR event
Inflow = 0.48 cfs @ 7.90 hrs, Volume= 0.160 af
Outflow = 0.48 cfs @ 7.92 hrs, Volume= 0.160 af, Atten= 0%, Lag= 1.0 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.09 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 3.0 min

Peak Storage= 44 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 4.18'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'



‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 4.61" for 10-YEAR event
Inflow = 1.28 cfs @ 7.89 hrs, Volume= 0.429 af
Outflow = 1.27 cfs @ 7.90 hrs, Volume= 0.428 af, Atten= 0%, Lag= 0.7 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.54 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 2.1 min

Peak Storage= 83 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 4.71'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 4.60" for 10-YEAR event
Inflow = 1.38 cfs @ 7.90 hrs, Volume= 0.462 af
Outflow = 1.38 cfs @ 7.91 hrs, Volume= 0.462 af, Atten= 0%, Lag= 0.6 min
Routed to nonexistent node 2R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.58 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 1.8 min

Peak Storage= 76 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 4.76'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>6.03"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.045 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>5.99"
Tc=5.0 min CN=80/98 Runoff=0.34 cfs 0.115 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.094 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>5.98"
Tc=5.0 min CN=80/98 Runoff=0.22 cfs 0.075 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>5.48"
Tc=5.0 min CN=80/98 Runoff=0.13 cfs 0.044 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>6.25"
Tc=5.0 min CN=0/98 Runoff=0.71 cfs 0.240 af

Reach 10R: SWALE Avg. Flow Depth=0.05' Max Vel=0.68 fps Inflow=0.13 cfs 0.044 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.13 cfs 0.044 af

Reach 11R: SWALE Avg. Flow Depth=0.09' Max Vel=0.98 fps Inflow=0.35 cfs 0.119 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.35 cfs 0.119 af

Reach 12R: SWALE Avg. Flow Depth=0.13' Max Vel=1.21 fps Inflow=0.63 cfs 0.213 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.63 cfs 0.212 af

Reach 13R: SWALE Avg. Flow Depth=0.24' Max Vel=1.69 fps Inflow=1.68 cfs 0.567 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=1.68 cfs 0.566 af

Reach 14R: SWALE Avg. Flow Depth=0.25' Max Vel=1.73 fps Inflow=1.81 cfs 0.611 af
n=0.030 L=87.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=1.81 cfs 0.611 af

Total Runoff Area = 1.207 ac Runoff Volume = 0.612 af Average Runoff Depth = 6.09"
8.04% Pervious = 0.097 ac 91.96% Impervious = 1.110 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.13 cfs @ 7.88 hrs, Volume= 0.045 af, Depth> 6.03"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.34 cfs @ 7.88 hrs, Volume= 0.115 af, Depth> 5.99"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.28 cfs @ 7.87 hrs, Volume= 0.094 af, Depth> 6.25"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.22 cfs @ 7.88 hrs, Volume= 0.075 af, Depth> 5.98"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af, Depth> 5.48"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.71 cfs @ 7.87 hrs, Volume= 0.240 af, Depth> 6.25"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-YEAR Rainfall=6.50"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 5.48" for 100-YEAR event
Inflow = 0.13 cfs @ 7.89 hrs, Volume= 0.044 af
Outflow = 0.13 cfs @ 7.92 hrs, Volume= 0.044 af, Atten= 0%, Lag= 1.5 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.68 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 4.6 min

Peak Storage= 19 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 3.82'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 5.78" for 100-YEAR event
Inflow = 0.35 cfs @ 7.89 hrs, Volume= 0.119 af
Outflow = 0.35 cfs @ 7.91 hrs, Volume= 0.119 af, Atten= 0%, Lag= 1.1 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.98 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 3.4 min

Peak Storage= 36 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 4.07'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

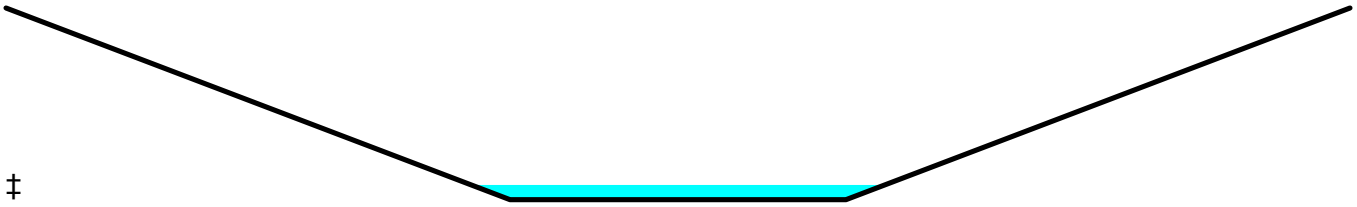
Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 5.97" for 100-YEAR event
Inflow = 0.63 cfs @ 7.90 hrs, Volume= 0.213 af
Outflow = 0.63 cfs @ 7.91 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.9 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.21 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 2.7 min

Peak Storage= 52 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 4.30'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'



‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 6.09" for 100-YEAR event
Inflow = 1.68 cfs @ 7.89 hrs, Volume= 0.567 af
Outflow = 1.68 cfs @ 7.90 hrs, Volume= 0.566 af, Atten= 0%, Lag= 0.7 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.69 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 1.9 min

Peak Storage= 99 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 4.92'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 6.08" for 100-YEAR event
Inflow = 1.81 cfs @ 7.90 hrs, Volume= 0.611 af
Outflow = 1.81 cfs @ 7.91 hrs, Volume= 0.611 af, Atten= 0%, Lag= 0.6 min
Routed to nonexistent node 2R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.73 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 1.6 min

Peak Storage= 91 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 4.98'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'

‡

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points x 2
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment9A: SOUTH DR Runoff Area=0.090 ac 88.89% Impervious Runoff Depth>1.86"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.014 af

Subcatchment9B: SOUTH DR Runoff Area=0.230 ac 86.96% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.11 cfs 0.035 af

Subcatchment9C: SOUTH DR Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.030 af

Subcatchment9D: SOUTH DR Runoff Area=0.150 ac 86.67% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=80/98 Runoff=0.07 cfs 0.023 af

Subcatchment9E: SOUTH DR Runoff Area=0.097 ac 61.86% Impervious Runoff Depth>1.51"
Tc=5.0 min CN=80/98 Runoff=0.04 cfs 0.012 af

SubcatchmentB8: Runoff Area=0.460 ac 100.00% Impervious Runoff Depth>2.01"
Tc=5.0 min CN=0/98 Runoff=0.24 cfs 0.077 af

Reach 10R: SWALE Avg. Flow Depth=0.02' Max Vel=0.42 fps Inflow=0.04 cfs 0.012 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.04 cfs 0.012 af

Reach 11R: SWALE Avg. Flow Depth=0.05' Max Vel=0.63 fps Inflow=0.10 cfs 0.035 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.10 cfs 0.035 af

Reach 12R: SWALE Avg. Flow Depth=0.07' Max Vel=0.79 fps Inflow=0.20 cfs 0.065 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.20 cfs 0.065 af

Reach 13R: SWALE Avg. Flow Depth=0.12' Max Vel=1.14 fps Inflow=0.54 cfs 0.177 af
n=0.030 L=100.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.54 cfs 0.177 af

Reach 14R: SWALE Avg. Flow Depth=0.13' Max Vel=1.17 fps Inflow=0.58 cfs 0.191 af
n=0.030 L=87.0' S=0.0100 '/' Capacity=78.41 cfs Outflow=0.58 cfs 0.191 af

Total Runoff Area = 1.207 ac Runoff Volume = 0.192 af Average Runoff Depth = 1.90"
8.04% Pervious = 0.097 ac 91.96% Impervious = 1.110 ac

Summary for Subcatchment 9A: SOUTH DR

Runoff = 0.04 cfs @ 7.89 hrs, Volume= 0.014 af, Depth> 1.86"
Routed to Reach 14R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.020	98	SW
*	0.010	80	PERV
	0.090	96	Weighted Average
	0.010	80	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

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

Summary for Subcatchment 9B: SOUTH DR

Runoff = 0.11 cfs @ 7.89 hrs, Volume= 0.035 af, Depth> 1.84"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.170	98	RD
*	0.030	98	SW
*	0.030	80	PERV
	0.230	96	Weighted Average
	0.030	80	13.04% Pervious Area
	0.200	98	86.96% Impervious Area

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

Summary for Subcatchment 9C: SOUTH DR

Runoff = 0.09 cfs @ 7.88 hrs, Volume= 0.030 af, Depth> 2.01"
Routed to Reach 12R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.160	98	RD
*	0.020	98	SW
	0.180	98	Weighted Average
	0.180	98	100.00% Impervious Area

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

Summary for Subcatchment 9D: SOUTH DR

Runoff = 0.07 cfs @ 7.89 hrs, Volume= 0.023 af, Depth> 1.84"
Routed to Reach 11R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.110	98	RD
*	0.020	98	SW
*	0.020	80	PERV
	0.150	96	Weighted Average
	0.020	80	13.33% Pervious Area
	0.130	98	86.67% Impervious Area

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

Summary for Subcatchment 9E: SOUTH DR

Runoff = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af, Depth> 1.51"
Routed to Reach 10R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.060	98	RD
*	0.037	80	PERV
	0.097	91	Weighted Average
	0.037	80	38.14% Pervious Area
	0.060	98	61.86% Impervious Area

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

Summary for Subcatchment B8:

Runoff = 0.24 cfs @ 7.88 hrs, Volume= 0.077 af, Depth> 2.01"
Routed to Reach 13R : SWALE

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ-YEAR Rainfall=2.24"

	Area (ac)	CN	Description
*	0.420	98	RD
*	0.040	98	SW
	0.460	98	Weighted Average
	0.460	98	100.00% Impervious Area

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

Summary for Reach 10R: SWALE

Inflow Area = 0.097 ac, 61.86% Impervious, Inflow Depth > 1.51" for WQ-YEAR event
Inflow = 0.04 cfs @ 7.91 hrs, Volume= 0.012 af
Outflow = 0.04 cfs @ 7.95 hrs, Volume= 0.012 af, Atten= 0%, Lag= 2.4 min
Routed to Reach 11R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.42 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 5.0 min

Peak Storage= 8 cf @ 7.95 hrs
Average Depth at Peak Storage= 0.02' , Surface Width= 3.64'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 60.00', Outlet Invert= 59.00'

‡

Summary for Reach 11R: SWALE

Inflow Area = 0.247 ac, 76.92% Impervious, Inflow Depth > 1.71" for WQ-YEAR event
Inflow = 0.10 cfs @ 7.91 hrs, Volume= 0.035 af
Outflow = 0.10 cfs @ 7.94 hrs, Volume= 0.035 af, Atten= 0%, Lag= 1.7 min
Routed to Reach 12R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.63 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 4.8 min

Peak Storage= 17 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 3.77'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 59.00', Outlet Invert= 58.00'

‡

Summary for Reach 12R: SWALE

Inflow Area = 0.427 ac, 86.65% Impervious, Inflow Depth > 1.83" for WQ-YEAR event
Inflow = 0.20 cfs @ 7.91 hrs, Volume= 0.065 af
Outflow = 0.20 cfs @ 7.94 hrs, Volume= 0.065 af, Atten= 0%, Lag= 1.4 min
Routed to Reach 13R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.79 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 4.1 min

Peak Storage= 25 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 3.90'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 58.00', Outlet Invert= 57.00'

‡

Summary for Reach 13R: SWALE

Inflow Area = 1.117 ac, 92.21% Impervious, Inflow Depth > 1.91" for WQ-YEAR event
Inflow = 0.54 cfs @ 7.90 hrs, Volume= 0.177 af
Outflow = 0.54 cfs @ 7.92 hrs, Volume= 0.177 af, Atten= 0%, Lag= 1.0 min
Routed to Reach 14R : SWALE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.14 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 2.9 min

Peak Storage= 47 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 4.23'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 57.00', Outlet Invert= 56.00'

‡

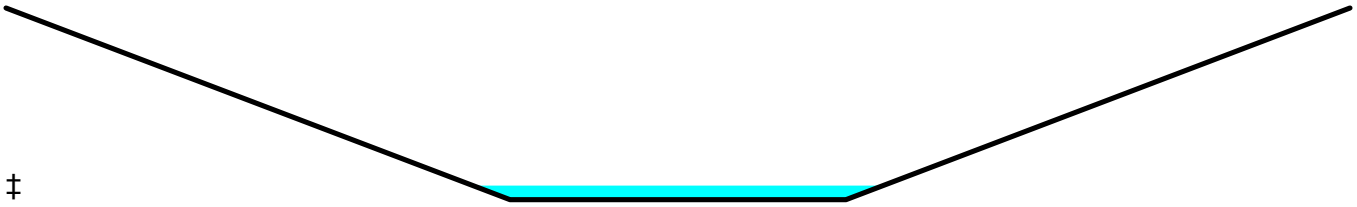
Summary for Reach 14R: SWALE

Inflow Area = 1.207 ac, 91.96% Impervious, Inflow Depth > 1.90" for WQ-YEAR event
Inflow = 0.58 cfs @ 7.92 hrs, Volume= 0.191 af
Outflow = 0.58 cfs @ 7.93 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.8 min
Routed to nonexistent node 2R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.17 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 2.5 min

Peak Storage= 43 cf @ 7.93 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 4.26'
Bank-Full Depth= 1.75' Flow Area= 15.3 sf, Capacity= 78.41 cfs

3.50' x 1.75' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 87.0' Slope= 0.0100 '/'
Inlet Invert= 56.00', Outlet Invert= 55.13'



‡

Appendix D
WWHM Modeling

Future Bioretention Sizing

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: default
Site Name:
Site Address:
City:

Report Date:	3/28/2025
Gage:	Portland
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.467
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.31
Pervious Total	1.31
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.31

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Mitigated Land Use

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
SIDEWALKS FLAT	0.1
PARKING FLAT	1.17
Impervious Total	1.27
Basin Total	1.27

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

Surface retention 1	Surface retention 1

Routing Elements
Predeveloped Routing

Mitigated Routing

Bioretention 1

Bottom Length:	40.00 ft.
Bottom Width:	40.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	SMMWW 12 in/hr
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	291.45
Total Outflow (ac-ft.):	304.494
Percent Through Underdrain:	95.72
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Outlets:	
Outlet 1	Outlet 2
Outlet Flows To:	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0367	0.0000	0.0000	0.0000
0.0412	0.0367	0.0007	0.0000	0.0000
0.0824	0.0367	0.0014	0.0000	0.0000
0.1236	0.0367	0.0021	0.0000	0.0000
0.1648	0.0367	0.0028	0.0000	0.0000
0.2060	0.0367	0.0035	0.0000	0.0000
0.2473	0.0367	0.0042	0.0000	0.0000
0.2885	0.0367	0.0048	0.0000	0.0000
0.3297	0.0367	0.0055	0.0008	0.0000
0.3709	0.0367	0.0062	0.0012	0.0000
0.4121	0.0367	0.0069	0.0017	0.0000
0.4533	0.0367	0.0076	0.0023	0.0000
0.4945	0.0367	0.0083	0.0031	0.0000
0.5357	0.0367	0.0090	0.0040	0.0000
0.5769	0.0367	0.0097	0.0051	0.0000
0.6181	0.0367	0.0104	0.0063	0.0000
0.6593	0.0367	0.0111	0.0077	0.0000
0.7005	0.0367	0.0118	0.0093	0.0000
0.7418	0.0367	0.0125	0.0111	0.0000
0.7830	0.0367	0.0132	0.0118	0.0000
0.8242	0.0367	0.0138	0.0131	0.0000
0.8654	0.0367	0.0145	0.0136	0.0000
0.9066	0.0367	0.0152	0.0152	0.0000
0.9478	0.0367	0.0159	0.0176	0.0000
0.9890	0.0367	0.0166	0.0202	0.0000
1.0302	0.0367	0.0173	0.0230	0.0000
1.0714	0.0367	0.0180	0.0257	0.0000
1.1126	0.0367	0.0187	0.0260	0.0000

1.1538	0.0367	0.0194	0.0293	0.0000
1.1951	0.0367	0.0201	0.0328	0.0000
1.2363	0.0367	0.0208	0.0329	0.0000
1.2775	0.0367	0.0215	0.0365	0.0000
1.3187	0.0367	0.0221	0.0405	0.0000
1.3599	0.0367	0.0228	0.0447	0.0000
1.4011	0.0367	0.0235	0.0468	0.0000
1.4423	0.0367	0.0242	0.0492	0.0000
1.4835	0.0367	0.0249	0.0539	0.0000
1.5247	0.0367	0.0256	0.0589	0.0000
1.5659	0.0367	0.0263	0.0628	0.0000
1.6071	0.0367	0.0270	0.0642	0.0000
1.6484	0.0367	0.0277	0.0698	0.0000
1.6896	0.0367	0.0284	0.0756	0.0000
1.7308	0.0367	0.0291	0.0760	0.0000
1.7720	0.0367	0.0297	0.0817	0.0000
1.8132	0.0367	0.0303	0.0880	0.0000
1.8544	0.0367	0.0310	0.0947	0.0000
1.8956	0.0367	0.0316	0.1016	0.0000
1.9368	0.0367	0.0322	0.1050	0.0000
1.9780	0.0367	0.0328	0.1086	0.0000
2.0192	0.0367	0.0335	0.1667	0.0000
2.0604	0.0367	0.0341	0.1667	0.0000
2.1016	0.0367	0.0347	0.1667	0.0000
2.1429	0.0367	0.0354	0.1667	0.0000
2.1841	0.0367	0.0360	0.1667	0.0000
2.2253	0.0367	0.0366	0.1667	0.0000
2.2665	0.0367	0.0372	0.1667	0.0000
2.3077	0.0367	0.0379	0.1667	0.0000
2.3489	0.0367	0.0385	0.1667	0.0000
2.3901	0.0367	0.0391	0.1667	0.0000
2.4313	0.0367	0.0398	0.1667	0.0000
2.4725	0.0367	0.0404	0.1667	0.0000
2.5137	0.0367	0.0410	0.1667	0.0000
2.5549	0.0367	0.0416	0.1667	0.0000
2.5962	0.0367	0.0423	0.1667	0.0000
2.6374	0.0367	0.0429	0.1667	0.0000
2.6786	0.0367	0.0435	0.1667	0.0000
2.7198	0.0367	0.0441	0.1667	0.0000
2.7500	0.0367	0.0446	0.1667	0.0000

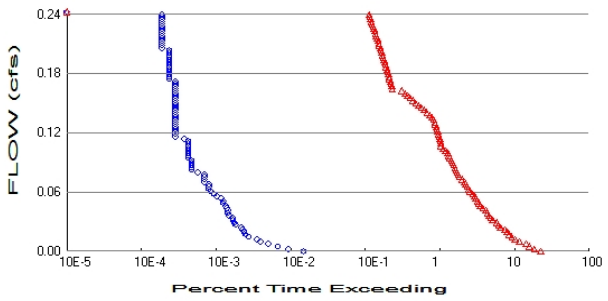
Bioretention Surface Hydraulic Table

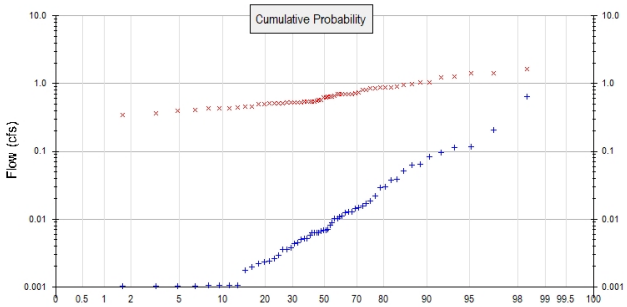
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.7500	0.0367	0.0446	0.0000	0.1111	0.0000
2.7912	0.0367	0.0461	0.0000	0.1111	0.0000
2.8324	0.0367	0.0476	0.0000	0.1357	0.0000
2.8736	0.0367	0.0491	0.0000	0.1388	0.0000
2.9148	0.0367	0.0507	0.0000	0.1418	0.0000
2.9560	0.0367	0.0522	0.0000	0.1449	0.0000
2.9973	0.0367	0.0537	0.0000	0.1479	0.0000
3.0385	0.0367	0.0552	0.0000	0.1510	0.0000
3.0797	0.0367	0.0567	0.0000	0.1540	0.0000
3.1209	0.0367	0.0582	0.0000	0.1571	0.0000
3.1621	0.0367	0.0597	0.0000	0.1602	0.0000
3.2033	0.0367	0.0613	0.0000	0.1632	0.0000
3.2445	0.0367	0.0628	0.0000	0.1663	0.0000
3.2857	0.0367	0.0643	0.0716	0.1693	0.0000
3.3269	0.0367	0.0658	0.2257	0.1724	0.0000

3.3681	0.0367	0.0673	0.4267	0.1754	0.0000
3.4093	0.0367	0.0688	0.6597	0.1785	0.0000
3.4505	0.0367	0.0703	0.9111	0.1815	0.0000
3.4918	0.0367	0.0719	1.1671	0.1846	0.0000
3.5330	0.0367	0.0734	1.4136	0.1876	0.0000
3.5742	0.0367	0.0749	1.6378	0.1907	0.0000
3.6154	0.0367	0.0764	1.8292	0.1937	0.0000
3.6566	0.0367	0.0779	1.9818	0.1968	0.0000
3.6978	0.0367	0.0794	2.0963	0.1998	0.0000
3.7390	0.0367	0.0809	2.1826	0.2029	0.0000
3.7500	0.0367	0.0813	2.2934	0.2037	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.31
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 1.27

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.007564
5 year	0.028131
10 year	0.059216
25 year	0.136971
50 year	0.241406
100 year	0.408791

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.626128
5 year	0.861117
10 year	1.031554
25 year	1.264306
50 year	1.450664
100 year	1.64842

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.001	0.862
1950	0.006	0.462
1951	0.052	0.510
1952	0.008	0.693
1953	0.006	0.500
1954	0.014	0.652
1955	0.007	0.432
1956	0.115	0.946
1957	0.002	0.642
1958	0.005	1.038

1959	0.005	0.369
1960	0.002	0.640
1961	0.010	0.877
1962	0.004	0.435
1963	0.004	0.515
1964	0.007	0.515
1965	0.038	0.536
1966	0.022	0.539
1967	0.006	0.631
1968	0.010	0.972
1969	0.009	1.236
1970	0.649	1.644
1971	0.005	0.440
1972	0.016	0.491
1973	0.004	0.515
1974	0.117	0.736
1975	0.007	0.431
1976	0.015	0.561
1977	0.001	0.398
1978	0.030	0.705
1979	0.006	1.035
1980	0.013	0.453
1981	0.064	0.809
1982	0.038	0.696
1983	0.206	0.858
1984	0.004	0.524
1985	0.001	0.575
1986	0.001	0.709
1987	0.029	0.571
1988	0.001	0.539
1989	0.003	0.536
1990	0.003	0.532
1991	0.011	0.407
1992	0.002	0.533
1993	0.007	0.815
1994	0.001	0.537
1995	0.002	0.874
1996	0.082	1.256
1997	0.062	0.903
1998	0.006	0.883
1999	0.012	0.528
2000	0.019	0.340
2001	0.001	0.309
2002	0.095	0.700
2003	0.011	0.524
2004	0.001	0.709
2005	0.001	0.626
2006	0.017	0.697
2007	0.002	0.640
2008	0.013	1.432
2009	0.004	1.405

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6493	1.6440
2	0.2061	1.4317
3	0.1173	1.4051

4	0.1149	1.2559
5	0.0951	1.2364
6	0.0823	1.0375
7	0.0643	1.0349
8	0.0621	0.9724
9	0.0515	0.9458
10	0.0382	0.9028
11	0.0378	0.8831
12	0.0301	0.8768
13	0.0288	0.8742
14	0.0218	0.8620
15	0.0186	0.8580
16	0.0169	0.8146
17	0.0158	0.8092
18	0.0147	0.7355
19	0.0143	0.7093
20	0.0128	0.7089
21	0.0127	0.7048
22	0.0124	0.7000
23	0.0110	0.6973
24	0.0109	0.6956
25	0.0103	0.6934
26	0.0103	0.6524
27	0.0088	0.6423
28	0.0082	0.6397
29	0.0070	0.6396
30	0.0069	0.6308
31	0.0068	0.6263
32	0.0066	0.5754
33	0.0064	0.5710
34	0.0063	0.5608
35	0.0062	0.5393
36	0.0062	0.5390
37	0.0058	0.5375
38	0.0052	0.5360
39	0.0051	0.5359
40	0.0050	0.5331
41	0.0044	0.5321
42	0.0044	0.5279
43	0.0038	0.5241
44	0.0036	0.5240
45	0.0036	0.5155
46	0.0029	0.5153
47	0.0026	0.5148
48	0.0024	0.5105
49	0.0023	0.4996
50	0.0022	0.4907
51	0.0019	0.4621
52	0.0018	0.4526
53	0.0011	0.4403
54	0.0011	0.4354
55	0.0010	0.4316
56	0.0010	0.4306
57	0.0010	0.4065
58	0.0010	0.3980
59	0.0010	0.3690
60	0.0010	0.3396
61	0.0010	0.3093

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0038	317	480820	151678	Fail
0.0062	200	393340	196670	Fail
0.0086	143	340937	238417	Fail
0.0110	107	304363	284451	Fail
0.0134	84	248324	295623	Fail
0.0158	76	215385	283401	Fail
0.0182	58	197526	340562	Fail
0.0206	53	182596	344520	Fail
0.0230	51	169913	333162	Fail
0.0254	48	158170	329520	Fail
0.0278	46	138835	301815	Fail
0.0302	39	130557	334761	Fail
0.0326	38	123221	324265	Fail
0.0350	36	107885	299680	Fail
0.0374	35	102003	291437	Fail
0.0398	32	96848	302650	Fail
0.0422	31	92079	297029	Fail
0.0446	31	87822	283296	Fail
0.0470	30	80336	267786	Fail
0.0494	29	74112	255558	Fail
0.0518	27	70840	262370	Fail
0.0542	27	67781	251040	Fail
0.0566	25	64958	259832	Fail
0.0590	22	62327	283304	Fail
0.0614	20	59247	296235	Fail
0.0638	18	54456	302533	Fail
0.0662	17	51269	301582	Fail
0.0686	17	49344	290258	Fail
0.0710	17	47505	279441	Fail
0.0734	15	45665	304433	Fail
0.0758	15	42371	282473	Fail
0.0782	15	39142	260946	Fail
0.0806	15	37623	250820	Fail
0.0830	12	36275	302291	Fail
0.0854	10	35013	350130	Fail
0.0878	10	33794	337940	Fail
0.0902	10	32661	326610	Fail
0.0926	10	31527	315270	Fail
0.0950	10	30415	304150	Fail
0.0974	9	29324	325822	Fail
0.0998	9	28340	314888	Fail
0.1022	9	27185	302055	Fail
0.1046	9	25324	281377	Fail
0.1070	9	23528	261422	Fail
0.1094	9	22244	247155	Fail
0.1118	9	21924	243600	Fail
0.1142	9	21624	240266	Fail
0.1166	8	21286	266075	Fail
0.1190	6	20905	348416	Fail
0.1214	6	20514	341900	Fail
0.1238	6	20061	334350	Fail
0.1262	6	19605	326750	Fail
0.1286	6	19152	319200	Fail
0.1310	6	18681	311350	Fail

0.1334	6	18176	302933	Fail
0.1358	6	17646	294100	Fail
0.1382	6	16694	278233	Fail
0.1406	6	15445	257416	Fail
0.1430	6	14230	237166	Fail
0.1454	6	13054	217566	Fail
0.1478	6	12018	200300	Fail
0.1502	6	11024	183733	Fail
0.1526	6	10106	168433	Fail
0.1550	6	9272	154533	Fail
0.1574	6	8547	142450	Fail
0.1598	6	7850	130833	Fail
0.1622	6	7225	120416	Fail
0.1646	6	6637	110616	Fail
0.1670	6	4926	82100	Fail
0.1694	6	4830	80500	Fail
0.1718	6	4740	79000	Fail
0.1742	6	4637	77283	Fail
0.1766	5	4541	90820	Fail
0.1790	5	4447	88940	Fail
0.1814	5	4357	87140	Fail
0.1838	5	4265	85300	Fail
0.1862	5	4156	83120	Fail
0.1886	5	4055	81100	Fail
0.1910	5	3974	79480	Fail
0.1934	5	3888	77760	Fail
0.1958	5	3794	75880	Fail
0.1982	5	3724	74480	Fail
0.2006	5	3647	72940	Fail
0.2030	5	3557	71140	Fail
0.2054	5	3478	69560	Fail
0.2078	4	3390	84750	Fail
0.2102	4	3300	82500	Fail
0.2126	4	3225	80625	Fail
0.2150	4	3157	78925	Fail
0.2174	4	3091	77275	Fail
0.2198	4	3001	75025	Fail
0.2222	4	2922	73050	Fail
0.2246	4	2847	71175	Fail
0.2270	4	2781	69525	Fail
0.2294	4	2710	67750	Fail
0.2318	4	2642	66050	Fail
0.2342	4	2571	64275	Fail
0.2366	4	2511	62775	Fail
0.2390	4	2449	61225	Fail
0.2414	4	2402	60050	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
retention 1 POC	☑	277.09	304.49	0.00	☐	0.00	291.45	95.72	Treat. Credit
Total Volume Infiltrated		277.09	304.49	0.00		0.00	291.45	291 / 304 = 96%	Treat. Credit = 96%
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

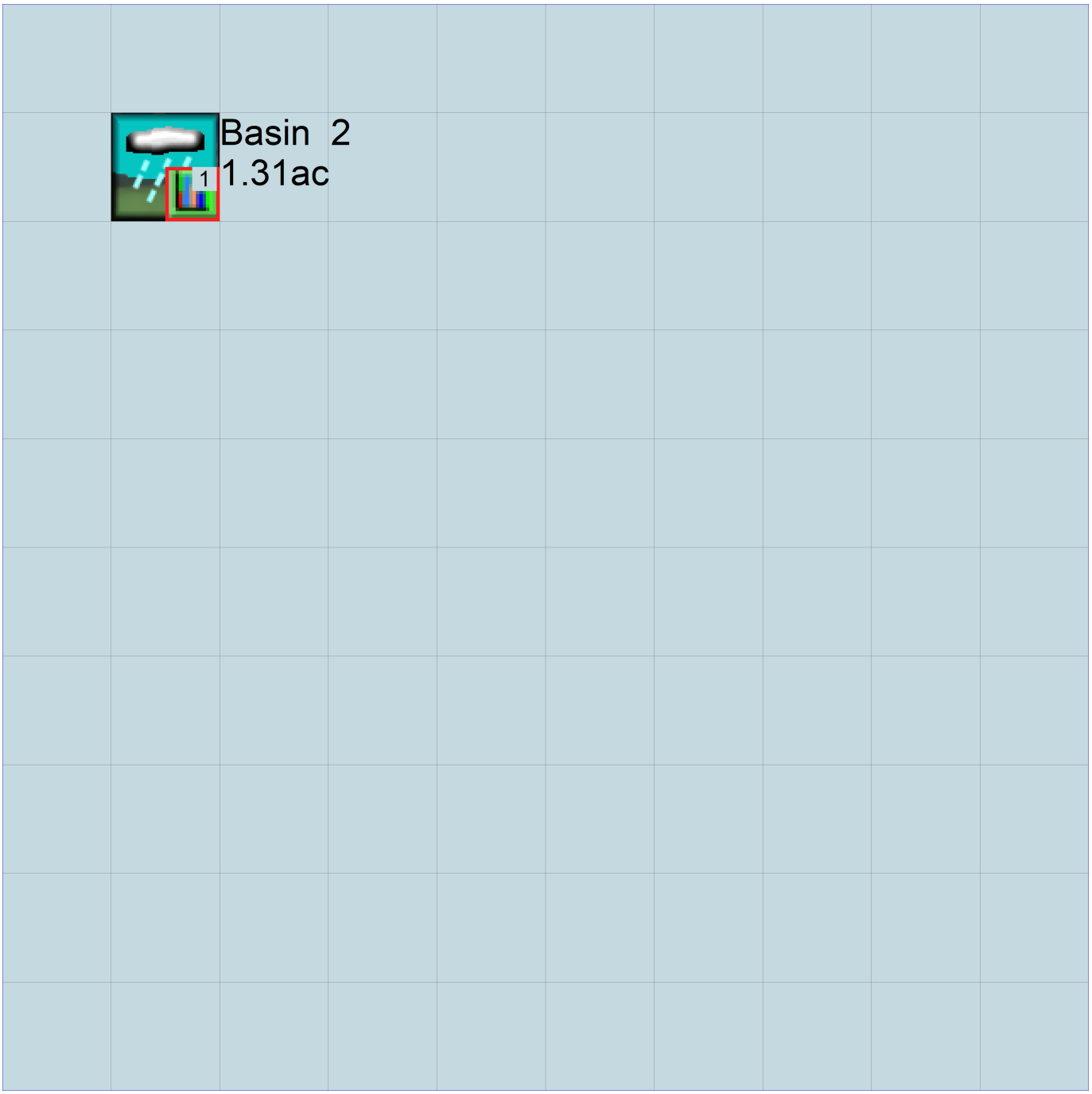
PERLND Changes

No PERLND changes have been made.

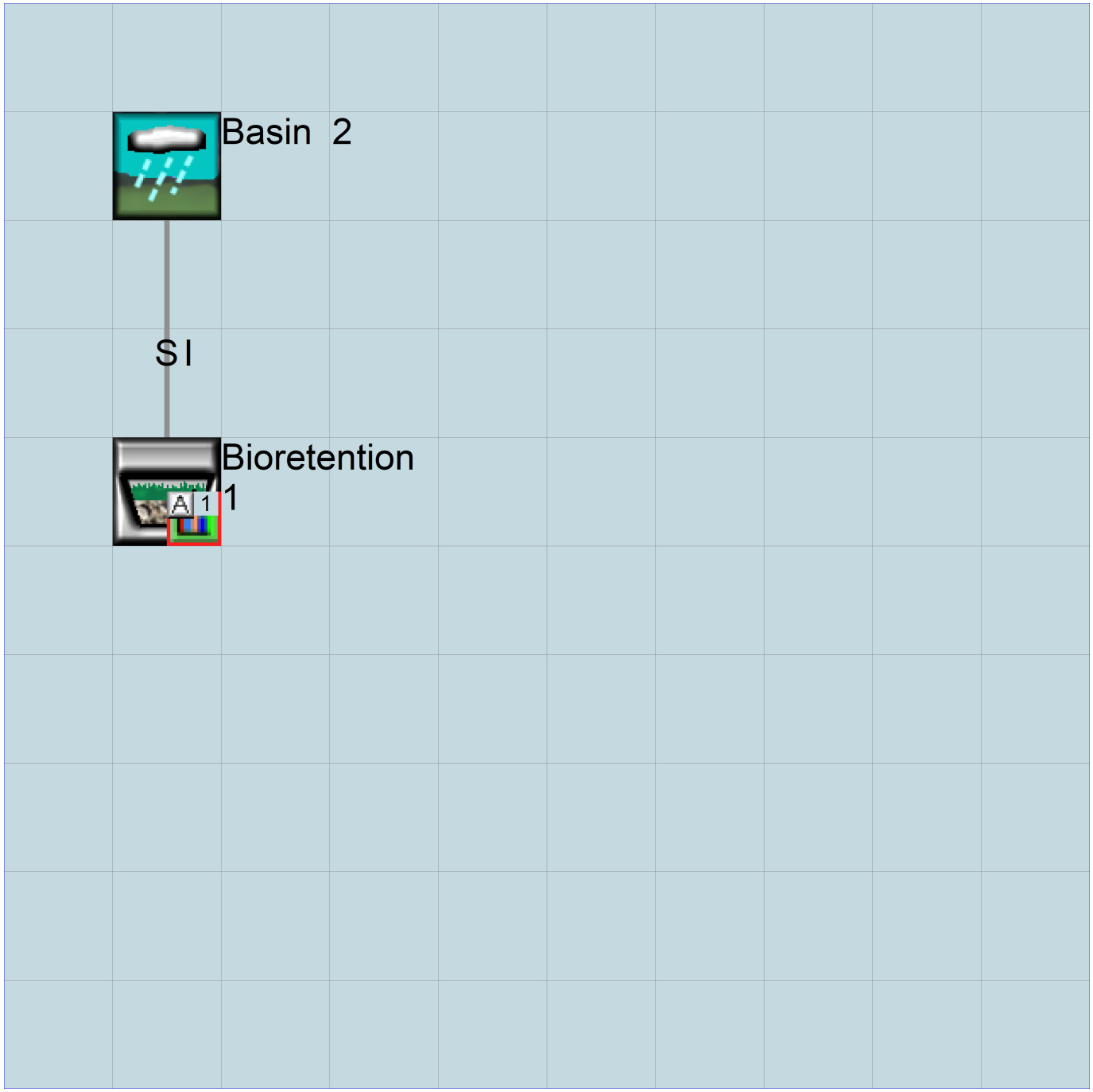
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default.wdm
MESSU       25   Predefault.MES
            27   Predefault.L61
            28   Predefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  2                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1               0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  2***
PERLND   1                        1.31     COPY   501     12
PERLND   1                        1.31     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><--->
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default.wdm
MESSU       25   Mitdefault.MES
            27   Mitdefault.L61
            28   Mitdefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       8
      IMPLND      11
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface retention  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                       in  out           ***
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
  END ACTIVITY

  PRINT-INFO
```

```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    8      SIDEWALKS/FLAT         1    1    1   27    0
   11      PARKING/FLAT           1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    8         0    0    1    0    0    0
   11         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    8         0    0    4    0    0    4    1    9
   11         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    8         0    0    0    0    0
   11         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    8            400      0.01       0.1       0.1
   11            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
```

```
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    8              0         0
   11              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    8              0         0
   11              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  2***
IMPLND   8                        0.1     RCHRES   1      5
IMPLND  11                       1.17     RCHRES   1      5

******Routing******
IMPLND   8                        0.1     COPY     1     15
IMPLND  11                       1.17     COPY     1     15
RCHRES   1                          1     RCHRES   2      8
RCHRES   2                          1     COPY   501     16
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Surface retentio-008    2    1    1    1   28    0    1
    2     Bioretention  1         1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
```

```
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1       0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    2       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
    1              1      0.01       0.0       0.0       0.0       0.0
    2              2      0.01       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  2093.14
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   68    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.036731  0.000000  0.000000
  0.041209  0.036731  0.000692  0.000000
  0.082418  0.036731  0.001384  0.000000
  0.123626  0.036731  0.002077  0.000000
  0.164835  0.036731  0.002769  0.000000
  0.206044  0.036731  0.003461  0.000000
  0.247253  0.036731  0.004153  0.000000
  0.288462  0.036731  0.004845  0.000000
  0.329670  0.036731  0.005537  0.000754
  0.370879  0.036731  0.006230  0.001155
  0.412088  0.036731  0.006922  0.001671
  0.453297  0.036731  0.007614  0.002313
  0.494505  0.036731  0.008306  0.003091
```

```
0.535714  0.036731  0.008998  0.004014
0.576923  0.036731  0.009691  0.005091
0.618132  0.036731  0.010383  0.006331
0.659341  0.036731  0.011075  0.007742
0.700549  0.036731  0.011767  0.009332
0.741758  0.036731  0.012459  0.011107
0.782967  0.036731  0.013152  0.011786
0.824176  0.036731  0.013844  0.013074
0.865385  0.036731  0.014536  0.013632
0.906593  0.036731  0.015228  0.015241
0.947802  0.036731  0.015920  0.017614
0.989011  0.036731  0.016612  0.020199
1.030220  0.036731  0.017305  0.023002
1.071429  0.036731  0.017997  0.025659
1.112637  0.036731  0.018689  0.026029
1.153846  0.036731  0.019381  0.029285
1.195055  0.036731  0.020073  0.032777
1.236264  0.036731  0.020766  0.032861
1.277473  0.036731  0.021458  0.036509
1.318681  0.036731  0.022150  0.040487
1.359890  0.036731  0.022842  0.044715
1.401099  0.036731  0.023534  0.046808
1.442308  0.036731  0.024227  0.049198
1.483516  0.036731  0.024919  0.053940
1.524725  0.036731  0.025611  0.058947
1.565934  0.036731  0.026303  0.062813
1.607143  0.036731  0.026995  0.064221
1.648352  0.036731  0.027687  0.069766
1.689560  0.036731  0.028380  0.075585
1.730769  0.036731  0.029072  0.076006
1.771978  0.036731  0.029700  0.081679
1.813187  0.036731  0.030328  0.088047
1.854396  0.036731  0.030956  0.094685
1.895604  0.036731  0.031584  0.101575
1.936813  0.036731  0.032213  0.104997
1.978022  0.036731  0.032841  0.108633
2.019231  0.036731  0.033469  0.166667
2.060440  0.036731  0.034097  0.166667
2.101648  0.036731  0.034725  0.166667
2.142857  0.036731  0.035353  0.166667
2.184066  0.036731  0.035982  0.166667
2.225275  0.036731  0.036610  0.166667
2.266484  0.036731  0.037238  0.166667
2.307692  0.036731  0.037866  0.166667
2.348901  0.036731  0.038494  0.166667
2.390110  0.036731  0.039122  0.166667
2.431319  0.036731  0.039751  0.166667
2.472527  0.036731  0.040379  0.166667
2.513736  0.036731  0.041007  0.166667
2.554945  0.036731  0.041635  0.166667
2.596154  0.036731  0.042263  0.166667
2.637363  0.036731  0.042891  0.166667
2.678571  0.036731  0.043520  0.166667
2.719780  0.036731  0.044148  0.166667
2.750000  0.036731  0.048052  0.166667
END FTABLE  2
FTABLE      1
 26    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.036731  0.000000  0.000000  0.000000
0.041209  0.036731  0.001514  0.000000  0.111111
0.082418  0.036731  0.003027  0.000000  0.135735
0.123626  0.036731  0.004541  0.000000  0.138787
0.164835  0.036731  0.006055  0.000000  0.141840
0.206044  0.036731  0.007568  0.000000  0.144892
0.247253  0.036731  0.009082  0.000000  0.147945
0.288462  0.036731  0.010595  0.000000  0.150997
0.329670  0.036731  0.012109  0.000000  0.154050
0.370879  0.036731  0.013623  0.000000  0.157102
```

```
  0.412088  0.036731  0.015136  0.000000  0.160155
  0.453297  0.036731  0.016650  0.000000  0.163207
  0.494505  0.036731  0.018164  0.000000  0.166260
  0.535714  0.036731  0.019677  0.071570  0.169312
  0.576923  0.036731  0.021191  0.225672  0.172365
  0.618132  0.036731  0.022705  0.426722  0.175417
  0.659341  0.036731  0.024218  0.659695  0.178470
  0.700549  0.036731  0.025732  0.911089  0.181522
  0.741758  0.036731  0.027245  1.167052  0.184575
  0.782967  0.036731  0.028759  1.413620  0.187627
  0.824176  0.036731  0.030273  1.637810  0.190680
  0.865385  0.036731  0.031786  1.829184  0.193732
  0.906593  0.036731  0.033300  1.981777  0.196785
  0.947802  0.036731  0.034814  2.096308  0.199837
  0.989011  0.036731  0.036327  2.182633  0.202890
  1.000000  0.036731  0.036731  2.293441  0.203704
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.467          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.467          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1.467          RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1003 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Appendix E
Erosion Control and Stormwater Plans

GENERAL NOTES:

1. SEE SHEET G03 FOR PROJECT'S GENERAL NOTES.
2. SEE SHEET G02 FOR ABBREVIATIONS AND MASTER LEGEND.
3. CONTRACTOR TO DIRECT RUNOFF TO PROPOSED PONDS FOR TEMPORARY SEDIMENT PONDS. CONTRACTOR TO REMOVE SEDIMENT PRIOR TO POND SEEDING.

EROSION CONTROL NOTES:

1. STORM DRAIN INLET PROTECTION PER STANDARD DETAIL ON SHEET EC03.
2. SILT FENCE PER DETAIL ON SHEET EC03.
3. STABILIZED CONSTRUCTION ENTRANCE PER DETAIL ON SHEET EC03.
4. BIODEGRADABLE CHECK DAM SEE DETAIL ON SHEET EC03 FOR SPACING AND MATERIALS.
5. INSTALL EROSION CONTROL AT CULVERT ENDS PER DETAIL ON SHEET EC03.

LEGEND

- PROPOSED CRUSHED SURFACING BASE COURSE
- PROPOSED GRIND AND INLAY
- 67 PROPOSED SURFACE CONTOUR
- 67 ADD ALT SURFACE CONTOUR

EVERGREEN HIGHWAY (SR 14)

POND 1 (ADD ALT)

(970 LF) 2

PROPOSED FLOW ARROW (TYP)

EXISTING FLOW ARROW (TYP)

FUTURE BLDG
FF 69.50
BLDG PAD
FF 69.17

CONTRACTOR TO USE PROPOSED PONDS AS TEMPORARY SEDIMENT TRAPS

(TYP) 1

VALLEY LINE (TYP)

PRIVATE DRIVE

POND 3

PROPOSED HYDRANT

MATCHLINE SEE SHEET EC02

CONTRACTOR TO USE PROPOSED PONDS AS TEMPORARY SEDIMENT TRAPS

EXISTING CONTOUR (TYP)

PROPOSED CONTOUR (TYP)

PROPOSED ADD ALT CONTOUR (TYP)

POND 2

COYOTE RIDGE RD

(294 LF) 2

(TYP) 4

Scale 1" = 30'

0 15 30 60

100% PLANS

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EROSION CONTROL PLAN FOR: CASCADE BUSINESS PARK

A SITE LOCATED IN THE CITY OF NORTH BONNEVILLE, WASHINGTON

811 Know what's below. Call before you dig.

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	MARCH 2025
	78260.000
SHEET ID	EC01
SHEET	5 OF 30

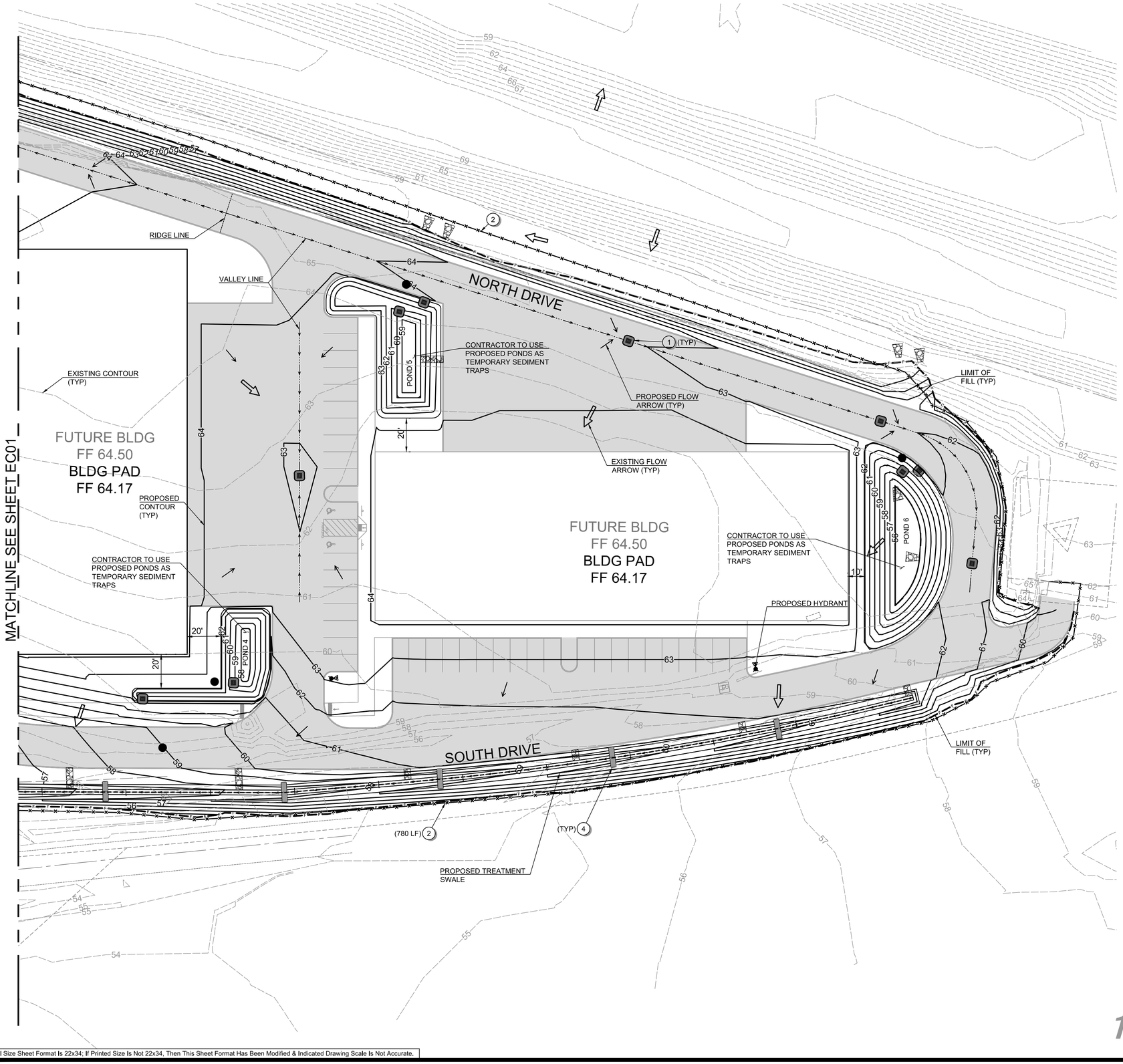
GENERAL NOTES:

1. SEE SHEET G03 FOR PROJECT'S GENERAL NOTES.
2. SEE SHEET G02 FOR ABBREVIATIONS AND MASTER LEGEND.
3. CONTRACTOR TO DIRECT RUNOFF TO PROPOSED PONDS FOR TEMPORARY SEDIMENT PONDS. CONTRACTOR TO REMOVE SEDIMENT PRIOR TO POND SEEDING.

EROSION CONTROL NOTES:

1. STORM DRAIN INLET PROTECTION PER STANDARD DETAIL ON SHEET EC03.
2. SILT FENCE PER DETAIL ON SHEET EC03.
3. STABILIZED CONSTRUCTION ENTRANCE PER DETAIL ON SHEET EC03.
4. BIODEGRADABLE CHECK DAM SEE DETAIL ON SHEET EC03 FOR SPACING AND MATERIALS.
5. INSTALL EROSION CONTROL AT CULVERT ENDS PER DETAIL ON SHEET EC03.

LEGEND	
	PROPOSED CRUSHED SURFACING BASE COURSE
	PROPOSED GRIND AND INLAY
67	PROPOSED SURFACE CONTOUR
67	ADD ALT SURFACE CONTOUR



Scale 1" = 30'

0 15 30 60

100% PLANS

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EROSION CONTROL PLAN FOR: CASCADE BUSINESS PARK

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SHEET ID	EC02
SHEET	6 OF 30

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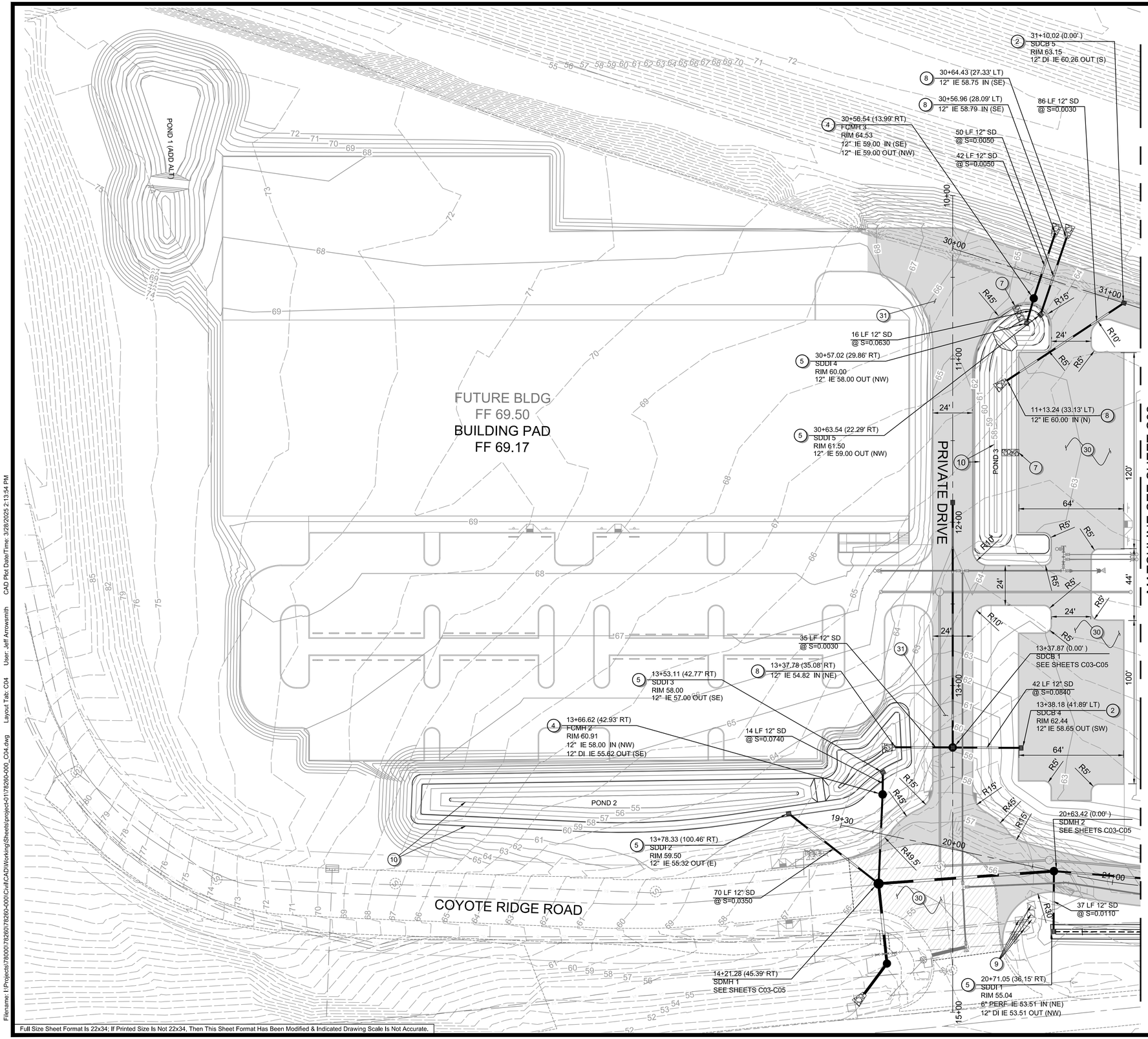

Scale 1" = 30'

0 15 30 60

100% PLANS

GENERAL NOTES

1. SEE SHEET G02 FOR PLAN SET LEGEND.
2. SEE SHEET G03 FOR PLAN SET GENERAL NOTES.
2. SEE SHEETS C03-C05 FOR STORM PROFILES AND C06-C07 FOR SWALE PROFILE.

CONSTRUCTION NOTES - STORM SEWER

1. INSTALL CATCH BASIN TYPE 2 PER WSDOT STANDARD PLAN B-10.20, WITH CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLANS B-30.70. SEE SHEETS D03 AND D04. CATCH BASIN IS 48-INCH I.D. UNLESS NOTED OTHERWISE ON THE PLANS.
2. INSTALL CATCH BASIN TYPE 2 PER WSDOT STANDARD PLAN B-10.20, WITH RECTANGULAR FRAME AND GRATE PER WSDOT STANDARD PLANS B-30.10 AND B-30.30. SEE SHEETS D03 AND D04. CATCH BASIN IS 48-INCH I.D. UNLESS NOTED OTHERWISE ON THE PLANS.
3. INSTALL 48" MANHOLE TYPE 1 PER WSDOT STANDARD PLAN B-15.20, WITH CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLAN B-30.70. SEE SHEETS D03 AND D04.
4. INSTALL FLOW CONTROL MANHOLE PER DETAIL ON SHEET D02.
5. INSTALL DITCH INLET PER DETAIL ON SHEET D01.
6. INSTALL CATCH BASIN TYPE 1 PER STANDARD PLAN B-5.20. SEE SHEET D03.
7. INSTALL 4-FOOT WIDE, 6-INCH THICK, QUARRY SPALLS PAD FROM TOP OF SWALE (AT LOCATION OF FUTURE CURB SCUPPER) TO BOTTOM OF SWALE PER DETAIL ON SHEET D01.
8. CONSTRUCT STORM SEWER OUTLET WITH TRASH RACK PER DETAILS ON SHEET D02.
9. RELOCATE AND ADJUST EXISTING UTILITY STRUCTURE TO FINISHED GRADE.
10. CONSTRUCT POND PER DETAILS ON SHEET ST01.
11. CONSTRUCT STORM SEWER OUTLET PER DETAIL ON SHEET D02. BEVEL END TO MATCH SLOPE.
12. CONSTRUCT FLOW SPREADER EVERY 50 FEET PER DETAIL ON SHEET D01.
13. CONSTRUCT 620'Lx3'W BIOFILTRATION SWALE @ S=0.0100 PER DETAILS ON SHEET D01. SEE SHEET C06-C07 FOR PROFILE.
14. INSTALL 60" MANHOLE TYPE 1 PER WSDOT STANDARD PLAN B-15.20, WITH CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLAN B-30.70. SEE SHEETS D03 AND D04.
15. BEVEL END TO MATCH SLOPE AND INSTALL PIPE END WITH TRASH RACK PER DETAILS ON SHEET D02.

CONSTRUCTION NOTES - STREET

30. BASE COURSE PER TYPICAL SECTION ON SHEET ST01.
31. PRIVATE DRIVE PER TYPICAL SECTION ON SHEET ST01.
32. NORTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
33. SOUTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
34. PROTECT EXISTING UTILITY STRUCTURES.
35. GRIND AND INLAY PER TYPICAL SECTION ON SHEET ST01.

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STREET AND STORM PLAN FOR:

CASCADE BUSINESS PARK

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SHEET ID	C01
SHEET	14 OF 30

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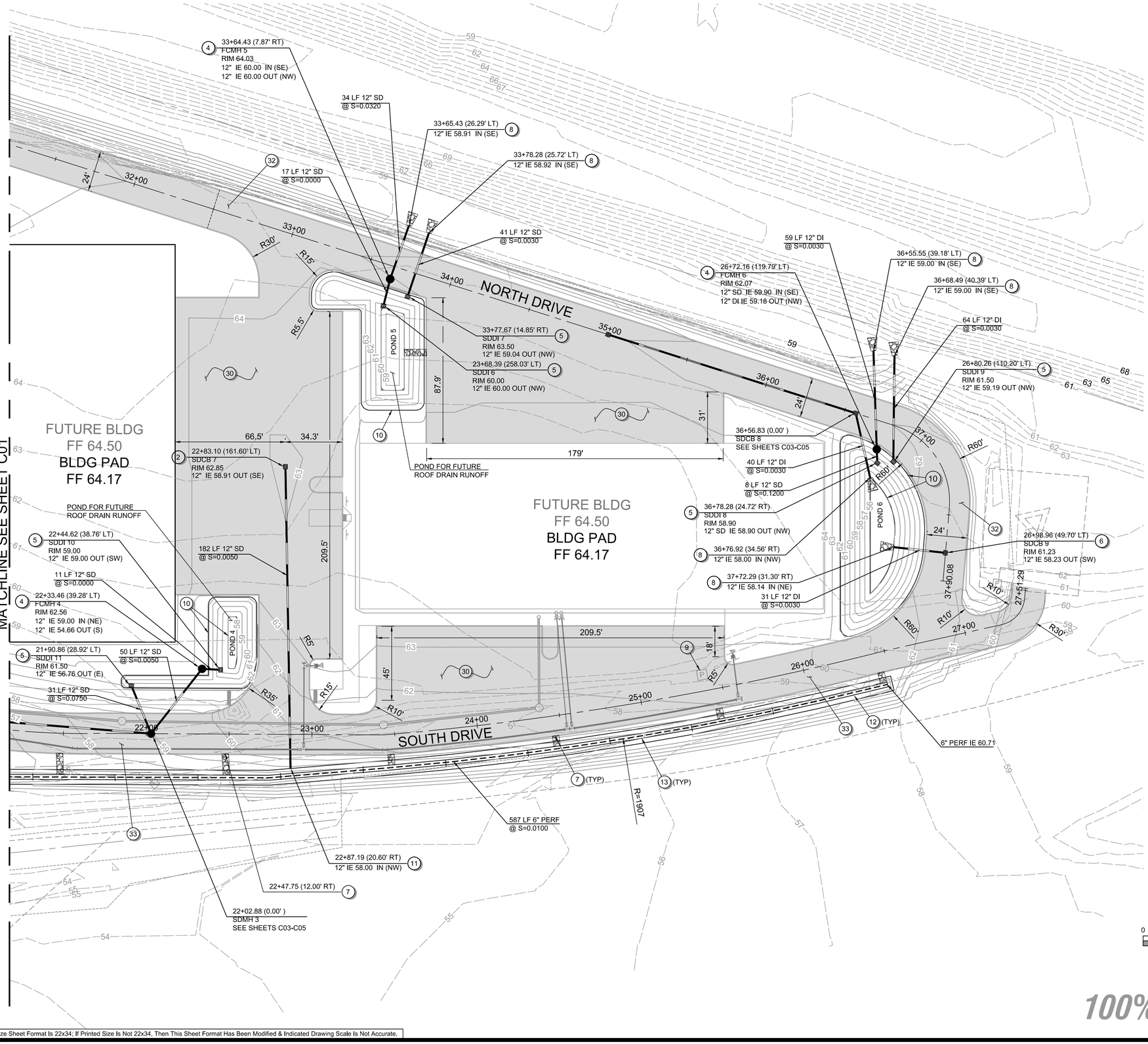

GENERAL NOTES

1. SEE SHEET G02 FOR PLAN SET LEGEND.
2. SEE SHEET G03 FOR PLAN SET GENERAL NOTES.
2. SEE SHEETS C03-C05 FOR STORM PROFILES AND C06-C07 FOR SWALE PROFILE.

CONSTRUCTION NOTES - STORM SEWER

1. INSTALL CATCH BASIN TYPE 2 PER WSDOT STANDARD PLAN B-10.20, WITH CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLANS B-30.70. SEE SHEETS D03 AND D04. CATCH BASIN IS 48-INCH I.D. UNLESS NOTED OTHERWISE ON THE PLANS.
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4. INSTALL FLOW CONTROL MANHOLE PER DETAIL ON SHEET D02.
5. INSTALL DITCH INLET PER DETAIL ON SHEET D01.
6. INSTALL CATCH BASIN TYPE 1 PER STANDARD PLAN B-5.20. SEE SHEET D03.
7. INSTALL 4-FOOT WIDE, 6-INCH THICK, QUARRY SPALLS PAD FROM TOP OF SWALE (AT LOCATION OF FUTURE CURB SCUPPER) TO BOTTOM OF SWALE PER DETAIL ON SHEET D01.
8. CONSTRUCT STORM SEWER OUTLET WITH TRASH RACK PER DETAILS ON SHEET D02.
9. RELOCATE AND ADJUST EXISTING UTILITY STRUCTURE TO FINISHED GRADE.
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15. BEVEL END TO MATCH SLOPE AND INSTALL PIPE END WITH TRASH RACK PER DETAILS ON SHEET D02.

CONSTRUCTION NOTES - STREET

30. BASE COURSE PER TYPICAL SECTION ON SHEET ST01.
31. PRIVATE DRIVE PER TYPICAL SECTION ON SHEET ST01.
32. NORTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
33. SOUTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
34. PROTECT EXISTING UTILITY STRUCTURES.
35. GRIND AND INLAY PER TYPICAL SECTION ON SHEET ST01.

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STREET AND STORM PLAN FOR: CASCADE BUSINESS PARK

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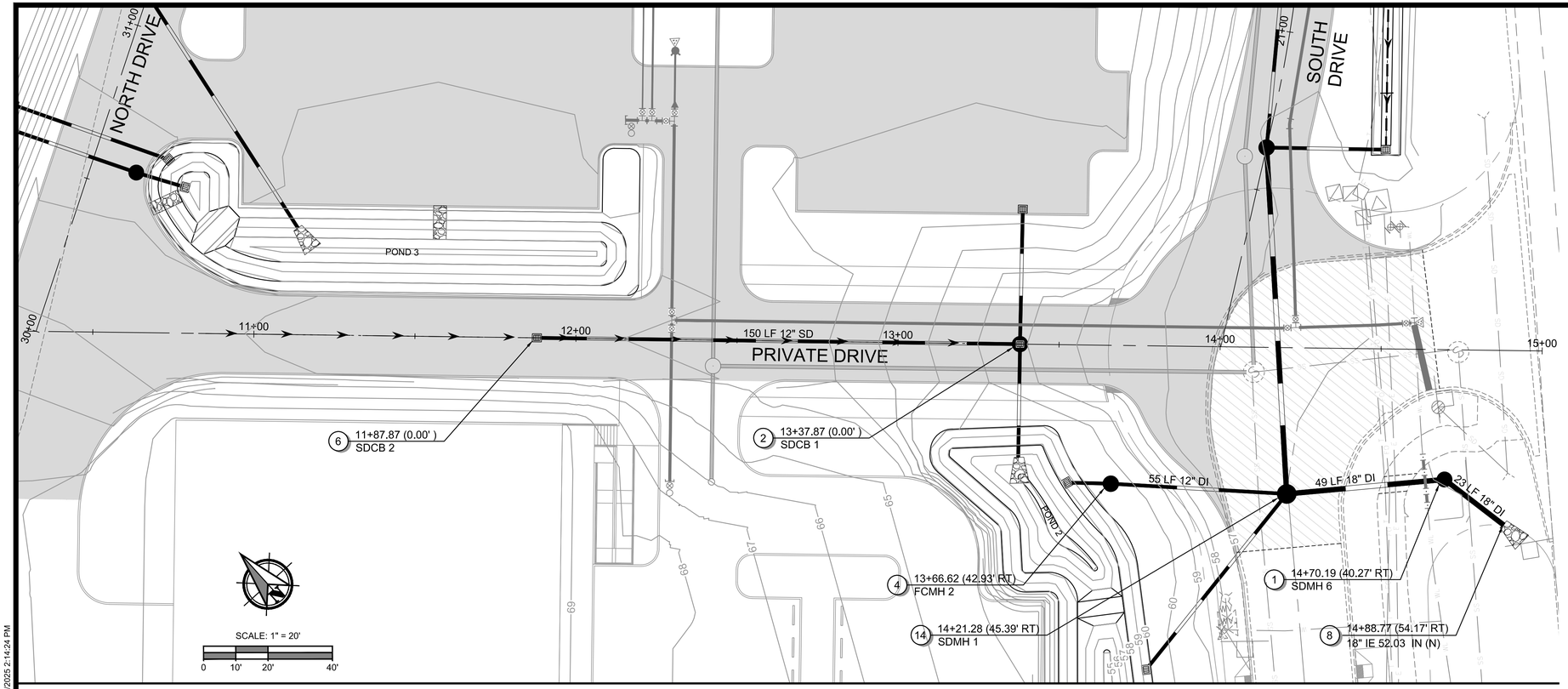

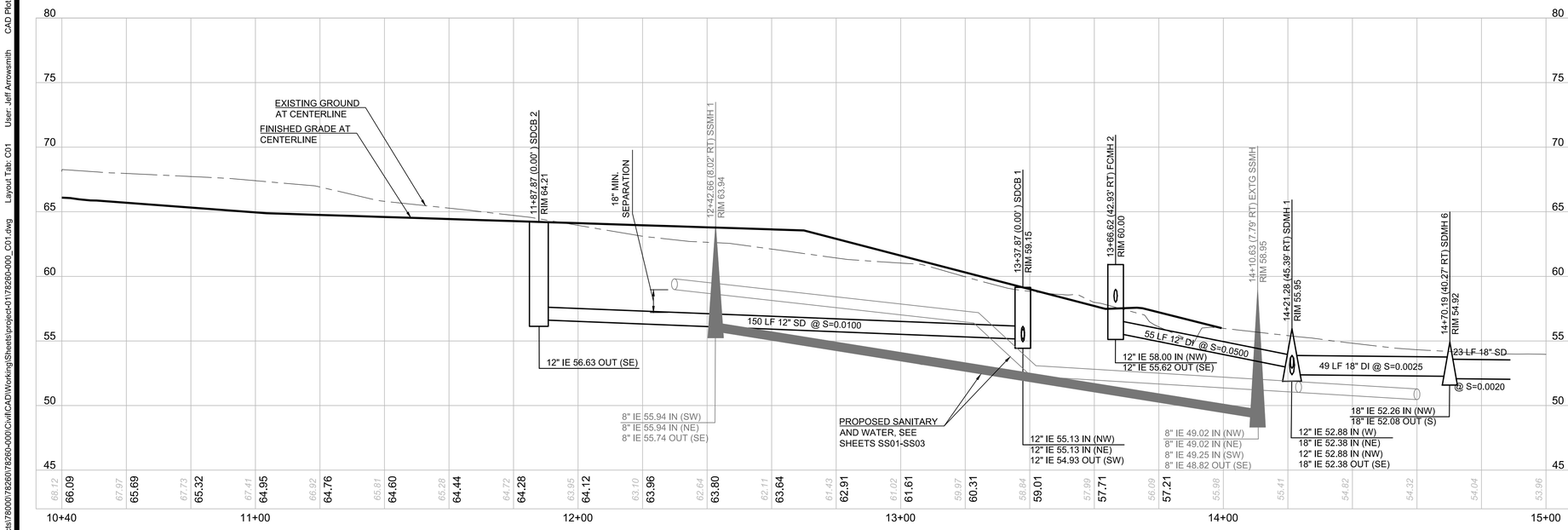

GENERAL NOTES

1. SEE SHEET G02 FOR PLAN SET LEGEND.
2. SEE SHEET G03 FOR PLAN SET GENERAL NOTES.
2. SEE SHEETS C03-C05 FOR STORM PROFILES AND C06-C07 FOR SWALE PROFILE.

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5. INSTALL DITCH INLET PER DETAIL ON SHEET D01.
6. INSTALL CATCH BASIN TYPE 1 PER STANDARD PLAN B-5.20. SEE SHEET D03.
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33. SOUTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
34. PROTECT EXISTING UTILITY STRUCTURES.
35. GRIND AND INLAY PER TYPICAL SECTION ON SHEET ST01.

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PRIVATE DRIVE STORM PROFILE FOR: CASCADE BUSINESS PARK

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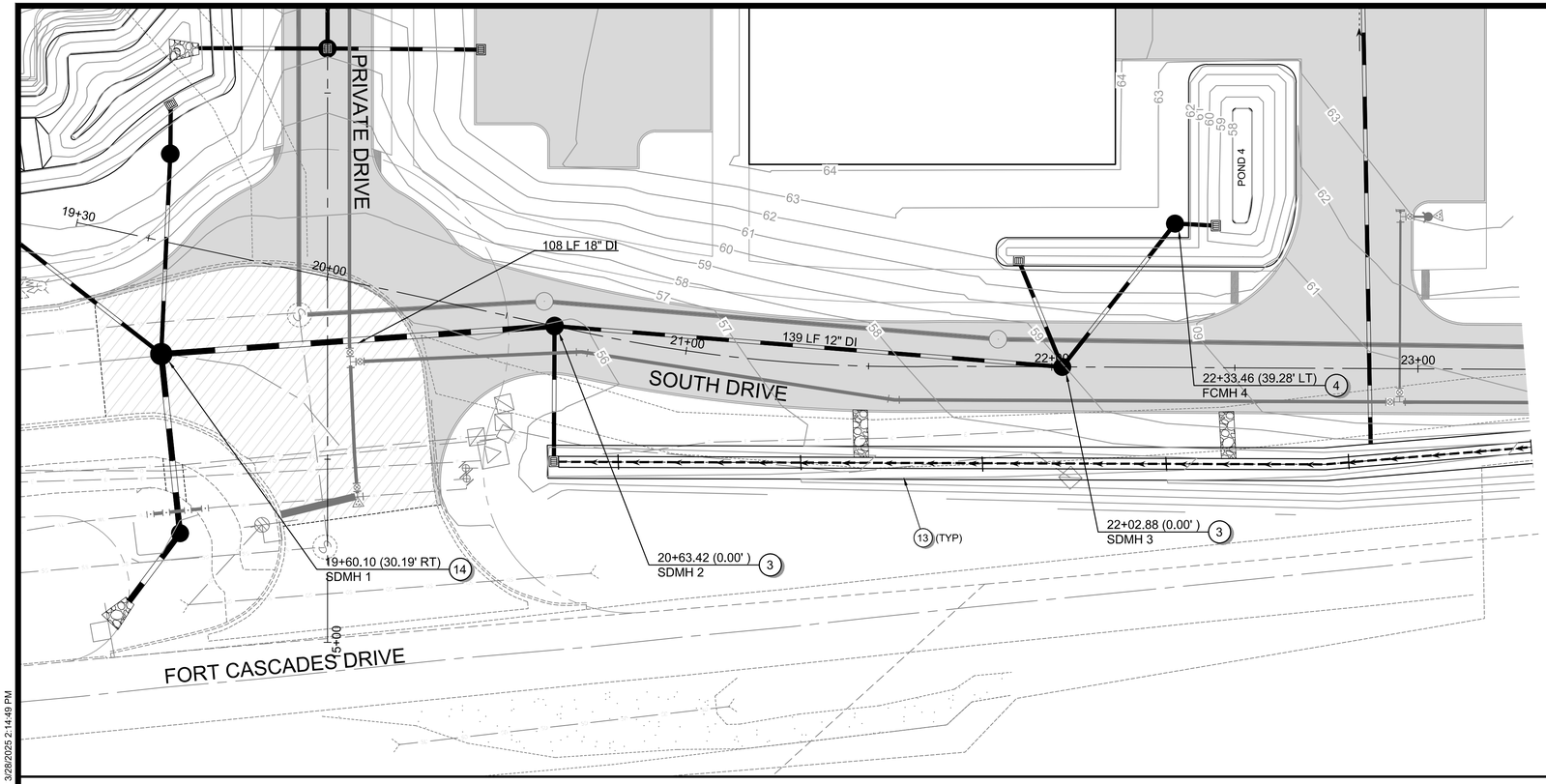

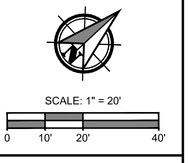

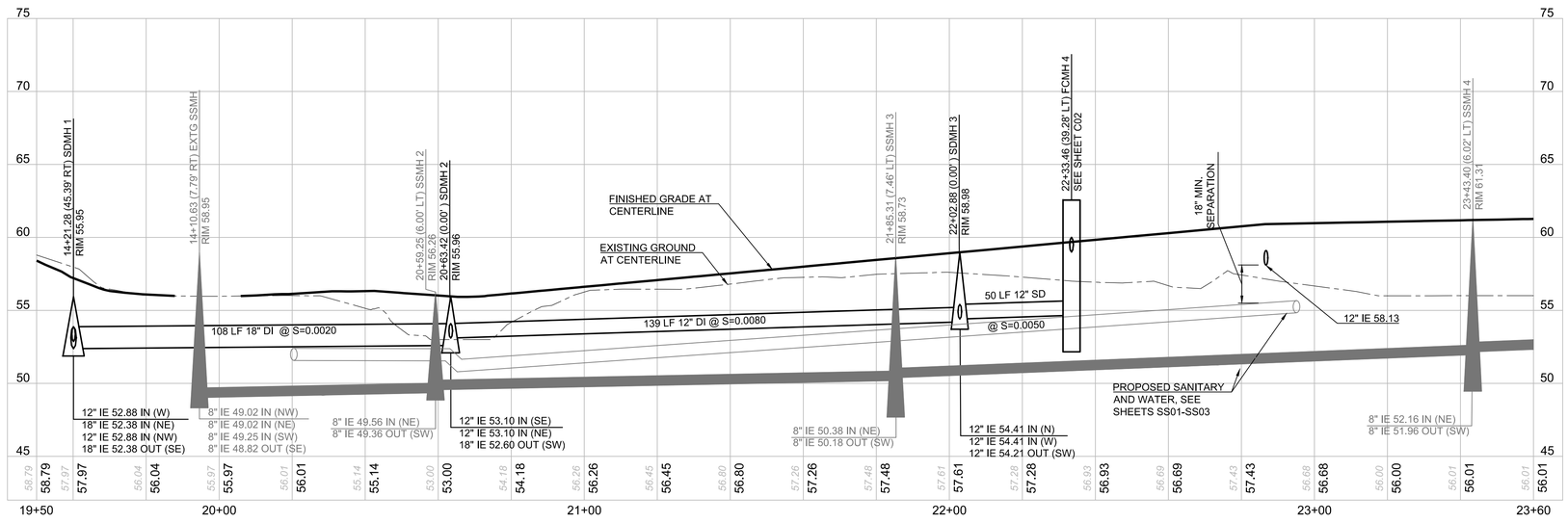

GENERAL NOTES

1. SEE SHEET G02 FOR PLAN SET LEGEND.
2. SEE SHEET G03 FOR PLAN SET GENERAL NOTES.
2. SEE SHEETS C03-C05 FOR STORM PROFILES AND C06-C07 FOR SWALE PROFILE.

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33. SOUTH DRIVE PER TYPICAL SECTION ON SHEET ST01.
34. PROTECT EXISTING UTILITY STRUCTURES.
35. GRIND AND INLAY PER TYPICAL SECTION ON SHEET ST01.

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SOUTH DRIVE STORM PROFILE FOR:

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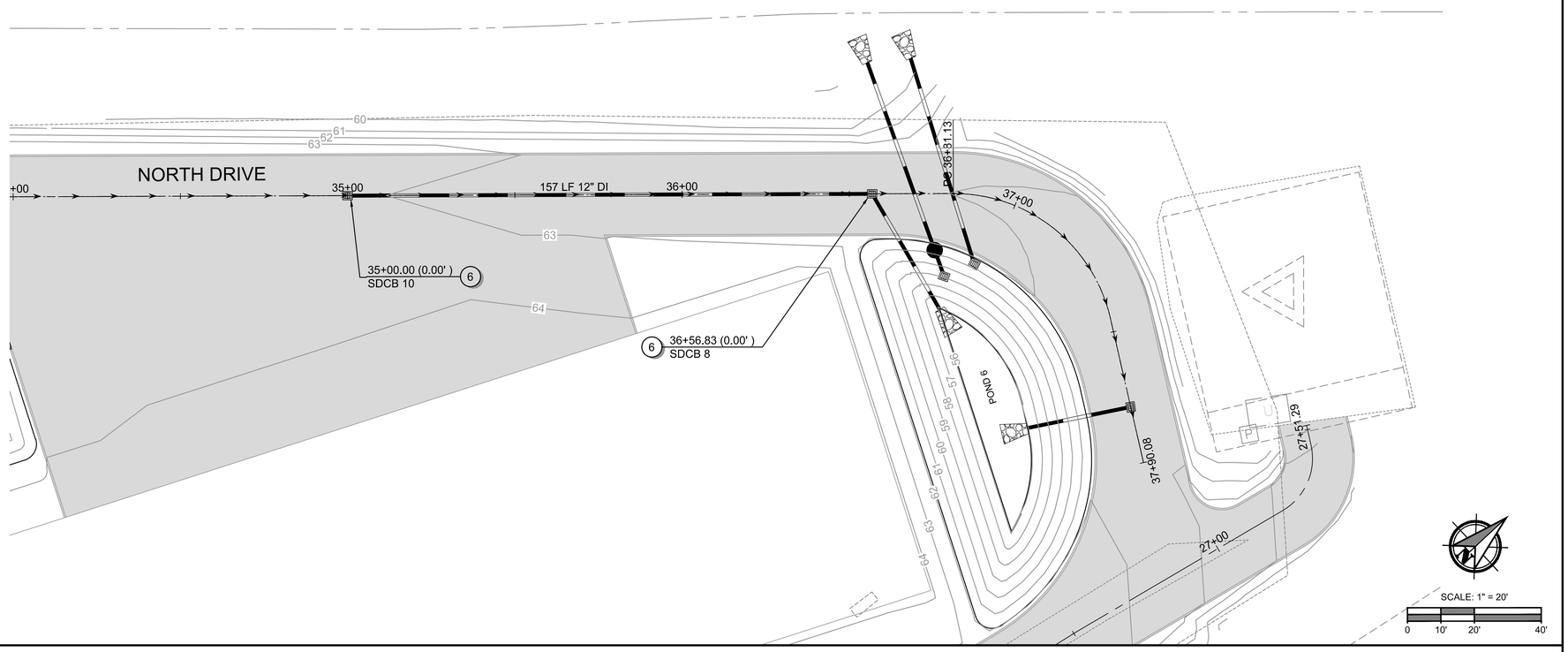

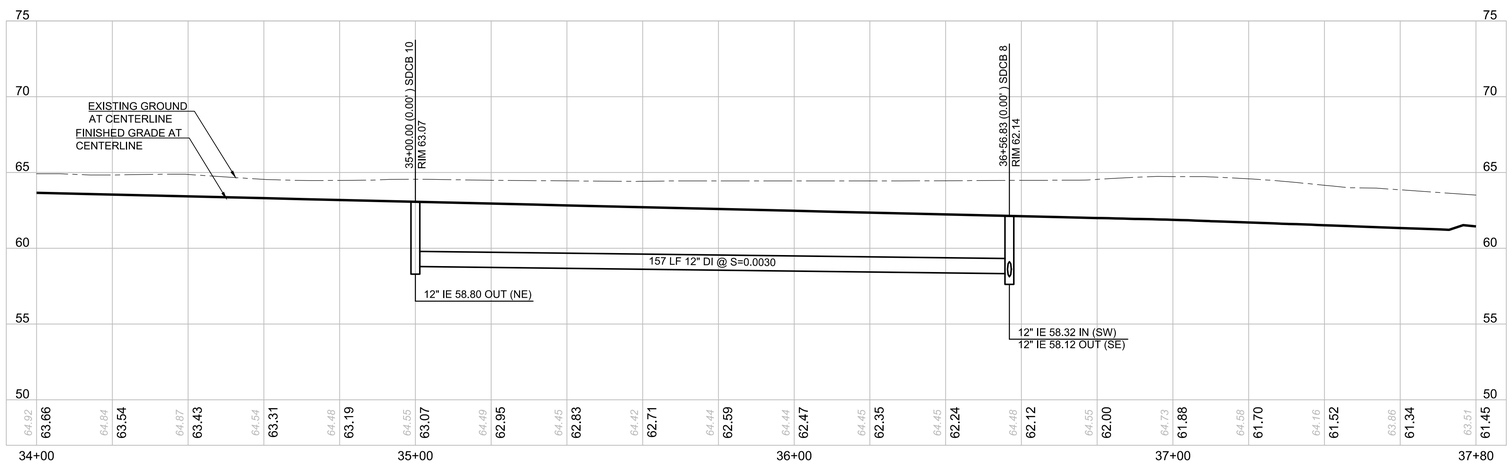

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CONSTRUCTION NOTES - STREET

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34. PROTECT EXISTING UTILITY STRUCTURES.
35. GRIND AND INLAY PER TYPICAL SECTION ON SHEET ST01.

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NORTH DRIVE STORM PROFILE FOR: CASCADE BUSINESS PARK

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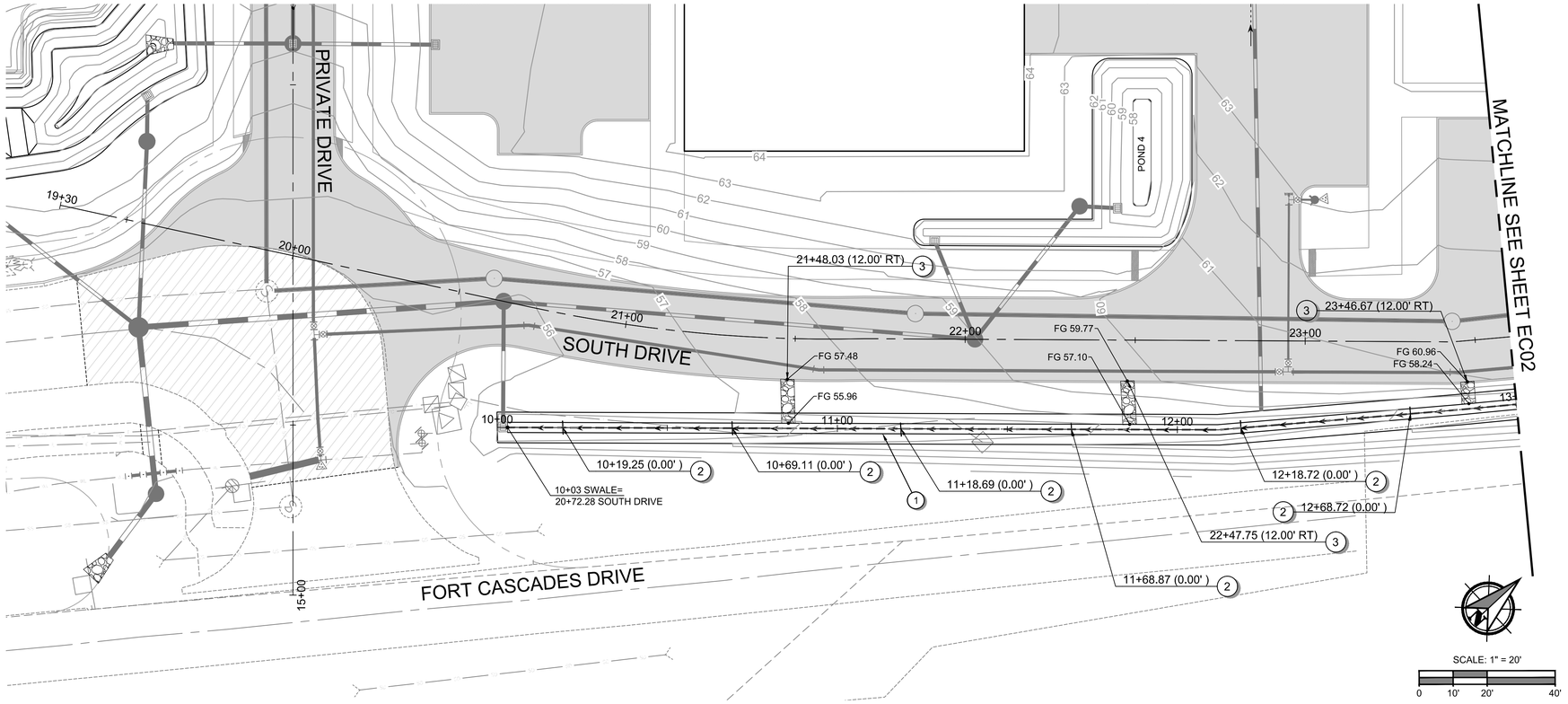

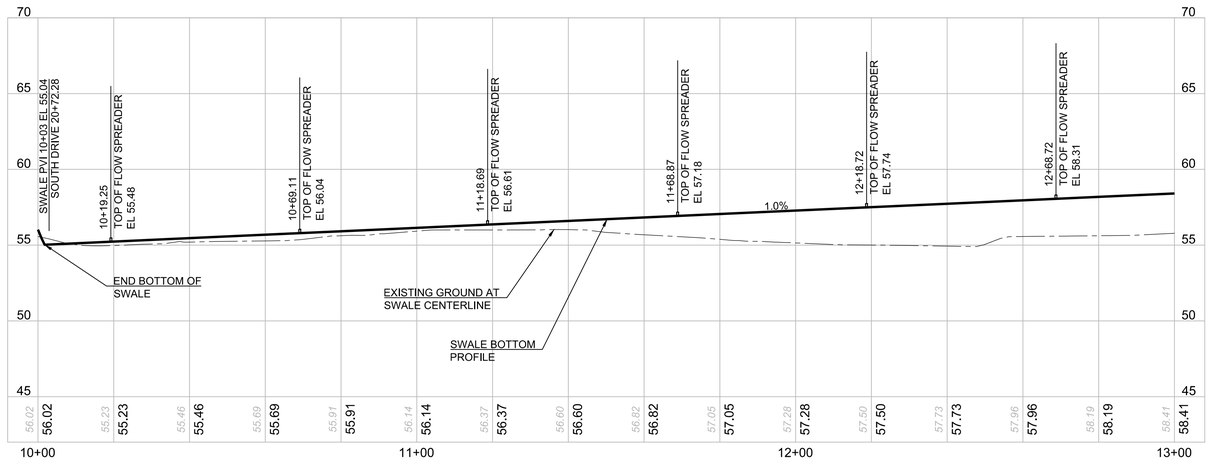

GENERAL NOTES:

1. SEE SHEET G03 FOR PROJECT'S GENERAL NOTES.
2. SEE SHEET G02 FOR ABBREVIATIONS AND MASTER LEGEND.

SITE PLAN NOTES:

1. PROPOSED SWALE PER TYPICAL SECTION, SEE SHEET ST01.
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BIOFILTRATION SWALE PROFILE FILE FOR:
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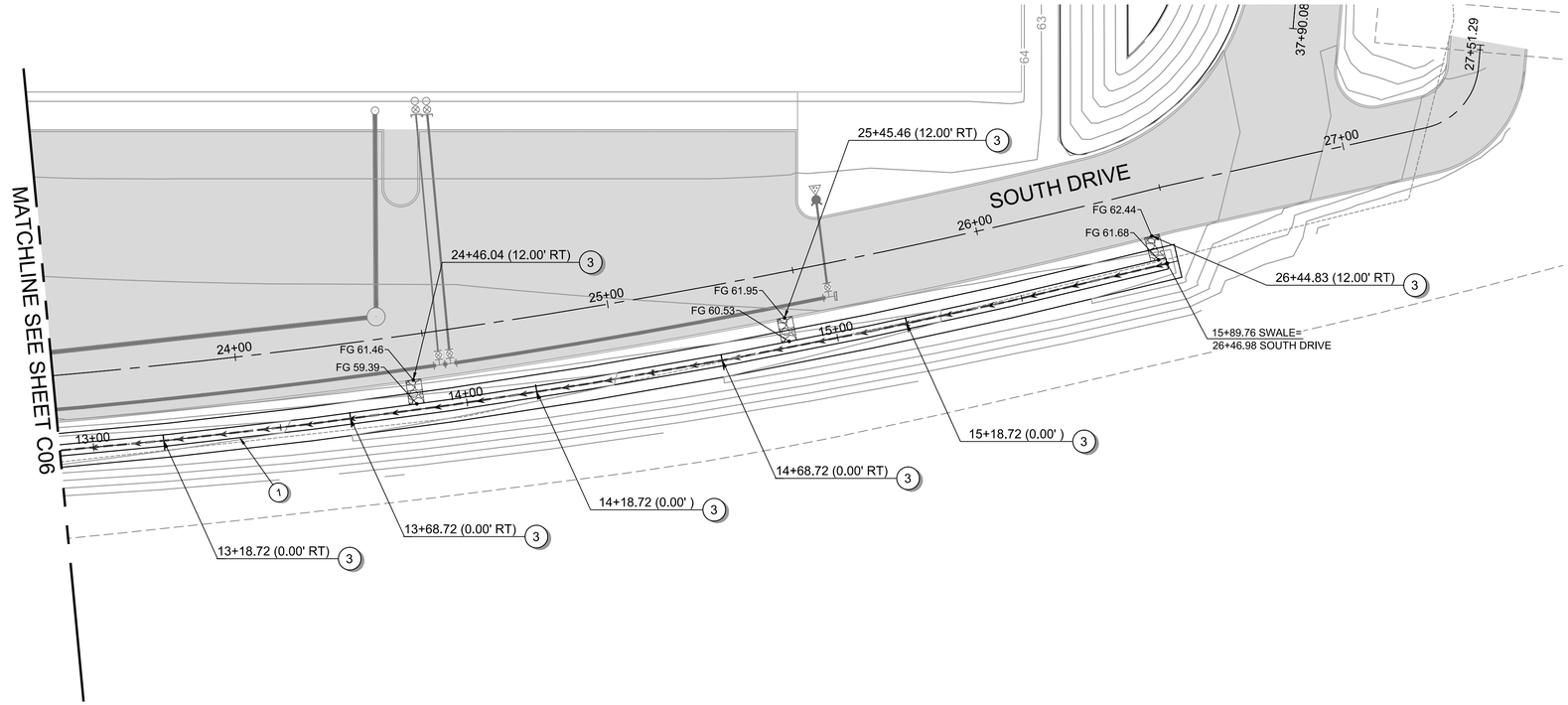

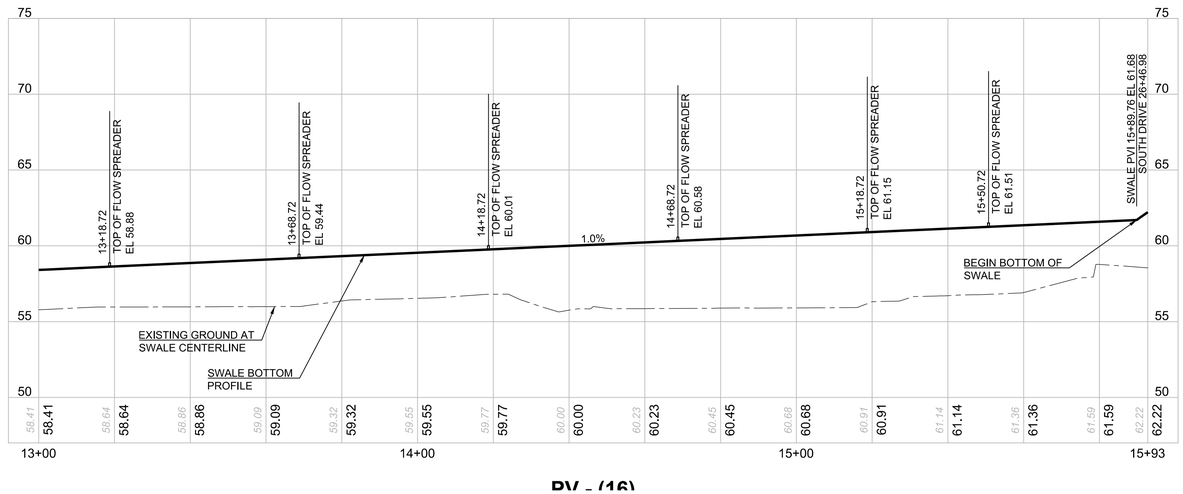

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GENERAL NOTES:

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BIOFILTRATION SWALE PROFILE FOR: CASCADE BUSINESS PARK

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Appendix F
Geotechnical Report

REPORT ON

CASCADE BUSINESS PARK PRELIMINARY GEOTECHNICAL SITE EVALUATION NORTH BONNEVILLE, WASHINGTON

by
Hart Crowser, a division of Haley & Aldrich
Vancouver, Washington

for
Maul Foster Alongi, Inc.
Vancouver, Washington

File No. 0203059-000
April 2022

Draft

HARTCROWSER
A division of Haley & Aldrich

HART CROWSER
A DIVISION OF HALEY & ALDRICH
300 West 15th Street
Vancouver, WA 98660
360.448.4189

21 April 2022
File No. 0203059-000

Maul Foster Alongi, Inc.
109 East 13th Street
Vancouver, Washington 98660

Attention: Mr. Ben Johnson

Subject: Cascade Business Park Preliminary Geotechnical Site Evaluation
North Bonneville, Washington

Ladies and Gentlemen:

Enclosed is our preliminary geotechnical site evaluation report for the proposed Cascade Business Park development to be located east of Cascade Drive and south of State Route 14 in North Bonneville, Washington. The approximately 42-acre project site is located at approximate coordinates of 45.641° North latitude and 121.964° West longitude.

Our understanding of the proposed project is based on project drawings and discussions with Maul Foster Alongi, Inc. The conceptual development plans include construction of up to nine buildings ranging from 12,000 to 60,000 square feet (SF), driveways and parking lots, and a boat parking area. The buildings are expected to be mixed-use with possible uses including a hotel, light industrial, retail/commercial, restaurants/breweries, etc. Total square footage of buildings is expected to be between 200,000 and 300,000 SF. The current conceptual plans shows up to five buildings, including a hotel, in the southwestern half of the site and the remainder in the northeastern portion. Pad grades in the southwest are elevated approximately 20 to 30 feet higher than pad grades in the northeastern area.

Based on available geotechnical data, subsurface conditions at the site typically consist of loose to dense artificial fill (exceeding 40 feet in thickness in places) overlying very dense and hard native materials at depth. The primary geotechnical issues affecting the design and construction of the planned development include seismic shaking, seismic settlement, slope stability, settlement under static loading, stormwater infiltration, and earthwork considerations pertaining to the presence of cobbles and boulders in the artificial fill. Preliminary recommendations for structure foundations include shallow spread footings, potentially bearing on a zone of ground improvement to mitigate seismic settlement hazards. Our preliminary recommendations regarding foundations, site grading, and other geotechnical aspects of this project are presented in this report. These preliminary recommendations are intended to support initial design efforts for the proposed development; design-level geotechnical exploration(s) likely including additional subsurface exploration will be necessary for final design of proposed structures.

Draft

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
HART CROWSER, A DIVISION OF HALEY & ALDRICH

Lauren K. Phillips, PE
Senior Staff Engineer

Micah Hintz
Project Manager

Daniel J. Trisler, PE
Principal Geotechnical Engineer

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1. Introduction

Hart Crowser, a division of Haley & Aldrich (Haley & Aldrich), is pleased to present this report to Maul Foster Alongi, Inc. (MFA) describing our preliminary review of geotechnical conditions at the Cascade Business Park site in North Bonneville, Washington. The approximately 42-acre, triangular-shaped project site is located on the north bank of the Columbia River approximately 30 miles upstream from Portland, Oregon, and is bound by Evergreen Highway (State Route 14) to the north, Fort Cascades Drive to the south and east, and residential properties to the west. Our work was performed in general accordance with the Subcontractor Work Order Authorization dated 21 October 2021.

This report contains the results of our analysis and provides recommendations for design and construction of the proposed development. The first section of this report provides an overview of the project. The main body of the report presents our preliminary geotechnical engineering findings and recommendations in detail. Figures are presented at the end of the text. The location of the site is shown on Figure 1; the existing site layout and topography with the location of our explorations is shown on Figure 2, and the conceptual layout of the proposed development is shown on Figure 3. Supporting information is provided in the appendices. Appendix A contains site subsurface exploration logs and Appendix B contains the results of laboratory testing completed for our analysis. Appendix C includes boring logs and laboratory test data from previous explorations by others.

1.1 PROJECT UNDERSTANDING

We understand that MFA is assisting the city of North Bonneville with master planning for development of the Cascade Business Park site. Our understanding of the proposed site layout is based on our discussions with MFA and review of conceptual drawings prepared by MFA, including the undated, "Figure 1 Grading Exhibit, Cascade Business Park, North Bonneville, Washington," and, "Cascade Business Park Conceptual Site Planning, Site Plan D," with issue date 4 May 2021. These documents depict a proposed development consisting of up to nine buildings, driveways and parking lots, and a boat parking area. The buildings are expected to be mixed-use with possible uses including a hotel, light industrial, retail/commercial, and restaurants/breweries. Total square footage of the buildings is expected to be between 200,000 and 300,000 square feet. The current plan shows up to five of the proposed buildings, including the hotel, within the elevated southwestern half of the site, where proposed pad grades roughly range from Elevation 85 feet (El. 85) to El. 90 (NAVD 88). The remaining structures are planned within the northeastern portion of the site, with proposed pad grades ranging between El. 60 and El. 65.

1.2 SITE HISTORY

The site was used as grazing land prior to the mid-1970s, when it was purchased by the U.S. Army Corps of Engineers (COE), and subsequently cleared of vegetation. During construction of the Bonneville Lock and Dam Second Powerhouse between 1976 and 1982, the site was used for storage, washing, maintenance, and staging of construction equipment. Between 1981 and 1982, the site was also used as a disposal area for over one million cubic yards of excavated materials, predominantly consisting of dredge spoils excavated from the widening of the northernmost channel of the Columbia River and concrete rubble from the temporary cofferdams. This stockpile of material covers the majority of the site and extends between approximately 10 and 50 feet above surrounding native grades, as shown on Figure 2.

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Between 1992 and 1994, the COE investigated potential contamination of onsite soils caused by leaks and spills during the site's prior use as a contractor staging and vehicle maintenance area. Petroleum-containing soils were subsequently removed, and in 1997, the Washington Department of Ecology determined that no further action (NFA) was necessary. Subsurface explorations performed after the NFA judgment revealed buried debris and other materials deemed recognized environmental concerns (RECs). These hazards are discussed in detail in, "Phase I Environmental Site Assessment, Cascade Business Park, Skamania County Parcel Number 02072000020500, North Bonneville, Washington 98639," prepared by MFA and dated 28 July 2020.

Structures formerly present at the site during construction of the dam improvements have been demolished, with the exception of a large concrete pad present near the northeastern corner of the site.

The existing asphalt-paved Coyote Ridge roadway was constructed in 2012, connecting Cascades Drive to Fort Cascades Drive, and roughly bisecting the site into northeastern and southwestern portions.

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2. Scope of Services

This preliminary geotechnical site evaluation was performed to obtain geotechnical information on subsurface conditions at the site and to develop preliminary geotechnical design recommendations for the subject project. Specifically, our scope of services included the following tasks:

- Reviewed relevant, readily available geologic maps and geotechnical reports that cover the site vicinity and nearby to evaluate geologic hazards, regional soil mapping, and local soil and groundwater conditions.
- Conducted a limited subsurface investigation consisting of the following:
    - Two borings advanced to depths of approximately 50 and 35 feet below ground surface (bgs) using sonic drilling methods;
    - Eight test pits advanced to depth between 10 and 11 feet bgs using a backhoe; and
    - Three infiltration tests.
- Completed a limited program of lab testing that included three grain size analyses, eight moisture content tests, and two fines content tests.
- Evaluated seismic design criteria and preliminarily identified seismic hazards, including ground shaking, ground shaking amplification, and liquefaction.
- Conducted preliminary engineering analyses of settlement, bearing capacity, slope stability, and infiltration.
- Developed conceptual recommendations for foundation alternatives, ground improvement, retaining walls, infiltration systems, and building set-backs.
- Evaluated preliminary construction considerations for earthworks, foundations, retaining walls, pavements, and infiltration systems.
- Prepared this report summarizing our findings and preliminary conclusions and recommendations.

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3. Site Conditions

3.1 GEOLOGY AND SOIL MAPPING

3.1.1 Geologic Mapping

Geology in the vicinity of the proposed project site is mapped in the Washington Geologic Information Portal at the 1:100,000 scale. The geology of the site has been mapped as Quaternary alluvium. The alluvial deposits are described as unconsolidated or semiconsolidated and are composed of clay, silt, sand, gravel, and cobbles. Mapping indicates that locally the surficial geology may include modified land and artificial fill (Washington State Department of Natural Resources, 2002).

Based on our review of the United States Geological Survey's Quaternary Fault and Fold Database of the United States, mapped faults near the site include the Eagle Creek Thrust Fault located 5 miles south of the site, the "Faults near The Dalles" located 17 miles east of the site, and Lacamas Lake Fault located 19 miles west of the site. The Cascadia Subduction Zone (referred to in the database as the Cascadia fold and fault belt) is mapped as close as 120 miles west of the site.

3.1.2 Soils Mapping

The near-surface native soils at the site are mapped in the U.S. Department of Agriculture (USDA) web soil survey (USDA 2018). The survey indicates that the surficial soils at the site consist primarily of Pilchuck very fine sandy loam (0 to 3 percent slopes), with Arents (0 to 5 percent slopes) mapped along the south-eastern edge of the site, along Fort Cascades Drive. The Pilchuck soils are described as fine sandy loam and loamy sand derived from flood plain deposits with an estimated hydraulic conductivity in the most restrictive layer of high (approximately 1.98 to 5.95 inches per hour) and are described as somewhat excessively drained. The Arents soils are described as gravelly sandy loam derived from terraces. The Arents soils have an estimated hydraulic conductivity in the most limiting layer of moderately high to high (approximately 0.57 to 5.95 inches per hour) and are described as well-drained.

3.2 SURFACE CONDITIONS

The ground surface at the site is generally uneven and largely covered in grass with few trees. Coyote Ridge, an asphalt-paved road constructed onsite in 2012, traverses the site in a z-shaped alignment, starting from Cascade Drive in the northwest corner and ending at Fort Cascades Drive along the southeastern site boundary. Boulders and concrete debris are present at the surface in localized areas across the site. A paved pad with approximate dimensions of 150 feet by 85 feet is located in the northeast corner of the site.

Fill soils from construction of the Bonneville Dam are present at the site, forming a large mound that has mostly remained undisturbed for the last approximately 40 years. This mound reaches its greatest elevation in the western portion of the site, reaching a high point of approximately El. 103. The mound steps down to the northeast of Cascade Drive to El. 70. The natural ground elevations are approximately El. 40 along the south side of the site adjacent to Fort Cascades Drive and El. 50 along the north side of the site.

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Existing slopes on site range from gradual slopes of 3 horizontal to 1 vertical (3H:1V) or flatter, to steeper slopes of approximately 2H:1V. There are relatively level areas on the southwest and northeast portions of the site where the majority of the proposed buildings are located. The mound on the southwest portion of the site falls off steeply to the west and south at slopes ranging from approximately 3H:1V to 2H:1V. Some of the proposed buildings are located at the top of these slopes.

3.3 SUBSURFACE CONDITIONS

Our understanding of subsurface conditions at the site was developed from interpretation of geologic maps and our explorations, in conjunction with soil properties inferred from field observations and laboratory tests. This understanding of subsurface conditions formed the basis for the conclusions and preliminary recommendations provided in this report.

Subsurface explorations performed at the site include the current exploration program performed by Haley & Aldrich in February 2022, and four other geotechnical and environmental exploration programs performed onsite by others between 1989 and 2012 (Appendix A). The approximate locations and designations of the previous and current subsurface explorations are shown on Figures 2 and 3. The following serves as a summary of these various exploration programs:

1990 Hamilton Island Site Inspection Study (Army Corps of Engineers)

- Two exploratory borings (designated DH12 and DH14) were drilled onsite to depths ranging from 19.5 to 46 feet bgs.

1994 Parcels 2 and C Environmental Baseline Study (Woodward-Clyde Consultants)

- Four exploratory borings (designated SB1 through SB4) were drilled to depths ranging from 27 to 36.5 feet bgs, using an air-rotary drill rig;
- Three monitoring wells (designated MW1 through MW3) were drilled to depths ranging from 26.5 to 49 feet bgs, using an air-rotary drill rig; and
- Sixteen test pits (designated in this report as WC-TP1 to WC-TP16) were excavated to depths of 4 to 15 feet bgs using a track-mounted backhoe.

2001 Test Pit Exploration (Squier Associates)

- Eight test pits (designated in this report as SA-TP-1 through SA-TP-8) were excavated to depths of 5 to 23 feet bgs using a track-mounted excavator.

2012 Geotechnical Site Investigation for Flexible Pavement Design (Columbia West Engineering)

- Eleven test pits (designated in this report as CW-TP-1 through CW-TP-11) were excavated to depths of 3.5 to 12 feet bgs using a track-mounted excavator, at locations along Coyote Ridge and near the western site limits.

2022 Preliminary Exploration Program (Haley & Aldrich)

- Two exploratory boring (designated B-06 and B-07) were drilled to depths of 36.5 and 51.5 feet bgs, using a truck-mounted sonic drill rig;

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- Eight test pits (designated TP-01 through TP-08) were excavated to depths of 10 to 11 feet bgs using a track-mounted backhoe; and
- Three shallow infiltration tests (designated IT-1 through IT-3) were performed to test the rate of hydraulic conductivity of the soils within the upper 1 to 3 feet of the site.

The approximate locations of the borings, monitoring wells, test pits, and infiltration tests are indicated on Figures 2 and 3.

3.3.1 Soils

Subsurface conditions at the site are typically defined by a thick layer of artificial fill overlying native alluvial materials. Boring B-06 encountered loose to medium dense fill material to a depth of approximately 44 feet bgs before encountering native materials near El. 53. Boring B-07 did not encounter native material, with fill above El. 59 at this location primarily consisting of loose to medium dense silty sand with variable quantities (sometimes significant) of gravel, cobbles, and boulders. All eight test pits encountered fill materials, typically composed of silty sand with gravel and cobbles in addition to boulders up to 2 feet in largest dimension, petrified wood, and brick debris.

Moisture contents in the fill encountered at borings B-06 and B-07 ranged from 11 to 19 percent. Fines content of the fill ranged from 17 to 28 percent.

Fill encountered in historical borings by the Army Corps of Engineers and Woodward Clyde Consultants was typically described as silty gravel with cobbles and silty sand with gravel. Historical boring logs often report high sampling blow counts and corresponding descriptions of the fill as dense to very dense; however, these high blow counts are coupled with low sample recovery and descriptions of medium to coarse gravel, cobbles, and boulders within the fill, suggesting that the blow counts may be partially attributed to the presence of oversize material rather than the density of the fill materials. Many borings also encountered occasional seams of silt and clay up to 3 feet thick in the fill material.

Below the fill material, native soils consisting of dense to very dense silty sand and sandy gravel and hard clayey silt and sandy silt with gravel extended to the bottom of boring B-06. Cobbles were also encountered in the native soils. Data presented in the Woodward Clyde report, notably cross section A-A', suggests that the fill-native contact in the central to southwestern portion of the site is expected to be present between El. 50 and El. 60.

3.3.2 Groundwater

Depth to groundwater appears variable across the site. Boring B-06 encountered perched groundwater at a depth of 40.6 feet bgs (approx. El. 56), several feet above an approximately 1-foot-thick layer of fat clay. Perched groundwater at B-07 was encountered at a depth of just 1.2 feet bgs, several feet above a lean clay layer. Seepage was noted at a depth of 7 feet at test pit TP-01 during the current field exploration.

Historical boring and test pit logs reported encountering water at various elevations. Columbia West test pits TP-2 and TP-3 encountered free water at El. 44 and El. 55, respectively, while the other nine test pits performed during that study did not encounter free water. Woodward Clyde borings MW2 and MW3 reported free water near El. 54 and El. 80, respectively; test pits TP8, TP9, and TP12 from this study reportedly encountered seepage near El. 53, El. 54, and El. 49, respectively. Most of the reported free

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water and seepage elevations are within several feet of the interpreted fill-native contact, suggesting that several feet of perched water may typically be present near this contact across the site. As many of the test pits and borings did not report free water at or below these elevations, these instances of free water are not interpreted to signify a regional groundwater table.

The deepest stabilized groundwater level at the site was encountered at monitoring well MW-1, which was constructed with a base elevation of El. 11 on 28 January 1993. A stabilized groundwater measurement collected approximately one month after installation on 25 February 1993 reported a groundwater elevation of approximately El. 17. We interpret that the site groundwater table is at approximately El. 17, and that groundwater instances recorded at higher elevations in other onsite explorations are perched layers resting over localized, less-permeable soil layers of clay and silt.

3.3.3 Infiltration

We performed three in situ infiltration tests at the project site. The tests were completed in shallow test holes advanced adjacent to select test pits. The infiltration tests consisted of open-hole, falling head test. The results of the field testing and associated fines content and soil type of tested soils are provided in Table I. The drawdown values presented in Table I are not to be used for design but are provided to show the direct results of the field measurement.

TABLE I
Infiltration Test Data

Infiltration Test No.	Test Pit No.	Approximate Test Depth (feet)	Field Drawdown Rate (inches/hour)	Soil Type (USCS)	Fines Content (percent)
IT-1	TP-02	3	0.4	SM	25
IT-2	TP-05	3	0.2	SM	28
IT-3	TP-08	3	0.2	SM	21

3.4 GEOLOGIC AND SEISMIC HAZARDS

3.4.1 Seismic Shaking

We evaluated potential seismic shaking at the site using guidelines presented by ASCE 7-16, as referenced by the currently adopted 2018 International Building Code. Code-based seismic design values for design-level recommendations for the proposed structures may vary if the subsequent version of the ASCE 7 guidelines (ASCE 7-22) is adopted at the time of design.

The expected peak bedrock acceleration having a 2 percent probability of exceedance in 50 years (2,475-year return period) is 0.275g. This value represents the peak acceleration on bedrock beneath the site and does not account for ground motion amplification due to site-specific effects. The peak ground acceleration (PGA) is determined by applying a site class factor to the peak bedrock acceleration. The PGA accounting for site amplification is PGA_M = 0.365g. Refer to *Section 4.4.2 Site Classification* for a discussion of ground motion amplification.

We obtained a deaggregation of the seismic sources contributing to the expected peak bedrock acceleration shown above from the United States Geological Survey's Unified Hazard Tool website

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(USGS 2022). Seismic sources contributing to this potential ground shaking include the shallow crustal faults of the Portland Hills fault system and the Cascadia Subduction Zone (CSZ) megathrust and intraplate sources. The data indicated that the "modal source" for shaking at the site at all potential periods of interest (0.0 to 2.0) is a magnitude 9.34 quake epicentered at the CSZ approximately 128 kilometers from the site. The modal source generally signifies the earthquake with the highest contribution to the site earthquake hazard, in this instance a rupture along the CSZ.

3.4.2 Site Classification

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by the 2018 International Building Code (IBC) (ICC 2015) to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet of soil and bedrock materials at a site. Artificial fill is present within the upper 20 to 40 feet of subsurface stratigraphy throughout much of the site and is generally characterized by sand and gravel that ranges from loose to dense across the site. The artificial fill is typically underlain by alluvium composed of dense to very dense granular soils and very stiff to hard fine-grained materials. Our explorations did not extend to a depth of 100 feet bgs; however, based on our knowledge of local geologic conditions, it is reasonable to extrapolate the consistency of the materials encountered at the base of the borings to 100 feet. Based on these conditions, the property has a **Site Class D**.

Refer to *Section 5.3 Seismic Design* of this report for additional discussion regarding the recommended site class value for design of structures.

3.4.3 Liquefaction

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

The Washington State Geologic Information Portal website maps the site as having a moderate to high susceptibility to liquefaction.

We performed site-specific liquefaction potential analysis on the materials encountered in our borings, using procedures outlined in Idriss and Boulanger (2014). In accordance with American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures (ASCE 7-16), we completed the liquefaction hazard analysis using the site class adjusted Maximum Considered Earthquake Geometric Mean PGA (PGAM). We used a PGA_M of 0.365 g and associated earthquake magnitude of 9.34 in our analysis. A design groundwater elevation of El. 17 was considered, based on the groundwater level reported at monitoring well MW-1. Based on the depth to the regional groundwater table, within

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the dense to very dense native alluvial materials, we conclude that the liquefaction hazard within materials submerged by the regional groundwater table is low.

While the loose to dense artificial fill that blankets the site is well above the design groundwater table and is therefore assumed to be unsaturated, much of this material would be subject to liquefaction under saturated conditions. Perched groundwater has been identified at various depths throughout the site during the current and previous subsurface exploration programs, as well as during grading of Coyote Ridge. Fill saturated by perched water may be subject to localized liquefaction and liquefaction-induced settlements. The potential for localized liquefaction settlement should be considered during design-level evaluations for the development.

3.4.4 Cyclic Densification

Seismically induced compaction or densification of non-saturated granular soil (such as sand above the groundwater table) due to earthquake vibrations can result in settlement of the ground surface. The non-engineered artificial fill at the site is largely composed of loose to dense granular soils with potential for susceptibility to cyclic densification.

We evaluated the potential for cyclic densification within the artificial fill logged at borings B-06 and B-07 using the procedure described by Pradel (1998) and incorporating the refinements presented by Yee, Duku, and Stewart (2014). Our analyses indicate that the granular artificial fill present within the upper approximately 40 feet bgs in the western portion of the site may experience cyclic densification on the order of 3 to 6 inches, under seismic shaking from the design earthquake. We assume that fill soils present in the eastern portion of the site are similarly susceptible to cyclic densification, despite relatively high sampling blow counts, which are assumed to be attributed to the presence of gravels and cobbles. As the fill thickness in the eastern region is generally on the order of 20 to 30 feet, we judge that cyclic densification settlements in the eastern area will be on the order of 1 to 2 inches total. Due to uneven composition of the fill and subsurface boring data indicating loose and dense fill profiles within a short distance of one another, we anticipate that the cyclic densification may be variable across the site and manifest with significant differential settlement. We conclude that the potential for cyclic densification at the site is high.

3.4.5 Fault Rupture

There are no mapped earthquake faults passing through or near the site. The nearest mapped faults are the Eagle Creek Thrust Fault located 5 miles south of the site, the “Faults near The Dalles” located 17 miles east of the site, and Lacamas Lake Fault located 19 miles west of the site.

3.5 SLOPE STABILITY

We understand that significant regrading will be completed at the site to accommodate development. In some areas, grades will be raised with new fill and slopes will be made steeper to accommodate the new buildings. Our understanding of proposed grading is based on a topographic site plan of existing conditions and proposed conditions provided by MFA via email on 17 March 2022. The majority of slopes in the proposed grading configuration are at an inclination of 3H:1V (horizontal: vertical) or flatter.

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Based on the proposed grading plans, we analyzed a slope profile crossing the site from north to south, passing directly to the east of the proposed 3-story hotel, at the location shown on Figure 2. The stability analyses were performed using RocScience Slide2, a limit-equilibrium software program for analyzing static and pseudostatic (seismic) factors of safety for soil slopes (Rocscience 2020). The slope section was analyzed using circular searches with Spencer's Method to calculate the factor of safety against sliding. A static factor of safety of 1.5 or greater for slopes analyzed using this method is typically considered adequate for demonstrating stability.

The Bray and Macedo (2019) procedure was used for estimating seismic-induced slope displacements based on probability of exceedance. This procedure is performed by determining the yield acceleration (ky) of a given slope configuration using limit-equilibrium analysis, selecting a design earthquake magnitude, estimating an initial fundamental period of the sliding mass as a function of critical failure surface height and average shear wave velocity of the subsurface profile, and selection of a design spectral acceleration that corresponds to a period equal to 1.3 times the initial fundamental period.

Preliminary seismic slope evaluation considered a M_w 9.34 event occurring along the Cascadia Subduction Zone, and a slope profile was evaluated to estimate seismic-induced slope displacements at 50-percent and 16-percent (one standard deviation) probabilities of exceedance. Estimated seismic slope displacements are expected to be on the order of 4 inches for the 50-percent exceedance level, and on the order of approximately 10 inches for the 16-percent exceedance level.

Based on the results of our slope stability analysis, site slopes laid back at inclinations no steeper than 3H:1V are generally expected to perform well under static and seismic conditions. *We recommend that design-level geotechnical analyses include supplemental slope stability evaluations where planned inclinations are steeper than 3H:1V and for all structures located near planned or existing slopes.*

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4. Conclusions

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed development. The following provides a summary of key preliminary geotechnical findings and conclusions.

- Site soils include a thick layer (over 40 feet in places) of loose to dense fill soils predominantly composed of silty and clayey sand and gravel. The fill soils are underlain by dense native soils composed of silty sand with gravel and cobbles. Cobbles and boulders are present in both fill and native soil layers.
- Perched groundwater is present at various depths across the site. Areas of perched groundwater over layers of silt and clay are likely to be encountered during construction. Localized pockets of "confined" water may be encountered where water upwells when exposed (e.g. artesian conditions).
- Due to the loose and variable nature of the fill soils, it is expected that seismic shaking will induce localized liquefaction and/or densification of the soil. Seismically induced settlements of 1 to 6 inches may result from a design-level earthquake.
- We anticipate the soils present at shallow depths beneath the existing ground surface will be suitable for support of conventional building foundations, building floor slabs, and pavements, once prepared and compacted in conformance with geotechnical recommendations.
  - Due to the variable and loose nature of the existing fill, recompaction of 1 to 3 feet of existing fill materials will be required below building foundation/slab and pavement subgrades.
  - The use of interlocking grade beams/footings may be required to reduce potential differential settlement (static and seismic).
  - Ground improvement may be required to increase bearing capacity and limit settlement for select structures and improvements.
- Site soils have low hydraulic conductivity rates and are expected to vary significantly across the site, due to the preponderance of artificial fill. The use of infiltration systems for the disposal of stormwater within thick fill areas may not be feasible. Placement of infiltration systems in native soils areas (at the bases of the fill mounds) will require further study to characterize the infiltration capacity of those materials.
- The on-site native soils are typically suitable for reuse as structural fill, provided they are properly moisture conditioned and oversized materials are removed. We note that:
  - The presence of cobbles and boulders across the site may pose challenges for excavation.
  - The high fines content of the soils may cause them to be easily disturbed during construction. The use of wet soil/weather earthwork practices will likely be required during construction.
- Current conceptual plans show existing slopes being regraded at a 3H:1V inclination, which based on our analysis is expected to be stable in both static and seismic states.

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- For planning purposes, we recommend structures be set-back from a 2H:1V projection extending from the toe of nearby slopes. For structures located between 2H:1V and 3H:1V projection, structure-specific stability analysis will be required.
- If existing slopes are left at inclinations steeper than 3H:1V then they should be considered seismically unstable and susceptible to significant sloughing.
- If existing slopes are left at inclinations steeper than 2H:1V then they should be considered both statically and seismically unstable. Structures should not be constructed on or directly adjacent to slopes steeper than 2H:1V.

The following sections present our preliminary design and construction considerations that can be used for initial planning of future development. These guidelines should not be used for final design of future improvements.

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5. Preliminary Geotechnical Design Considerations

5.1 FOUNDATIONS

As discussed above, much of the site is underlain by variable (loose to dense) artificial fill that is expected to be subject to significant static and seismic settlements in its current state. Static settlements may feasibly be addressed by performing limited overexcavation and recompaction of subgrade soils to provide an engineered fill subgrade that provides relatively uniform foundation support. However, approximately 1 to 6 inches of seismic settlement is expected to occur across the site.

The preliminary foundation design and construction guidelines provided in this section of the report will help improve the seismic performance of the proposed buildings. The design philosophy behind the IBC (ICC 2018) is that a building will not collapse during a design-level earthquake; however, cosmetic and functional distress will occur, and even structural distress is likely to result, potentially rendering the structures unusable until repaired or replaced. If these performance criteria are not acceptable, we should be notified so we can modify our recommendations.

Based on the results of our investigation, it is our opinion that one- to three-story structures can be supported on conventional spread foundations or mat foundations designed to gain support on a zone of overexcavated and recompacted structural fill (where estimated settlements can be tolerated) or bear on subgrade subjected to ground improvement (where estimated settlements exceed structural tolerances). Furthermore, due to the soil variability, we recommend that spread footings be tied to one another following the criterion outlined in Section 12.13.9 Requirements for Foundations on Liquefiable Sites of ASCE-7-16 (ASCE/SEI 2016).

Preliminary recommendations for spread foundations bearing are discussed below.

5.1.1 Shallow Foundations Bearing on Recompacted Fill

For lightly loaded buildings that are relatively insensitive to settlement, we anticipate that shallow spread footings bearing on recompacted fill can be used.

5.1.1.1 Dimensions and Design Criteria

For preliminary design, we recommend strip footings be designed for a maximum allowable bearing pressure of 2,000 pounds per square foot (psf). The footings should have a minimum width of 1.5 feet. Isolated footings should not be used. All footings should be interconnected with one another following the criterion outlined in Section 12.13.9 of ASCE-7-16 (ASCE/SEI 2016). For the design matrices, the structural engineer may assume that there is 0 inches of lateral spreading displacement and a maximum of 4 inches of differential settlement over a 50-foot span. (Actual settlements may vary from this amount, likely less, however, this value should be used for preliminary planning.)

5.1.1.2 Lateral Resistance

Lateral loads on footings can be resisted by passive earth pressures on the sides of footings and by friction on the bearing surface. We recommend that passive earth pressures be calculated using an

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equivalent fluid density of 350 pounds per cubic foot (pcf). We recommend using a friction coefficient of 0.30 for foundations placed on in situ soil or 0.5 for foundations on a minimum 6-inch-thick aggregate base subgrade. The passive earth pressure and friction components may be combined, provided the passive component does not exceed two-thirds of the total. The lateral resistance values do not include safety factors.

5.1.1.3 Subgrade Preparation

The existing fills beneath proposed footings should be removed and/or scarified and recompacted to depths of between 1.5 and 3 feet below base of footing. The reworked area should extend laterally at least 6 to 18 inches beyond all edges of the footings. The exact depth and lateral extent of reworking will be determined in the future based on actual building location, loads, configuration, and supplemental explorations (if completed).

5.1.1.4 Settlement

We estimate that footings bearing on the existing loose to medium dense fill will experience some immediate settlement. For a lightweight, single-story structure, we expect settlement to be on the order of 0.5 inches. For taller, heavier buildings settlement is likely to be in the range of 1 to 2 inches.

As stated previously, seismic-induced cyclic densification may induce an additional 3 to 6 inches of settlement underneath structures in the western portion of the site, and 1 to 2 inches of settlement in the eastern portion.

As noted above, the foundation systems ability to resist and accommodate settlement shall be increased via the use of interlocking footings/grade beams.

5.1.2 Shallow Foundations Bearing on Ground Improvement

For larger, more heavily loaded buildings, or buildings that are sensitive to settlement, we anticipate that ground improvement measures may need to be implemented prior to the installation of shallow spread footings.

5.1.2.1 Ground Improvement Methods

There are multiple ground improvement measures that can be used to improve bearing capacity and mitigate anticipated static and seismic-induced settlements. However, the relatively extensive presence of cobbles and boulders at the site will cause difficulties with most systems. Therefore, the selection of a preferred ground improvement system will best be made during the design for a specific structure, when specialty contractors can be consulted by the project team.

Conceptually, we anticipate that an aggregate pier system (e.g. GeoPiers) will be viable. These systems create a pier filled with aggregate compacted via vibratory or impact action beneath a building pad. The piers densify the *in situ* soil during installation and provide a load-transfer mechanism to reduce loading on the *in situ* soils. Also, while not commonly used in the Pacific Northwest, this site may be suitable to improvement via deep dynamic compaction. Deep dynamic compaction is achieved by subjecting the fill to repeated impacts from a large mass suspended by a crane. The use of deep dynamic compaction is only feasible when other improvements (e.g. buildings) are not located proximate to a

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site. Another approach to ground improvement may be deep overexcavation of existing fill and reconstruction of a geogrid-reinforced fill pad beneath a building. Depending upon the building and soil conditions, the overexcavation and fill pad may be 5 to 10 feet thick.

The detailed final design and installation of ground improvement is typically performed by specialty subcontractors, in accordance with performance criteria established by the Owner's Geotechnical Engineer (Haley & Aldrich). Proposals by prospective specialty contractors bidding the work will be reviewed by the Geotechnical Engineer and the respective Structural Engineer for each structure for suitability of the proposed system and compliance with the project requirements.

5.1.2.2 Dimensions and Design Criteria

Preliminarily, we recommend anticipate that most ground improvement methods will allow for shallow footings to be designed using an allowable bearing pressure of 4 to 5 kips per square foot (ksf). Continuous footings should be at least 2 feet wide and isolated footings should be a minimum of 3 feet square.

5.1.2.3 Lateral Resistance

Lateral resistance of footings may preliminarily be designed per Section 5.1.1.2

5.1.2.4 Settlement

The settlement performance of building supported by ground improvements will vary depending upon the system chosen. However, we anticipate most systems will be capable of achieving maximum total and differential static settlements of 1-inch and 1/2-inch over a distance of 50 feet, respectively.

5.2 FLOOR SLABS

We anticipate that most buildings will have concrete slab-on-grade floors. Due to the variable nature of the site soils, we recommend that the upper 12 to 18 inches of soil beneath floor slabs be recompacted, or consist of 12 to 18 inches of new fill over the existing subgrade, to provide a uniform bearing surface.

To reduce water moisture transmission through floor slabs, we recommend installing a capillary moisture break and a water vapor retarder beneath floors. Typically, finished spaces with slab-on-grade floors, such as offices, will utilize capillary moisture breaks and vapor retarders to reduce the potential for water vapor transmission through the floor, which can adversely impact flooring materials and carpeting. Depending upon the depth to perched groundwater and building floor elevations, it is conceivable that a subslab drainage system may be required, particularly if existing grades are lowered and expose perched water.

5.3 SEISMIC DESIGN

We obtained the preliminary design parameters for the spectral acceleration from the U.S. Seismic Design Maps (USGS 2021a) for Latitude 45.6416 and Longitude -121.9651. The parameters provided in Table II are associated with the current code, ASCE 7-16, and are likely to change as the site is developed and ASCE 7-22 is in use.

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Table II

Preliminary Seismic Design Values for Site Class D Conditions

Seismic Parameter	ASCE 7-16 Design Values	ASCE 7-22 Design Values
Site Class	D[1]	D
MCE_R[2] Ground Motion (Period = 0.2 seconds), S_s	0.617 g[3]	0.62 g
MCE_R Ground Motion (Period = 1.0 seconds), S_1	0.279 g	0.23 g
Peak Ground Acceleration, PGA	0.275 g	*See Note 7*
Site Amplification Factor at 0.2 seconds, F_a	1.306	*See Note 8*
Site Amplification Factor at 1.0 seconds, F_v	*See Note 4*	*See Note 8*
Site Amplification Factor for PGA, F_{PGA}	1.325	*See Note 7*
Site-Modified Peak Ground Acceleration, PGA_M	0.365 g	0.35 g
Site-Modified Spectral Acceleration Value at 0.2 seconds, S_{MS}	0.806 g	0.84 g
Site-Modified Spectral Acceleration Value at 1.0 seconds, S_{M1}	*See Note 4*	*0.55 g*
Design Spectral Acceleration at 0.2 seconds, S_{DS}	0.537 g	0.56 g
Design Spectral Acceleration at 1.0 seconds, S_{D1}	*See Note 4*	*0.37 g*

Notes:

1) Per ASCE 7-16 Table 1613.5.2

2) MCE_R = Risk-targeted maximum considered earthquake

3) g = acceleration of gravity

4) Per ASCE 7-16 Supplement 1, Site Class D values for Fv, S_{M1}, and S_{D1} are only valid for calculation of Ts = S_{D1} / S_{DS} for the purpose of developing seismic response coefficients (Cs). Using Fv = 2.04, S_{M1} = 0.57, S_{D1} = 0.38, and Ts = 0.71.

5) Per ASCE 7-16 Section 11.4.8, Site Class D sites with S_1 greater than or equal to 0.6g; Site Class E sites with S_s greater than or equal to 1.0g; or Site Class D or E sites with S_1 greater than or equal to 0.2g shall have a site-specific ground motion hazard analysis performed in accordance with Section 21.2 unless exceptions are taken, per Section 11.4.8.

6) Per Exception 2 of ASCE 7-16, Section 11.4.8, structures on Site Class D sites with S_1 greater than or equal to 0.2g, a ground motion hazard analysis is not required provided the value of the seismic response coefficient C_s is determined by Eq. (12.8-2) for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T > T_s$ or Eq. (12.8-4) for $T > T_L$.

7) For ASCE 7-22, PGA_m is directly calculated without the need for PGA and F_{PGA}

8) Multi-period response spectrum data for ASCE 7-22 eliminates the need for F_a and F_v coefficients.

5.4 INFILTRATION SYSTEMS

The results of on-site field infiltration testing are described in Section 3.3.4 Infiltration. In general, we find that the tested soils have poor infiltration properties, exhibiting unfactored drawdown rates of 0.2 to 0.4 inches/hour. These rates are quite low and are reflective of the moderate fines content of the fills. Additionally, even poorly compacted fill material may have less porosity than a native soil of similar gradation.

We understand that an existing stormwater infiltration system at the western limits of the project was designed and constructed for Coyote Ridge Road. We did not have access to the infiltration design of the system, though based on its location it appears likely that the pond is at least partially located in native soils. These soils may be greater infiltration capacity than the embankment fills.

We recommend that supplemental in situ infiltration testing be performed at locations of proposed stormwater infiltration features as part of design-level geotechnical explorations. Supplemental testing may include additional borehole percolation tests or reduced-scale PIT tests.

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5.5 RIGID AND FLEXIBLE PAVEMENTS

Site pavements are expected to include flexible asphalt concrete (AC) sections and rigid Portland cement concrete (PCC) sections. New pavements should be supported by a subgrade prepared in accordance with *Section 5.6 Subgrade Preparation and Evaluation* of this report.

The use of permeable pavements may be feasible, though consideration would need to be given to the potential for lateral seepage to daylight on the existing slopes. Design of permeable pavements, if proposed, should be further evaluated in the future.

Design-level pavement recommendations will depend on expected traffic volumes at the site; however, based on the granular nature of the soils onsite and we anticipate that a 6- to 8-inch aggregate base layer will be suitable for support of both flexible and rigid pavements. This assumes that the upper 12 to 18 inches of soil subgrade consists of new engineered fill or recompacted *in situ* soil. The recommended AC pavement sections will likely be on the order of 2.5 to 3.5 inches thick in parking stalls and drive aisles, respectively. Recommended PCC pavement thicknesses are likely to be approximately 6 inches for reinforced and 5 inches for unreinforced.

Flexible AC should be 0.5-inch hot mix asphalt (HMA) in conformance with the specifications provided in Washington State Department of Transportation (WSDOT) Standard Specifications (WSS) 5 04 – HMA and WSS 9 03.8 – Aggregates for HMA (WSDOT 2022). The AC binder should be PG 64 22 Performance Grade AC according to WSS 9-02.1(4) – Performance Graded Asphalt Binder. The AC should be placed with a minimum lift thickness of 1.5 inches and be compacted to at least 91 percent of Rice Density of the mix, as determined in accordance with American Society for Testing and Materials (ASTM) D 2041.

Rigid PCC pavement should meet the specifications provided in WSS 5 05 – Cement Concrete Pavement. The PCC should have a minimum compressive strength of 4,000 psi and nominal maximum aggregate size of 1.5 inches. The PCC should be constructed with a maximum joint spacing of 15 feet.

Unreinforced slabs should be interlocked at contraction joints (e.g., continuous slab with no dowels), although dowels should be used at construction and expansion joints. Reinforced PCC should have No. 4 bars at 24 inches on center, each way at mid-depth of the PCC.

During site development, construction traffic should be limited to non-building, unpaved portions of the site or haul roads. Construction traffic should not be allowed on new pavements. If construction traffic is to be allowed on newly constructed road sections, an allowance for additional traffic will need to be made in the design pavement section.

5.6 EARTHWORK

Based on available information, we anticipate that earthwork will generally consist of light mass grading and excavation and backfilling for utilities and foundations. We recommend that earthwork activities be conducted in accordance with the Washington State Department of Transportation (WSDOT) *Standard Specifications* (WSS) (WSDOT 2022).

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5.6.1 Subgrade Preparation and Evaluation

Initial site preparation and earthwork operations will include clearing and grubbing, stripping, and grading to establish subgrade elevation for improvements. The surficial layer of soil beneath the vegetation contains roots and other organics and will not be suitable to remain beneath proposed improvements, including buildings and new fills. Actual stripping depths should be based on field observations at the time of construction. Stripped material should be transported off-site for disposal or stockpiled for use in landscaped areas.

We recommend that soil disturbed during grubbing operations be removed to expose firm, undisturbed subgrade. The resulting excavations should be backfilled with compacted structural fill.

The artificial fill soils that blanket the site should be expected to include oversize materials, such as large cobbles, boulders, and potentially oversize construction debris. These oversize materials may require individual handling and their presence may inhibit usage of scrapers for mass grading operations.

5.6.2 Reuse of Existing Site Soils

The on-site near-surface artificial fill materials are expected to be suitable for reuse as structural fill, provided they are stripped of organics including wood debris, properly moisture conditioned, and screened for removal of oversize material, such as cobbles, boulders, and construction debris. The fill materials are anticipated to be generally granular; however, we encountered several layers of silts and clays within the fill, which may be moderately to highly susceptible to wet weather disturbance.

While the *in-situ* soils are typically granular, they have significant fines content and will be moderately susceptible to disturbance from construction activities, particular when wet and/or during the rainy season. Due to the presence of perched water, wet soil conditions may be present even during dry weather. Earthwork planning should include considerations for minimizing subgrade disturbance and employing wet weather/wet soil construction methodologies.

5.6.3 Existing Fill Recompaction

As noted previously, it will be necessary to recompact existing fill materials beneath proposed foundations, slabs, and pavements. Depending upon the proposed usage, composition of the existing fill, moisture content and relative density of the existing fill, and thickness of new fill (if any), the thickness of the recompacted layer will vary, though is generally expected to range from 1 to 3 feet. The soil can be reworked via a combination of removal and replacement, or scarification followed by compaction. If needed, the soil shall be aerated to dry it. Typically, the fill shall be recompacted to a dense and unyielding condition and to a minimum of 90 to 95 percent of the soil's maximum dry density.

5.6.4 Slopes and Setbacks

The proposed site plan includes grading of cut and fill slopes throughout the site, with many proposed buildings situated near the crests of these slopes. Structures places at the crest of a slope have a greater potential for experiencing distress related to slope movements unless supported by a foundation system capable of transmitting loads through a potential slide mass.

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Current conceptual plans show existing slopes being regraded at a 3H:1V inclination, which based on our analysis is expected to be stable in both static and seismic states. For preliminary planning purposes, we recommend that structures located at least 10 feet from the crest of 3H:1V slopes; however, with building-specific evaluation lessor (to no) setbacks will be feasible.

For planning purposes, we also recommend structures be set-back from a 2H:1V projection extending from the toe of nearby slopes. For structures located between 2H:1V and 3H:1V projection, structure-specific stability analysis will be required.

If slopes are left at inclinations steeper than 3H:1V but flatter than 2H:1V, then they should be considered seismically unstable and susceptible to significant sloughing during a seismic event.

If existing slopes are left at inclinations steeper than 2H:1V then they should be considered both statically and seismically unstable. Structures should not be constructed on or directly adjacent to slopes steeper than 2H:1V.

5.6.5 Excavation and Dewatering

Subsurface conditions within the potential areas of excavation for foundations and subsurface utilities are anticipated to consist of artificial fill primarily composed of loose to medium dense granular soils with occasional layers of fine-grained soils and significant amount of oversized materials (cobbles and boulders). We expect that conventional earthmoving equipment in proper working condition should be capable of making necessary excavations for utilities, footings, and other earthwork. The presence of oversize materials within the artificial fill may reduce the pace of earthwork activities and enlarge trench, footing, and other excavations beyond their planned limits. The soils are generally granular and will have a tendency to run or slough when left in vertical cuts, and the contractor should anticipate that sloughing material could include large cobbles and boulders. Shoring or temporary cut-back slopes will be required for excavation stability.

In general, we anticipate the local groundwater table is within native materials near El. 17. However, higher perched groundwater layers are likely to be present around the site, as observed at many subsurface exploration locations. Excavations through perched water layer are likely to experience seepage and may require the use of localized sump pumps. In some cases, it is possible that sump pumps may not be sufficient for dewatering and the use of well points may be required.

Where permanent cuts will be made into the existing embankment, it is possible that zones of seepage will be encountered that require the installation of permanent passive dewatering system (e.g. French drains, subslab drains, etc.). The need for such systems should be evaluated as design progresses and at the time of construction.

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6. Limitations

We have prepared this preliminary report for the exclusive use of Maul Foster Alongi, Inc. and their authorized agents for the proposed Cascade Business Park in North Bonneville, Washington. Our work was completed in general accordance with the Subcontractor Work Order Authorization dated 21 October 2021. Our report is intended to provide our opinion of geotechnical conditions for planning purposes only. Site-specific investigation will be required in order to develop parameters for design and construction of the proposed improvements.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty, express or implied, should be understood.

Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Haley & Aldrich and will serve as the official document of record.

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FIGURES

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CASCADE BUSINESS PARK
NORTH BONNEVILLE, WASHINGTON

VICINITY MAP

MAP SOURCE: ESRI
SITE COORDINATES: 45°38'29"N, 121°57'55"W

APPROXIMATE SCALE: 1 IN = 2000 FT
APRIL 2022

FIGURE 1

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LEGEND

- BORING
- TEST PIT
- TEST PIT (COLUMBIA WEST ENGINEERING INC., 2012)
- TEST PIT (SQUIER ASSOCIATES, 2001)
- BORING (WOODWARD-CLYDE CONSULTANTS, 1993)
- TEST PIT (WOODWARD-CLYDE CONSULTANTS, 1993)
- MONITORING WELL (WOODWARD-CLYDE CONSULTANTS, 1993)
- BORING (ARMY CORPS OF ENGINEERS, 1990)
- ELEVATION CONTOUR, 1-FOOT INTERVAL
- PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. BASE MAP SOURCE: AUTOCAD FILE "EXISTING TOPOGRAPHY.DWG" MAUL FOSTER ALONGI, 14 APRIL 2022
3. AERIAL IMAGERY SOURCE: CLARITY

N

0 300 600

SCALE IN FEET

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CASCADE BUSNIESS PARK
NORTH BONNEVILLE, WASHINGTON

SITE PLAN WITH EXISTING TOPOGRAPHY

APRIL 2022

FIGURE 2

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LEGEND

- BORING
- TEST PIT
- TEST PIT (COLUMBIA WEST ENGINEERING INC., 2012)
- TEST PIT (SQUIER ASSOCIATES, 2001)
- BORING (WOODWARD-CLYDE CONSULTANTS, 1993)
- TEST PIT (WOODWARD-CLYDE CONSULTANTS, 1993)
- MONITORING WELL (WOODWARD-CLYDE CONSULTANTS, 1993)
- BORING (ARMY CORPS OF ENGINEERS, 1990)
- PROPOSED BUILDING FOOTPRINT
- PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. BASE MAP SOURCE: AUTOCAD FILE "SITE PLAN.DWG" MAUL FOSTER ALONGI, 14 APRIL 2022
3. AERIAL IMAGERY SOURCE: CLARITY

N

0 300 600
SCALE IN FEET

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CASCADE BUSNIESS PARK
NORTH BONNEVILLE, WASHINGTON

SITE PLAN WITH CONCEPTUAL GRADING AND DEVELOPMENT

APRIL 2022

FIGURE 3

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APPENDIX A
Field Explorations

Appendix A

FIELD EXPLORATIONS

We evaluated subsurface conditions at the site by completing eight test pits and two borings using the sonic core method between February 9 and 10, 2022. The field explorations were coordinated and overseen by geotechnical staff from Hart Crowser, who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, observed and recorded groundwater conditions, and maintained a detailed log of each test pit and boring. Exploration logs are included in this appendix. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

Figures 2 and 3 of the report show the approximate locations of the explorations. Explorations were located in the field using a hand-held Garmin Global Positioning System (GPS) unit.

Borings

The borings were advanced using sonic boring methods using a track-mounted Terrasonic TSi 150CC drill rig operated by Holt Services, Inc., of Edgewood, Washington. The borings were approximately 6 inches in diameter.

Test Pits

The test pits were excavated by Dan J Fisher Excavating, Inc of Forest Grove, Oregon, using a Case 580N backhoe loader. The test pit dimensions were approximately 10 feet long by 4 feet wide with total depths of approximately 10 to 11 feet.

Soil Sampling and Classification

Materials encountered in the explorations were classified in the field in general accordance with ASTM Standard Practice D 2488 “Standard Practice for the Classification of Soils (Visual-Manual Procedure).”

The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depths where the soil composition appeared to change; note that the actual changes in soil composition may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the Figure A - 1 Key to Exploration Logs. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils.” The sampler was driven by a 140-pound auto-trip hammer falling 30 inches, with a hammer energy efficiency of 83 percent. The N value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the sampler and from the sonic cores for subsequent classification and testing.

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Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

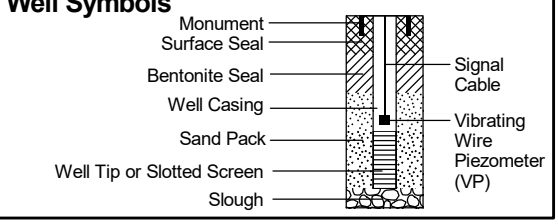
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



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KEY TO EXP LOGS (SOIL ONLY) - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:37 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - mschweitzer

Date Started: 02/10/2022 Date Completed: 02/10/2022
Logged by: K. Hendrickson Checked by: M. Espinoza
Location: Lat: 45.640819 Long: -121.966689 (WGS 84)
Ground Surface Elevation: 96.71 feet (NAVD 88)
Comments: Groundwater measurement is interpreted as seepage from perched water layer

Drilling Contractor/Crew: Holt Services, Inc.
Drilling Method: Sonic
Rig Model/Type: TSi 150CC / Track-mounted drill rig
Hammer Type: Auto-hammer
Hammer Weight (pounds): 140 Hammer Drop Height (inches): 30
Measured Hammer Efficiency (%): 83
Hole Diameter: 6 inches Well Casing Diameter: NA
Total Depth: 51.5 feet Depth to Groundwater: 40.6 feet

Elevation (feet)	Depth (feet)	Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description
96.7	0				60	G-1		SILTY SAND WITH GRAVEL (SM), trace cobbles, medium dense, moist, brown, occasional pockets of gray sandy clay, occasional organics. [FILL]
	5	18 9 3		5in.	18	S-1		
					30	G-2		
		6 4 3		6in.	18	S-2		CLAYEY SAND WITH GRAVEL (SC), trace cobbles, loose, moist to wet, brown.
					30	G-3 GS, WC		
	10	3 6 5		11in.	18	S-3		grades to medium dense, moist to wet
					60	G-4 WC		
	15	5 4 3		3in.	18	S-4		grades to loose increase in cobbles at 16 ft
					60	G-5		
	20	6 5 4		9in.	18	S-5		boulder at 19 ft
					60	G-6		
	25	5 4 3		8in.	18	S-6		grades to moist
					60	G-7		
	30	3 5 6		15in.	18	S-7		grades to medium dense
					60	G-8		CLAYEY SAND WITH GRAVEL AND COBBLES (SC), medium dense, moist, gray-brown.
	35	6 8 6		12in.	18	S-8		
					60	G-9 WC		grades to wet

Water Level: ▽ 2/10/2022

WC (%) ● Fines Content (%) ✖ SPT N Value
10 20 30 40

SPT N Value: 12, 7, 23, 11, 7, 9, 7, 11, 14

Draft

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Sonic Core Log
B-06

Figure **A-2**
Sheet **1 of 2**

HC BORING LOG - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:37 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - mschweitzer

Date Started: 02/10/2022 Date Completed: 02/10/2022 Drilling Contractor/Crew: Holt Services, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Drilling Method: Sonic

Location: Lat: 45.640819 Long: -121.966689 (WGS 84) Rig Model/Type: TSi 150CC / Track-mounted drill rig

Ground Surface Elevation: 96.71 feet (NAVD 88) Hammer Type: Auto-hammer

Comments: Groundwater measurement is interpreted as seepage from perched water layer Hammer Weight (pounds): 140 Hammer Drop Height (inches): 30

Measured Hammer Efficiency (%): 83

Hole Diameter: 6 inches Well Casing Diameter: NA

Total Depth: 51.5 feet Depth to Groundwater: 40.6 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level
56.7	40	4 4 6		5in.	18	S-9		CLAYEY SAND WITH GRAVEL AND COBBLES (SC), medium dense, wet, gray-brown.	2/10/2022
					60	G-10		grades to moist	
51.7	45	12 43 15		10in.	18	S-10		FAT CLAY WITH SAND (CH), trace gravel, moist, red-brown.	
					60	G-11		SILTY SAND WITH GRAVEL AND COBBLES (SM), very dense, moist, gray-brown. [NATIVE]	
46.7	50	15 17 29			18	S-11			
45.2								Bottom of Borehole at 51.5 feet.	

WC (%) ● Fines Content (%) ✖ SPT N Value ▲

10 20 30 40

10 58 46

Depth (feet) 40 45 50

Elevation (feet) 55 50 45 40 35 30 25 20

Depth (feet) 55 60 65 70 75

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Sonic Core Log
B-06

Figure **A-2**
Sheet **2 of 2**

HC BORING LOG - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:37 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - mschweitzer

Date Started: 02/10/2022	Date Completed: 02/10/2022	Drilling Contractor/Crew: Holt Services, Inc.	
Logged by: K. Hendrickson	Checked by: M. Espinoza	Drilling Method: Sonic	
Location: Lat: 45.640543 Long: -121.964884 (WGS 84)		Rig Model/Type: TSi 150CC / Track-mounted drill rig	
Ground Surface Elevation: 95.80 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 83	
		Hole Diameter: 6 inches	Well Casing Diameter: NA
		Total Depth: 36.5 feet	Depth to Groundwater: 1.2 feet

Depth (feet)	Elevation (feet)	Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level
0	95							SILTY SAND WITH GRAVEL (SM), loose, moist, brown, numerous organics. [FILL]	ATD
					48	G-1		boulder from 1 to 4 ft	
		10							
		4		0in.	18	S-1			
5	90	3			30	G-2		SILT (ML), medium stiff, wet, gray.	
		3		3in.	18	S-2		SANDY LEAN CLAY WITH GRAVEL (CL), medium stiff, moist to wet, brown-gray.	
		3							
		4			42	G-3			
10	85	8		10in.	18	S-3		SILTY SAND WITH GRAVEL (SM), loose, wet, brown.	
		3							
		5			60	G-4			
15	80	4		4in.	18	S-4		grades to few cobbles, moist to wet, gray	
		3							
		3			60	G-5 GS, WC			
20	75	3		10in.	18	S-5		grades to with cobbles, moist	
		4							
		6			60	G-6			
25	70	7		9in.	18	S-6		grades to wet, trace wood fragments	
		5							
		4			60	G-7		grades to moist	
30	65	4		6in.	18	S-7		grades to few cobbles, moist, gray, trace woody fragments	
		4							
		5			60	G-8			
35	60							SANDY SILT WITH GRAVEL (SM), hard, wet, gray.	
		15		17in.	18	S-8			
		16			18	G-9			
		18							

Bottom of Borehole at 36.5 feet.

WC (%) ● ✖ Fines Content (%) ▲ SPT N Value

10 20 30 40

7 7 8 6 17 10 9 9 34

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Sonic Core Log
B-07

Figure **A-3**
Sheet **1 of 1**

HC BORING LOG - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:37 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - mschweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.640143 Long: -121.965698 (WGS 84) Total Depth: 11 feet Depth to Seepage: 7 feet

Ground Surface Elevation: 91.70 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	Water Level
90	0			S-1 / WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist to wet, gray-brown, cobbles up to 12-inch diameter.	
85	5			S-2		SILTY SAND WITH GRAVEL (SM), wet, gray-brown, cobbles up to 8-inch diameter.	∼ 2/9/2022
80	10					Bottom of Test Pit at 11.0 feet.	
75	15						
70	20						
65	25						
60	30						
55	35						

WC (%): 10, 20, 30, 40

Depth (feet): 0, 5, 10, 15, 20, 25, 30, 35

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-01

Figure **A-4**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.640977 Long: -121.965588 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 100.26 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	WC / Fines Content (%)	Depth (feet)
100	0			S-1 GS, WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, gray-brown, boulders up to 2-foot diameter, trace petrified wood.		0
95	5			S-2				5
90	10					Bottom of Test Pit at 10.0 feet.		10
85	15							15
80	20							20
75	25							25
70	30							30
65	35							35

WC ● Fines Content (%) ✖ — 10 20 30 40

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-02

Figure **A-5**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.641834 Long: -121.965550 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 83.96 feet (NAVD 88)

Comments: Standing water at surface

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	WC (%)	Depth (feet)
80	0			S-1 / WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), (loose), moist to wet, brown, cobbles up to 12-inch diameter.		0
75	5			S-2		SILTY SAND WITH GRAVEL AND COBBLES (SM), gray and brown, cobbles up to 12-inch diameter.		5
70	10							10
						Bottom of Test Pit at 11.0 feet.		
65	15							15
60	20							20
55	25							25
50	30							30
45	35							35

WC: 10 20 30 40

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-03

Figure **A-6**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.641503 Long: -121.964406 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 104.98 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	Depth (feet)
100	0			S-1		SANDY SILT WITH COBBLES (ML), (loose), moist, brown, boulders up to 2-foot diameter.	0
	5			S-2		SILTY SAND WITH GRAVEL AND COBBLES (SM), gray-brown, occasional pockets of sandy clay, cobbles up to 8-inch diameter.	5
95	10					Bottom of Test Pit at 11.0 feet.	10
90	15						15
85	20						20
80	25						25
75	30						30
70	35						35

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-04

Figure **A-7**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.642806 Long: -121.963595 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 70.55 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	WC / Fines Content (%)	Depth (feet)
70	0			S-1 GS, WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, brown, cobbles up to 12-inch diameter.		0
						SILTY SAND WITH GRAVEL (SM), few cobbles, moist, gray, cobbles up to 8-inch diameter.	28	
65	5			S-2		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, brown, cobbles up to 12-inch diameter.		5
60	10					Bottom of Test Pit at 11.0 feet.		10
55	15							15
50	20							20
45	25							25
40	30							30
35	35							35

WC ● Fines Content (%) ✖ — 10 20 30 40

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-05

Figure **A-8**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.642505 Long: -121.962879 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 66.93 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	WC (%)	Depth (feet)
66.9	0			S-1		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, brown-gray, cobbles up to 12-inch diameter.		0
61.9	5			S-2 / WC		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), moist to wet, gray-brown, cobbles up to 12-inch diameter.	10	5
56.9	10					Bottom of Test Pit at 10.0 feet.		10
51.9	15							15
46.9	20							20
41.9	25							25
36.9	30							30
31.9	35							35

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-06

Figure **A-9**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.643415 Long: -121.962079 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 64.29 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description
64	0			S-1 / WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, brown, cobbles up to 12-inch diameter.
59	5			S-2		SILTY SAND WITH GRAVEL (SM), few cobbles, moist, gray, cobbles up to 8-inch diameter.
54	10					POORLY GRADED SAND WITH GRAVEL AND COBBLES (SP), moist, brown, boulders up to 2-feet diameter, trace brick debris.
						Bottom of Test Pit at 11.0 feet.

WC (%): 10, 20, 30, 40

Draft

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-07

Figure **A-10**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

Date Started: 02/09/2022 Date Completed: 02/09/2022 Contractor/Crew: Dan J. Fischer Excavating, Inc.

Logged by: K. Hendrickson Checked by: M. Espinoza Rig Model/Type: CASE 580 Super N / Backhoe

Location: Lat: 45.643742 Long: -121.961089 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered

Ground Surface Elevation: 61.61 feet (NAVD 88)

Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Sample Data: Length (inches)	Sample Data: Number / Tests	Graphic Log	Material Description	WC / Fines Content (%)	Depth (feet)
60	0			S-1 GS, WC		SILTY SAND WITH GRAVEL AND COBBLES (SM), moist, brown, cobbles up to 12-inch diameter.	21	0
55	5			S-2		SANDY SILT WITH GRAVEL (ML), trace cobbles, moist, brown, cobbles up to 6-inch diameter.		5
50	10					Bottom of Test Pit at 11.0 feet.		10
45	15							15
40	20							20
35	25							25
30	30							30
25	35							35

WC ● Fines Content (%) ✖ — 10 20 30 40

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General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Test Pit Log
TP-08

Figure **A-11**
Sheet **1 of 1**

HC TEST PIT - \\HALEYALDRICH.COM\SHARE\PDX_DATA\GEOMATICS\GINT\HC_LIBRARY.GLB - 20/4/22 21:40 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - msdhweitzer

APPENDIX B
Laboratory Test Results

Draft

Appendix B

LABORATORY TEST RESULTS

General

Soil samples obtained from the explorations were transported to our laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing. The tests were performed in general accordance with the test methods of the ASTM or other applicable procedures. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Percent Fines

Fines content analyses were performed to determine the percentage of soils finer than the No. 200 sieve—the boundary between sand size particles and silt size particles. The tests were performed in general accordance with ASTM Test Method D 1140. The test results are indicated on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Particle Size Distribution

Sieve analysis tests were also performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-2 in this appendix.

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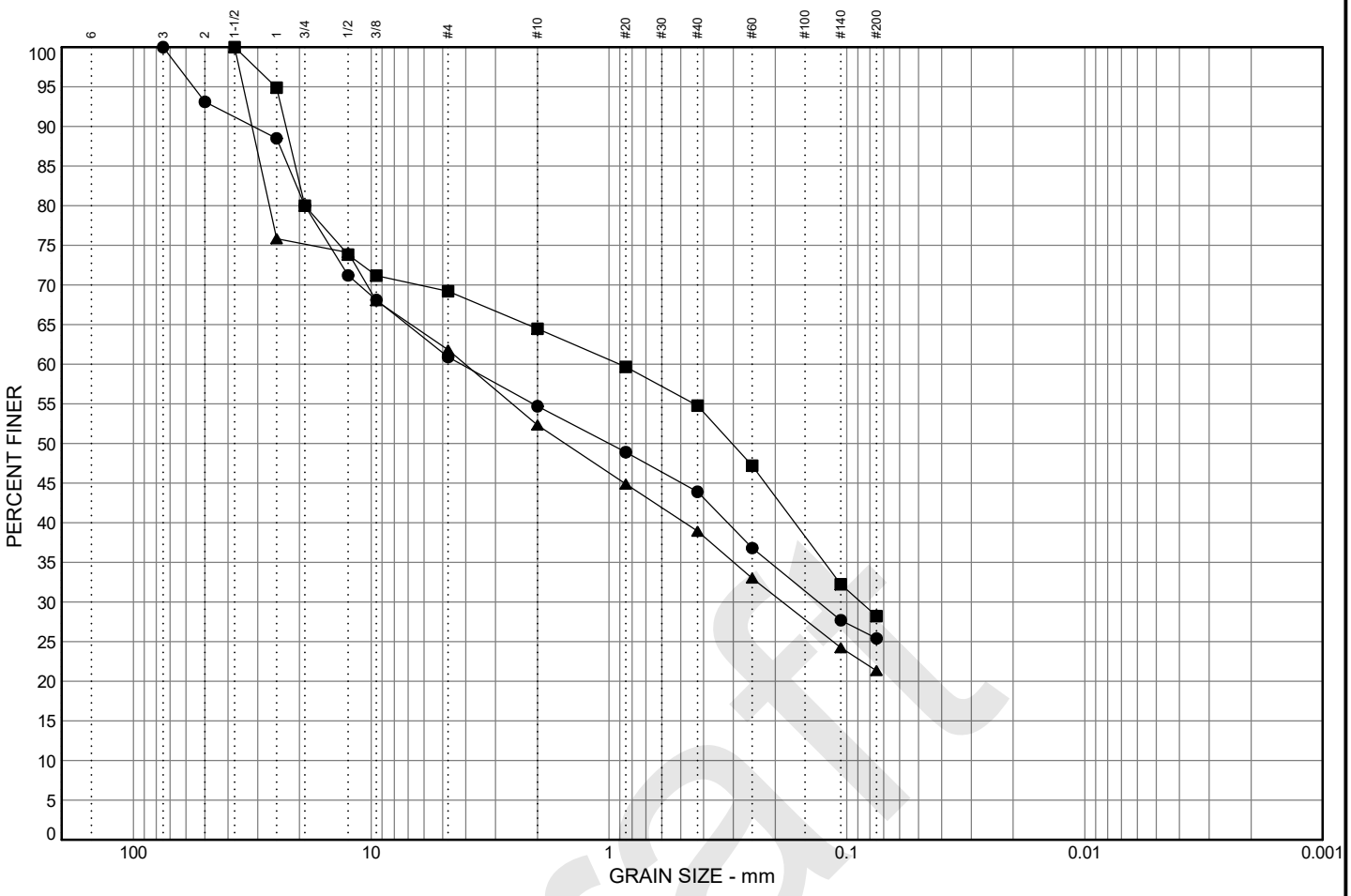

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** TP-02 **Sample No.:** S-1 **Depth:** 0.0 to 5.0 SILTY GRAVEL WITH SAND	0.0	39.1	35.5	25.4		16	GM
■ **Source:** TP-05 **Sample No.:** S-1 **Depth:** 0.0 to 5.0 SILTY SAND WITH GRAVEL	0.0	30.8	41.0	28.2		19	SM
▲ **Source:** TP-08 **Sample No.:** S-1 **Depth:** 0.0 to 5.0 SILTY SAND WITH GRAVEL	0.0	38.2	40.5	21.3		13	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			22.329	4.189	1.000	0.132				
■			20.836	0.905	0.304	0.087				
▲			29.157	4.028	1.532	0.186				

Remarks:

●

■ Scattered organics

▲

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Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203059-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 1**

HC GRAIN SIZE - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 3/8/22 10:48 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - ahultz

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
B-06	G-1	0.0								
B-06	G-2	5.0								
B-06	S-1	5.0								
B-06	G-3	7.5	37.1	40.0	22.8			14.1	SM	SILTY SAND WITH GRAVEL
B-06	S-2	7.5								
B-06	G-4	10.0						10.9		
B-06	S-3	10.0								
B-06	G-5	15.0								
B-06	S-4	15.0								
B-06	G-6	20.0								
B-06	S-5	20.0								
B-06	G-7	25.0								
B-06	S-6	25.0								
B-06	G-8	30.0								
B-06	S-7	30.0								
B-06	G-9	35.0						11.5		
B-06	S-8	35.0								
B-06	G-10	40.0								
B-06	S-9	40.0								
B-06	G-11	45.0								
B-06	S-10	45.0								
B-06	S-11	50.0								
B-07	G-1	0.0								
B-07	G-2	4.0								
B-07	S-1	4.0								
B-07	G-3	6.5								
B-07	S-2	6.5								
B-07	G-4	10.0								
B-07	S-3	10.0								
B-07	G-5	15.0	41.2	41.9	17.0			14.8	SM	SILTY SAND WITH GRAVEL
B-07	S-4	15.0								
B-07	G-6	20.0								
B-07	S-5	20.0								
B-07	G-7	25.0								
B-07	S-6	25.0								
B-07	G-8	30.0								
B-07	S-7	30.0								
B-07	G-9	35.0								
B-07	S-8	35.0								
TP-01	S-1	0.0						17.4		
TP-01	S-2	5.0								
TP-02	S-1	0.0	39.1	35.5	25.4			15.6	GM	SILTY GRAVEL WITH SAND
TP-02	S-2	5.0								
TP-03	S-1	0.0						12.7		
TP-03	S-2	5.0								
TP-04	S-1	0.0								
TP-04	S-2	5.0								

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SEATTLE - HC LAB SUMMARY (FOR REPORTS) - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 3/8/22 10:49 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - ahultz

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
TP-05	S-1	0.0	30.8	41.0	28.2			19.4	SM	SILTY SAND WITH GRAVEL
TP-05	S-2	5.0								
TP-06	S-1	0.0								
TP-06	S-2	5.0						12.6		
TP-07	S-1	0.0						12.7		
TP-07	S-2	5.0								
TP-08	S-1	0.0	38.2	40.5	21.3			13.4	SM	SILTY SAND WITH GRAVEL
TP-08	S-2	5.0								

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SEATTLE - HC LAB SUMMARY (FOR REPORTS) - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 3/8/22 10:49 - \\HALEYALDRICH.COM\SHARE\PDX_DATA\NOTEBOOKS\0203059-000_CASCADE_BUSINESS_PARK\FIELD DATA\PERM_GINT FILES\203059_000_EXPLORATIONS.GPJ - ahultz

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Project: Cascade Business Park
Location: North Bonneville, Washington
Project No.: 0203-059-000

Summary of Laboratory Results

Figure **B-1**
Sheet **2 of 2**

APPENDIX C
Historical Exploration Logs

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HOLE NUMBER: 12 FEATURE: HAMILTON ISLAND

TOP ELEVATION: 103.07' MSL COORDINATES: N: 723489 E: 1625782

TOTAL DEPTH: 46' INCLINATION FROM HORIZ: 90°

DEPTH	U.S.C CLASS	DESCRIPTION	DRAWINGS	REMARKS
0	GM	FILL-GRAVEL 40%, SUB-ANGULAR TO ROUNDED FRESH, ALL SIZES UP TO BOULDERS. 60% BASALT (RIVER GRAVEL BUT NOT IN PLACE). MATRIX-PLASTIC SANDY SILT.	DRILL HOLE BACK FILLED WITH GROUT	HOLE DRILLED WITH 8' AUGER STOPPED BY BOULDER AT 4', MOVED 2' EAST AND CONTINUED HOLE SPT #1 4.5'-6.3' 5/25/REFUSAL
5		MATERIAL CHANGES BETWEEN 6' AND 10' FROM RIVER GRAVELS TO PREDOMINATELY MATERIAL OF WEIGLE ORIGIN.		
10		FILL CONTINUED- GRAVEL-ROCK FRAGMENTS COMPOSED MOSTLY OF WEIGLE. BOULDER AT 11'		SPT #2 9.5'-11.0' 4/8/14 BLOWS
15				SPT #3 14.5'-16.8' 4/12/14 BLOWS
20				SPT #4 19.5'-21.8' 7/13/12 BLOWS
25				SPT #5 24.5'-26.8' 3/6/9 BLOWS
30		MATERIAL CHANGES BETWEEN 26' TO 29' TO FRESH ANGULAR BASALTIC ROCK FRAGMENTS LARGE WEIGLE BOULDER AT 32'		SPT #6 29.5'-31.8' 3/12/18 BLOWS AUGER REFUSED TO PENITRATE BELOW 32' PULLED AUGERS AND REPLACED BLADES NO WATER AT 32'
35		DECOMPOSED WEIGLE		SPT #7 34.5'-36.8' 18/11/13 BLOWS
40		FRESH TCR BASALT IN MOIST PLASTIC SILT MATRIX		SPT #8 39.5'-41.8' 6/12/19 BLOWS
45		GRAVELLY SILT-MOIST, PLASTIC, NON-DILATANT, MICAEOUS. GRAVEL 15%, FRESH ANGULAR TCR HOLE BOTTOMED 4 AUG 99		SPT #9 44.5'-46.8' 3/12/14 BLOWS SAMPLE# 8908807@1 SS TAKE WITH SPT #8
50				HOLE GROUTED SHUT ON 7 AUG.

HAMILTON ISLAND

Draft

HOLE NUMBER: 14 FEATURE: HAMILTON ISLAND

TOP ELEVATION: 69.35' MSL COORDINATES: N: 723928.81 E: 1626383.94

TOTAL DEPTH: 19.6' INCLINATION FROM HORIZ: 90°

DEPTH	U.S.C CLASS	DESCRIPTION	DRAWINGS	REMARKS
0	GM	FILL-GRAVEL WITH WOOD, PLASTIC AND SOME METAL. THE PLASTIC IS IN THE FORM OF HEAVY DUTY PLASTIC WRAP. THE WOOD IS CRUSHED AND BROKEN LUMBER AND BEAMS. METAL IS IN THE FORM OF NAILS AND SPIKES. GRAVELS 50% OF MATERIAL-ANGULAR TO SUB-ROUNDED RIVER GRAVELS. ALL SIZES UP TO BOULDERS. 95% BASALTS-FRESH	HOLE BACK FILLED WITH GROUT	STARTED AUGERING 2 AUGUST 89
5				SPT #1 4.5'-6.8' 2/2/3 BLOWS
	ML	SILT-PLASTIC, WET-PROBABLY THE ORIGINAL FLOOD-PLAIN SURFACE		
10	GM	GRAVEL-INPLACE-VERY HARD TO AUGER THROUGH RIVER GRAVEL, MULTILITHIC, FRESH, SUBANGULAR TO ROUNDED QUARTIZES PRESENT. MOSTLY BASALT		SPT #2 9.5'-11.8' 14/26/18 BLOWS
15		NO WATER AT BOTTOM		FIRST HOLE ABANDONED DUE TO BOULDER SECOND HOLE AUGERED TO 4'. THIRD HOLE AUGERED TO 20' BEFORE REFUSAL
		HOLE BOTTOMED 2 AUG 1989		SPT #3 14.5'-16.8' 2/9/12 BLOWS
20				SPT #4 19.6-19.6 REFUSAL-26 BLOWS
25				HOLE GROUTED SHUT ON 9 AUG 89 AUGER CUTTINGS WERE STORED IN DRUM
30				
35				
40				
45				
50				

HAMILTON ISLAND

Draft

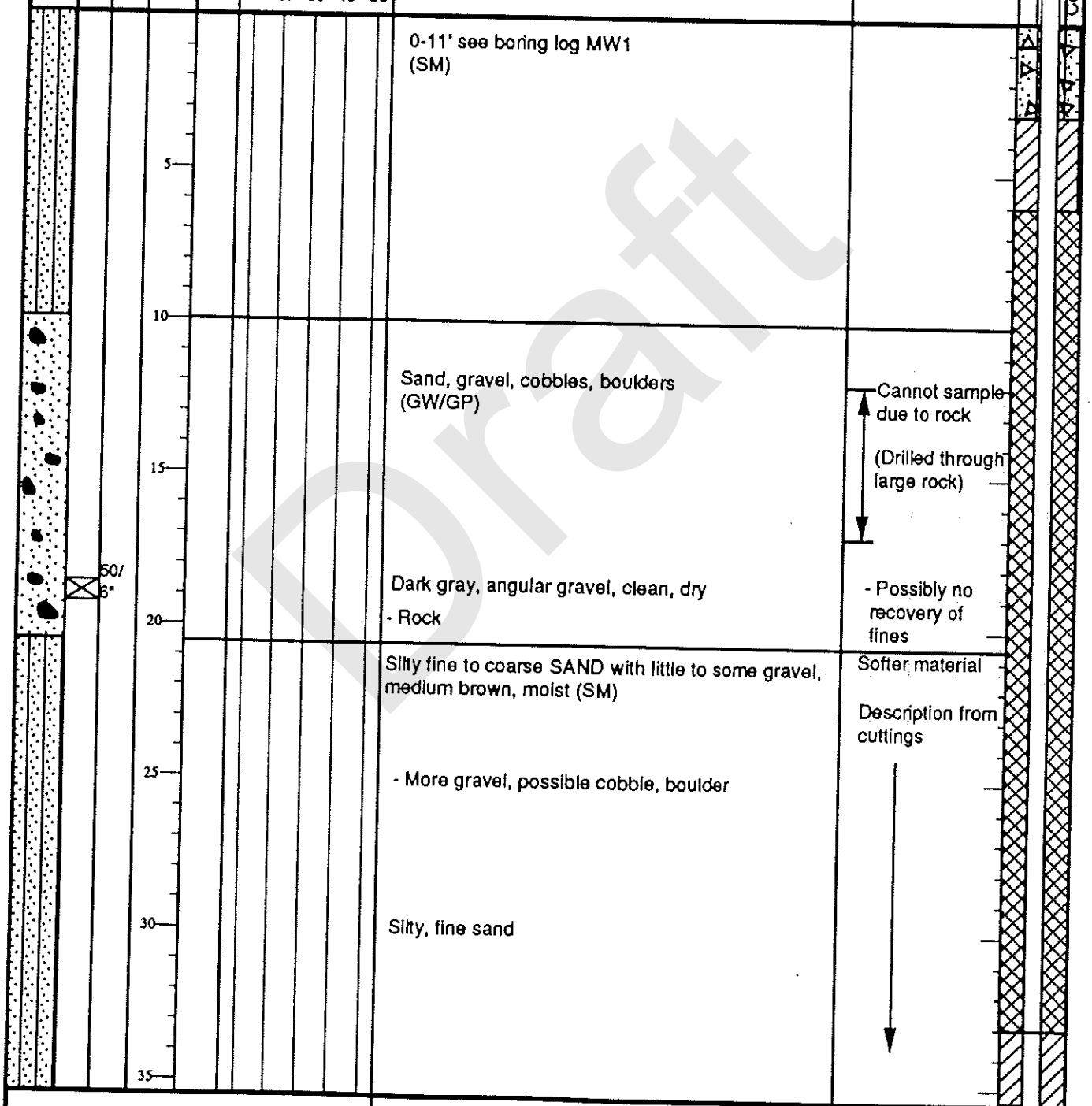
PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: MW1	
DATE STARTED: 1/25/93 COMPLETED: 1/25/93	TOTAL DEPTH: FT.	SURFACE ELEV: 58.87 FT.	DEPTH TO GW: FT.
LOGGED BY: T. BOOTH	PIEZOMETER SCREENED INTERVAL BGS: SEE REDRILL TO FT.		
DRILLING METHOD: HOLLOW STEM AUGER	INCLINOMETER: N/A		
DRILLING EQUIPMENT: TRAILER RIG	LOCATION: MAINTENANCE AREA #2		
DRILLING AGENCY: GEO-TECH	TOTAL NUMBER OF SAMPLES: 1 LAB SAMPLE		

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (★) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS
	1			12 18 25		Dark gray silty SAND with little gravel, trace clay (SM)	
	2			10 19 16		Brown	-Lab sample
		NR	5	7 10 8			
	3			5 7 7		Coarse gravelly, mottled	
		NR		16 18 22		Very rocky	-Refusal on drilling
			10				

BORING TERMINATED AT 11'
REDRILLED - SEE MW-1(REDRILL) LOG

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: MW1 REDRILL	
DATE STARTED: 1/27/93 COMPLETED: 1/28/93	TOTAL DEPTH: 49 FT.	SURFACE ELEV: 60.09 FT.	DEPTH TO GW: 4.5 FT.
LOGGED BY: T. BOOTH	PIEZOMETER SCREENED INTERVAL BGS: 49 TO 36 FT.		
DRILLING METHOD: AIR ROTARY	INCLINOMETER: N/A		
DRILLING EQUIPMENT: SCHRAMM	LOCATION: NEAR FORMER MAINTENANCE AREA #2, PARCEL 2		
DRILLING AGENCY: GEO-TECH	TOTAL NUMBER OF SAMPLES: 1		



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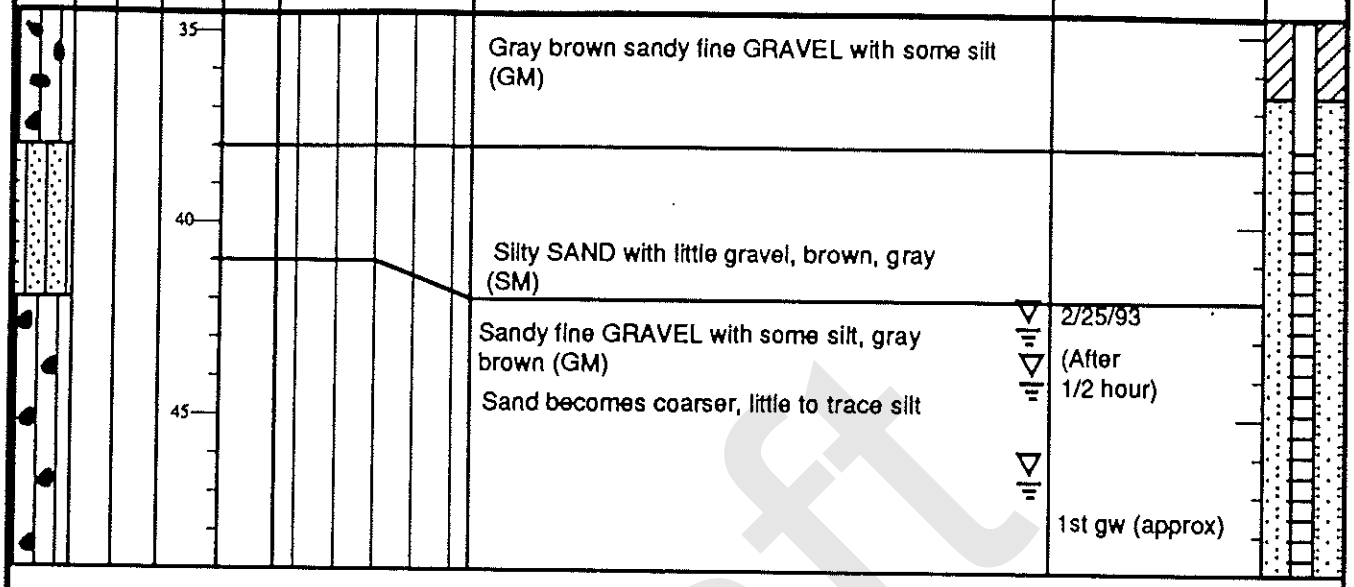
Woodward-Clyde Consultants

SAMPLE KEY: Standard Penetration Test; Dames and Moore

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: MW1 REDRILL



Depth (feet)	VISUAL DESCRIPTION (USCS)	REMARKS
35	Gray brown sandy fine GRAVEL with some silt (GM)	
40	Silty SAND with little gravel, brown, gray (SM)	
45	Sandy fine GRAVEL with some silt, gray brown (GM) Sand becomes coarser, little to trace silt	2/25/93 (After 1/2 hour) 1st gw (approx)

BORING TERMINATED AT 49'

(Drillers notes: After drilling through boulders at D=20' becomes easier drilling and sand and gravel for rest of hole)

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: MW2

DATE STARTED: 1/29/93 COMPLETED: 1/30/93	TOTAL DEPTH: 26.6 FT.	SURFACE ELEV: 65.52 FT.	DEPTH TO GW: 10.5 FT.
LOGGED BY: T. BOOTH	PIEZOMETER SCREENED INTERVAL BGS: 16 TO 5 FT.		
DRILLING METHOD: AIR ROTARY	INCLINOMETER: N/A		
DRILLING EQUIPMENT: SCHRAMM	LOCATION: MAINTENANCE AREA #1		
DRILLING AGENCY: GEO-TECH	TOTAL NUMBER OF SAMPLES: 5, 1 LAB SAMPLE		

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (△) per foot and Water Content (★) in percent (10 20 30 40 50)	VISUAL DESCRIPTION (USCS)	REMARKS	Well Construction
		NR		7 26 32		Silty fine to coarse SAND with gravel, brown, wet (SM) (FILL)	- Approx. ▽	
		NR	5	19 50/6"			Ponded water throughout swale	
	1	30		11 24 17		Trace gravel, wet	(Water perched on natural soil)	
	2	30	10	24 27 40		Silty SAND and GRAVEL, wet ▽	2/25/93 Lab Sample	
						- Rock	Fill Natural	
	3	25	15	8 24 11		Sandy SILT with gravel, gray, damp, (ML)	Sample mostly gravel, angular took baggie sample for TLC	
	4	65	20	7 14 25		Clayey SILT with trace sand, gravel, dark gray, moist		
	5	30	25	20 26 38		Sandy fine to coarse GRAVEL, angular, with trace to little silt, dark gray, moist (GP/GW)	No sample saved, too much gravel	

BORING TERMINATED AT 26.5'

Draft

Woodward-Clyde Consultants	SAMPLE KEY: 2 Standard Penetration Test; 2 Dames and Moore	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: MW3
DATE STARTED: 2/23/93 COMPLETED: 3/2/93	TOTAL DEPTH: FT.	SURFACE ELEV 81.34 FT. / DEPTH TO GW: FT.
LOGGED BY: T. BOOTH	PIEZOMETER SCREENED INTERVAL BGS: 27 TO 15.5 FT.	
DRILLING METHOD: AIR ROTARY	INCLINOMETER: N/A	
DRILLING EQUIPMENT: NODWELL	LOCATION: APPARENT DEBRIS DISPOSAL SITE, PARCEL 2	
DRILLING AGENCY: SOIL SAMPLING SERVICE	TOTAL NUMBER OF SAMPLES: 1, NO LAB SAMPLES	

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (*) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS	Well Construction
		NR	5	6 5 3		Silty fine SAND and fine to coarse GRAVEL medium brown, wet (SM) (FILL) 3/3/93 ▽	Cobbles, visible throughout sides of hole when casing was pulled	A.C.P.
		NR	10	4 4 3				
		NR		5 5 5				
		20	15	15 13 8		Becomes medium gray		
		NR	25	1 1 1		Silty SAND with little to some gravel, medium gray, moist to wet (SM)	Fill	
		NR	30			Appearance of grass blades, suggesting top of natural soil	Natural SLOUGH after recasing	

BORING TERMINATED AT 31'

Note: No analytical sample collected due to poor recovery

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PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 2	
DATE STARTED: 1/25/93 COMPLETED: 1/25/93	TOTAL DEPTH: 5 FT.	SURFACE ELEV:59.23FT.	DEPTH TO GW: N/A FT.
LOCATION: SEE MAP NEAR FUEL FARM #2	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grass/weed covering Sandy GRAVEL with little silt, cobbles present, brown, moist (GW)
			J	SS-3		Becomes green and dark gray to black
						Becomes reddish brown

TEST PIT TERMINATED AT 5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 3	
DATE STARTED: 1/25/93 COMPLETED: 1/25/93	TOTAL DEPTH: 4.5 FT.	SURFACE ELEV: 58.75 FT.	DEPTH TO GW: N/A FT.
LOCATION: SEE MAP	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: P120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weeds covering
						Sandy GRAVEL with little silt, cobbles and concrete present, dark brown, moist (GM)
			J	SS-4		Becomes greenish gray,
						Becomes reddish brown

TEST PIT TERMINATED AT 4.5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 4	
DATE STARTED: 1/25/93 COMPLETED: 1/25/93	TOTAL DEPTH: 5 FT.	SURFACE ELEV: 58.80 FT.	DEPTH TO GW: N/A FT.
LOCATION: SEE MAP	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Top soil, weeds/grasses covering
			J	SS-5		Sandy GRAVEL with little silt, cobbles, dark brown, moist (GM)
						Becomes greenish gray
						Becomes reddish brown

TEST PIT TERMINATED AT 5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

Woodward-Clyde Consultants

TEMP/TP/8-26-91'AR

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 5	
DATE STARTED: 1/26/93 COMPLETED: 1/26/93	TOTAL DEPTH: 4.5 FT.	SURFACE ELEV: 57.83 FT.	DEPTH TO GW: N/A FT.
LOCATION: SEE MAP FORMER WASHRACK AREA	TOTAL NO. OF SAMPLES: 2		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: P120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses, weeds covering over Sandy gravel with silt, dark brown, moist (GM) (Possibly FILL)
			J Grab	SS-6		Sandy SILT with gravel, dark gray and grayish green, moist (ML)
			J Grab	SS-7		Silty fine to coarse sand with little gravel, reddish brown, moist (SM)

TEST PIT TERMINATED AT 4.5'

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COMMENTS: Sampled the 2 ft. horizon 2-4 bgs and below

Note: SS-6 not sent to lab

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 6
DATE STARTED: 1/26/93 COMPLETED: 1/26/93	TOTAL DEPTH: 4 FT.	SURFACE ELEV: 53.75 FT. / DEPTH TO GW: N/A FT.
LOCATION: SEE MAP SOUTH SIDE OF FORMER MAINTENANCE BUILDING 2	TOTAL NO. OF SAMPLES: 1	
	LOGGED BY: J. WALLACE	
	EXCAVATION METHOD: PC120 TRACKHOE	
	EXCAVATION AGENCY: V & J, INC.	

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Sparse grass covering 3/4" crush rock cover (10" thick) (FILL)
			J	SS-8		Fine to coarse sandy GRAVEL with silt, cobbles, boulders, reddish brown, moist (GM)

BORING TERMINATED AT 4'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

Woodward-Clyde Consultants

TEMP/TP/9-26-91*AR

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 7	
DATE STARTED: 1/26/93 COMPLETED: 1/26/93	TOTAL DEPTH: 4.5 FT.	SURFACE ELEV: 53.55FT.	DEPTH TO GW: N/A FT.
LOCATION: WEST SIDE OF FORMER MAINTENANCE BUILDING #2	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
			J Grab	SS-9		≥ 3/4" crushed rock, gray-brown(GP) Reddish brown and gray black horizon of laminar caliche-like layers Fine to coarse sandy GRAVEL, reddish brown, moist

TEST PIT TERMINATED AT 4.5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 8	
DATE STARTED: COMPLETED:	TOTAL DEPTH: 11 FT.	SURFACE ELEV: 64.24 FT.	DEPTH TO GW: N/A FT.
LOCATION: JUST WEST OF TP-9	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weeds covering
	5					Fine to coarse sandy gravel with trace silt and some cobbles/boulders, medium brown, moist (GP) (FILL)
	10		Grab J	SS-10 SS-11	▽	Seepage

TEST PIT TERMINATED AT 11'

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

Woodward-Clyde Consultants

PAGE 1 OF 1

TEMPVTP/8-26-91*AA

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 9	
DATE STARTED: 1/26/93 COMPLETED: 1/26/93	TOTAL DEPTH: 9 FT.	SURFACE ELEV: 62.08 FT.	DEPTH TO GW: 8 FT.
LOCATION: JUST WEST OF BH-14	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses, weeds covering
	5					Fine to coarse GRAVEL with trace silt and boulders (to > 6 ft. diameter), medium brown, moist (GP) (FILL)
			Grab J	SS-12	▽	Seepage

TEST PIT TERMINATED AT 9'

Draft

COMMENTS: A few pieces of lumber observed in fill

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

Woodward-Clyde Consultants

TEMPYTP/9-26-91*AR

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 10	
DATE STARTED: 1/26/93 COMPLETED: 1/26/93	TOTAL DEPTH: 8.5 FT.	SURFACE ELEV: 62.39FT.	DEPTH TO GW: 7 FT.
LOCATION: FORMER OIL CHANGE AREA	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
	5					Fine sandy SILT with little gravel, medium brown and purplish gray and gray, moist (ML) (FILL)
			Grab J	SS-13		COBBLES (GP)

TEST PIT TERMINATED AT 8.5'

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

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PAGE 1 OF 1

TEMPYTP/8-26-91*AR

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 11	
DATE STARTED: 1/27/93 COMPLETED: 1/27/93	TOTAL DEPTH: 12 FT.	SURFACE ELEV:65.67FT.	DEPTH TO GW: 12 FT.
LOCATION: FORMER OIL CHANGE AREA	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grass/weed covering
						Gravelly SAND with silt, cobbles and small boulders present, medium brown, moist (SM) (FILL)
	5					Silty fine to medium SAND with gravel, cobbles and boulder size rocks (basalt) and concrete, some rebar, medium brown, moist (ML) (FILL)
	10		Grab J	SS-14		Becomes bluish green, increasing silt

TEST PIT TERMINATED AT 11.5'

COMMENTS:

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 12	
DATE STARTED: 1/27/93 COMPLETED: 1/27/93	TOTAL DEPTH: 15 FT.	SURFACE ELEV: 58.87 FT.	DEPTH TO GW: N/A FT.
LOCATION: FORMER OIL CHANGE AREA	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weeds covering
						Gravelly SAND with silt, cobbles, medium brown, moist (SM) (FILL)
	5					
						Silty fine SAND with cobbles, fine small boulders, medium brown, moist
	10				▽	Seep from north sidewall
		Grab	J	SS-15		Gravelly silt with trace sand, dark greenish gray, moist (ML)(Poss. natural)
	15					

COMMENTS:

TEST PIT TERMINATED AT 15'

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

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PAGE 1 OF 1

TEMP/TP9-26-91*AR

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 13	
DATE STARTED: 1/27/93 COMPLETED: 1/27/93	TOTAL DEPTH: 8 FT.	SURFACE ELEV: 99.34 FT.	DEPTH TO GW: N/A FT.
LOCATION: SPOIL AREA C NORTHEAST SIDE	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weed covering
						Gravelly SAND with silt, cobbles, medium brown, moist (SM) (FILL)
	5		J	SS-16		
						TEST PIT TERMINATED AT 8'

Draft

COMMENTS: 1 1/4" wire cable visible in pit at approximately 2 ft. bgs - waste materials

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 13	
DATE STARTED: 1/27/93 COMPLETED: 1/27/93	TOTAL DEPTH: 8 FT.	SURFACE ELEV: FT.	DEPTH TO GW: N/A FT.
LOCATION: SPOIL AREA C NORTHEAST SIDE NOTE: UNCERTAIN LOCATION.	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weed covering
						Gravelly SAND with silt, cobbles, medium brown, moist (SM) (FILL)
	5		J	SS-16		
						TEST PIT TERMINATED AT 8'

COMMENTS: 1 1/4" wire cable visible in pit at approximately 2 ft. bgs - waste materials

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 14	
DATE STARTED: 1/27/93 COMPLETED: 1/27/93	TOTAL DEPTH: 6 FT.	SURFACE ELEV: 99.34 FT.	DEPTH TO GW: N/A FT.
LOCATION: SPOIL AREA C NORTHEAST SIDE	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grassses/weeds covering
						Silty SAND with gravel and cobbles, medium brown, moist (SM) (FILL)
			Grab	SS-19 J		
						Sandy GRAVEL with silt. Gravel and cobbles range from <1 inch to >1 ft. dia., medium brown, moist (GM) (FILL)
	5					

TEST PIT TERMINATED AT 6'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag

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TEMPYTP/9-26-91*AA

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 15	
DATE STARTED: 1/28/93 COMPLETED: 1/28/93	TOTAL DEPTH: 4.5 FT.	SURFACE ELEV: 49.03 FT.	DEPTH TO GW: N/A FT.
LOCATION: NATURAL SURFACE WEST OF SPOIL AREA C	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weeds covering Sandy GRAVEL with silt, dark brown, moist (GM)
			Grab	SS-26		Organic rich silty SAND grading to medium brown, reddish brown medium sand, black, moist (SM)
			J			Sandy GRAVEL, cobbles, small BOULDERS reddish brown, moist (GP)

TEST PIT TERMINATED AT 4.5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

TEMPYTP9-26-91*AR

PROJECT: PARCELS 2 AND C	93C0036	LOG OF TEST PIT NO: 16	
DATE STARTED: 1/28/93 COMPLETED: 1/28/93	TOTAL DEPTH: 5 FT.	SURFACE ELEV: 43.20 FT.	DEPTH TO GW: N/A FT.
LOCATION: SOUTHWEST CORNER OF PARCEL 2	TOTAL NO. OF SAMPLES: 1		
	LOGGED BY: J. WALLACE		
	EXCAVATION METHOD: PC120 TRACKHOE		
	EXCAVATION AGENCY: V & J, INC.		

Graphic Log	Depth (feet)	SAMPLE Interval	SAMPLE Type	SAMPLE Number	% Water Content	VISUAL DESCRIPTION (USCS)
						Grasses/weeds covering Organic rich sandy gravel, dark brown, moist, (TOPSOIL)
			Grab J	SS-27		Sandy GRAVEL reddish brown, moist, (GP)

TEST PIT TERMINATED AT 5'

Draft

COMMENTS:

SAMPLE TYPE: B = Bulk (bag) J = Jar MB = Minibag	Woodward-Clyde Consultants	PAGE 1 OF 1

TEMP/TP/9-26-91*AR

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: SB1	
DATE STARTED: 1/28/93 COMPLETED: 1/29/93	TOTAL DEPTH: 25.5 FT.	SURFACE ELEV: 80.67 FT.	DEPTH TO GW: FT.
LOGGED BY: T. BOOTH	PIEZOMETER SCREENED INTERVAL BGS: N/A TO FT.		
DRILLING METHOD: AIR ROTARY	INCLINOMETER: N/A		
DRILLING EQUIPMENT: SCHRAMM	LOCATION: FORMER MAINTENANCE AREA, PARCEL 2		
DRILLING AGENCY: GEO-TECH	TOTAL NUMBER OF SAMPLES: 1		

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (*) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS
			5	18 18 25		Fine to coarse SAND and GRAVEL and cobbles with some silt, black-gray (GW/GP) (FILL) perched water Little silt, to clay	From cuttings: 6" -3.5' all rock, (cobbles and boulders,) black, angular
		NR					
		NR		9 9 13		As above	Easier drilling
			10				
			15				
	1	25		5 50/6			-Lab sample Fill
	2	35	20	5 15 50		Sandy medium GRAVEL to gravelly medium to coarse sand, some silt, brown, gray, with little to some silt (GM)	Natural - Gravel blocks sampler after 6" of drilling
	3	NR	25	15 20 20			

BORING TERMINATED AT 27'

Draft

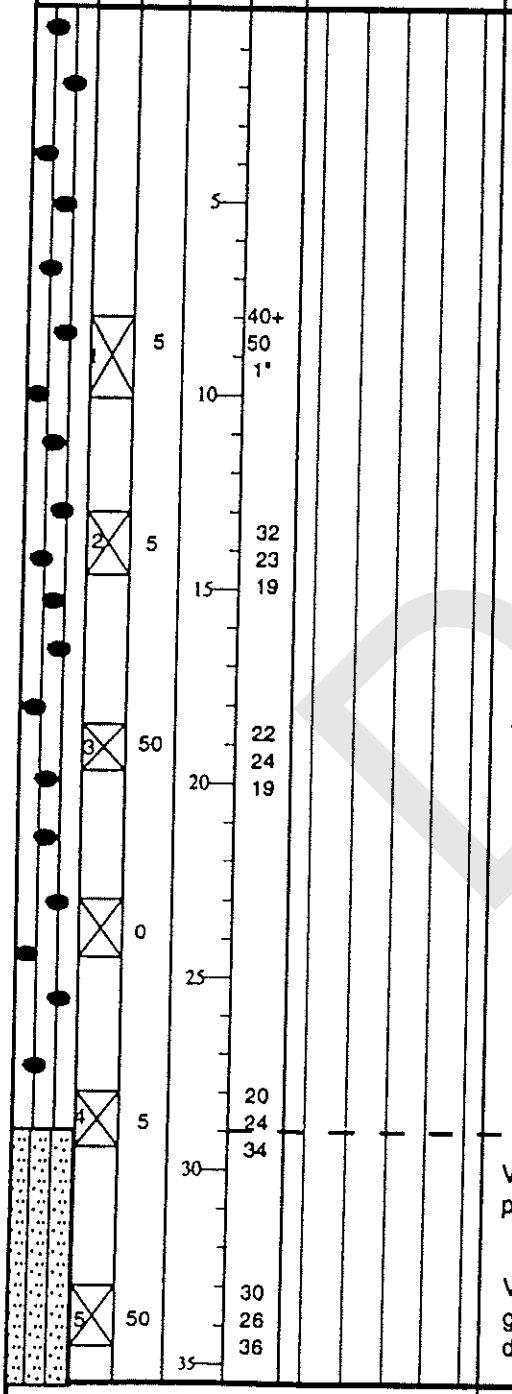
PROJECT: 93C0036A	PARCELS 2, AND C	LOG OF BORING NO: SB2	
DATE STARTED: 3/2/93 COMPLETED: 3/2/93	TOTAL DEPTH: 28 FT.	SURFACE ELEV: 69.24 FT.	DEPTH TO GW: FT.
LOGGED BY: G. DAVIS	PIEZOMETER SCREENED INTERVAL BGS: N/A TO FT.		
DRILLING METHOD: AIR O-DEX	INCLINOMETER: N/A		
DRILLING EQUIPMENT: NODWELL	LOCATION: FORMER FUELING AREA, PARCEL 2		
DRILLING AGENCY: SOIL SAMPLING SERVICE	TOTAL NUMBER OF SAMPLES: 7 TOTAL, 1 TO LAB		

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (*) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS
	0	0	5			(Dense), sandy medium GRAVEL with some silt, brown, silty, very wet (GM)(FILL)	Casing is too loose sample is all sluff, sampler sinks
	1	15	10	30 36 30		Very dense with some gravel, silty, coarse SAND, gravelly, gray-brown, very wet (SM) (FILL)	No odor
	2	0	15	24 30 32		As above	
	3	5	20	24 29 32		As above	
	4	50	25	16 18 21 27 50/1"		As above to 25' then:	[Lab sample at 27.5-28] Fill
		0					
		75		15 22 26		Very dense sandy SILT with wood and grass debris , gray brown, (ML)	Natural

BORING TERMINATED AT 28'

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: SB3	
DATE STARTED: 3/1/93 COMPLETED: 3/1/93	TOTAL DEPTH: 36.5 FT.	SURFACE ELEV: 95.80FT.	DEPTH TO GW: FT.
LOGGED BY: G. DAVIS	PIEZOMETER SCREENED INTERVAL BGS: N/A TO FT.		
DRILLING METHOD: O-DEX	LOCATION: TOP OF HILL, PARCEL 2		
DRILLING EQUIPMENT: NODWELL	INCLINOMETER: N/A		
DRILLING AGENCY: SOIL SAMPLING SERVICE	TOTAL NUMBER OF SAMPLES: 6 TOTAL, 1 TO LAB		



VISUAL DESCRIPTION (USCS)	REMARKS
Very dense sandy medium to coarse GRAVEL with some silt, gray, damp (GM) (FILL)	No sample at 2.5
As above	
As above, wet	
	Sampler refusal on cobble
	Fill
Very dense silty SAND with some gravel with plant debris, reddish-yellow brown (SM)	Natural
Very dense silty SAND with some gravel, brown, dry to damp, with plant detritus (SM)	- Lab Sample

Draft

PROJECT: PARCELS 2 AND C	93C0036	LOG OF BORING NO: SB3

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (*) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS	Well Construction
	6		35	75+ 50/1"		As above		

BORING TERMINATED AT 36.5'

Draft

PROJECT: PARCEL 2 AND C	93C0036	LOG OF BORING NO: SB4	
DATE STARTED: 3/1/93 COMPLETED:	TOTAL DEPTH: 32 FT.	SURFACE ELEV: 74.2 FT.	DEPTH TO GW: FT.
LOGGED BY: G. DAVIS	PIEZOMETER SCREENED INTERVAL BGS: N/A TO FT.		
DRILLING METHOD: O-DEX	LOCATION: DEBRIS AREA NEAR MW-3, PARCEL 2		
DRILLING EQUIPMENT: NODWELL	INCLINOMETER: N/A		
DRILLING AGENCY: SOIL SAMPLING SERVICE	TOTAL NUMBER OF SAMPLES: 8 TOTAL, 1 TO LAB		

Graphic Log	Sample Int.	Recovery %	Depth (feet)	Blow Count (per 6 in.)	N-Value (Δ) per foot and Water Content (★) in percent 10 20 30 40 50	VISUAL DESCRIPTION (USCS)	REMARKS
	1	25	5	5 6 7		Medium dense brown silty medium SAND with gravel, wet (SM)	Water encountered at approx. 3.0 bgs
	2	10	10	4 3 2		Loose gray sandy SILT with some gravel, wet (ML)	
	3	5	15	10 4 10		Medium dense, sandy silty medium GRAVEL brown, (GM)	No odor
	4	5	20	7 50 / 4"		Very dense silty medium GRAVEL with some sand, brown, wet	No odor
	5	5	25	8 5 6		As above, damp	
	6	5		11 10 8			
	7	50		8 100 34		Very dense, damp	Lab sample at 28.5 to 29
	8	15	30	24 30 22		As above, damp to dry, grass, plant detritus	Fill Natural

BORING TERMINATED AT 32'

Draft

Table 1: Test Pit Log Summary

Test Pit Number	Top Depth (ft)	Bottom Depth (ft)	USCS Group Symbol	Soil Name	Material Description	Estimated Percentages (1) Fines	Sand	Gravel	Cobbles	Boulders	LA Abrasion % Loss
Test Pit TP-1											
1	0	5	GP-GM	GRAVEL with cobbles and boulders, sand, and silt	Fine to coarse, subrounded to subangular gravel, subrounded to subangular cobbles, subround to subangular boulders (approximately 12 to 15 inch), fine to coarse sand, nonplastic fines; FILL.	10	20	30	40		
1	5	10	GM	Silty GRAVEL with cobbles and boulders, and sand	Fine to coarse, subrounded to subangular gravel, subrounded to subangular cobbles, subround to subangular boulders (approximately 12 to 15 inch), fine to coarse sand, nonplastic fines; FILL.	15	25	30	30		
1	10	15	SM	Silty SAND with gravel, cobbles, and boulders	Fine to coarse sand, nonplastic silt, fine to coarse, subrounded to subangular gravel, subrounded to subangular cobbles, subround to subangular boulders (approximately 12 to 15 inch); FILL.	20 ***17***	30 ***39***	30 ***32***	20 ***12*** (2)		31%
1	15	17	SM	Silty SAND with gravel, and cobbles	Fine to coarse, subangular to subrounded sand, nonplastic silt, fine to coarse, subrounded to subangular gravel, subrounded to subangular cobbles (3 to 8 inch); FILL.	40	30	15	15		
Test Pit TP-2											
2	0	17	GP-GM	GRAVEL with cobbles and boulders, sand, and silt	Light brown fine to coarse, round to subangular gravel, fine to coarse sand, rounded to subangular cobbles and boulders (15 inch maxiumum), nonplastic silt; 2 foot square concrete debris @10 feet; water @ 17 feet; FILL.	10	20	35	35		
2	17	23	GP-GM	GRAVEL with cobbles and boulders, sand, and silt	Light gray fine to coarse, round to subangular gravel, fine to coarse sand, rounded to subangular cobbles and boulders (15 inch maxiumum), nonplastic silt; FILL.	5	25	35	35		
Test Pit TP-3											
3	0	21	GP-GM	GRAVEL with cobbles and boulders, sand, and silt	Light gray fine to coarse, round to subangular gravel, fine to coarse sand, rounded to subangular cobbles and boulders (20 inch maximum), nonplastic silt; water @16 feet; FILL.	5 ***12***	15 ***38***	40 ***40***	40 ***10***		

Notes:

(1) Visual Estimates in the field were based on weight. The amounts shown for fines and sand were modified based on laboratory findings.
(2) Bold Italicized numbers indicate the percentages based upon sieve analysies of obtained samples. Sample sizes may not necessarily be representative, as determined by AASHTO T2.

Table 1: Test Pit Log Summary

Test Pit Number	Top Depth (ft)	Bottom Depth (ft)	USCS Group Symbol	Soil Name	Material Description	Estimated Percentages (1) Fines	Sand	Gravel	Cobbles	Boulders	LA Abrasion % Loss
Test Pit TP-4											
4	0	5	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders (15 inch maximum), nonplastic silt; FILL.	25	25	25	25		
4	5	10	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders (15 inch maximum), nonplastic silt; FILL.	35	30	20	15		
4	10	15	SM	Sandy SILT with gravel, cobbles and boulders	Medium plasticity silt, fine to coarse sand, fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders (15 inch maxiumum); water @ 11 feet; FILL.	45	25	15	15		
4	15	17	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders (15 inch maximum), nonplastic silt; NATIVE.	25	25	25	25		
Test Pit TP-5											
5	0	20	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders (15 inch maximum), nonplastic silt; water @13 feet; becomes gray @15 feet; FILL.	15 ***15***	20 ***39***	25 ***25***	40 ***21***		Not Testable
Test Pit TP-6											
6	0	5	GP-GM	GRAVEL with cobbles, sand, and silt	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles (8 inch maximum), and nonplastic silt; FILL.	10	30	50	10		
6	5	20	GP-GM	GRAVEL with cobbles, sand, and silt	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders, nonplastic silt; water at 18 feet; FILL.	10 ***11***	25 ***30***	35 ***41***	30 ***28***		25%
Test Pit TP-7											
7	0	5	GM	Silty GRAVEL with cobbles, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles (8 inch maximum), and nonplastic silt; FILL.	25	25	20	30		
7	5	10	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders, and nonplastic silt; FILL.	20	30	30	20		
7	10	14	GM	Silty GRAVEL with cobbles and boulders, and sand	Gray; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles and boulders, and nonplastic silt; FILL.	25	25	30	20		
Test Pit TP-8											
8	0	5	GM	Silty GRAVEL with cobbles and boulders, and sand	Light brown; fine to coarse, rounded to subangular gravel, rounded to subangular cobbles (5 inch maximum), and nonplastic silt; FILL.	35	25	30	10		

Notes:
(1) Estimates of grain size distributions were made visually in the field were based on estimated weight. The amounts shown for fines and sand were modified based on laboratory findings.
(2) Bold Italicized numbers indicate the percentages based upon sieve analysis of obtained samples. Sample sizes may not necessarily be representative, as determined by AASHTO T2.

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-1
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	65 feet	not encountered	0845	0935

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
					GC		FILL. Light brown to gray, wet, clayey GRAVEL. Interlayered pockets of sandy CLAY. Encountered minor wood debris and several subrounded to fractured boulders. [Soil Type 1]						
							Moisture-density gauge test results: wet density = 121.7, dry density = 121.7, percent moisture = 10.2%						
	GRAB	1.1						12.2	19.5	39	16		
5													
							Bottom of test pit at 7 feet. Ground water not encountered. Excavation backfilled loosely with on-site soil on 5/16/2012.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-2
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	50 feet	6 feet	0940	1010

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GC		FILL. Brown, damp, clayey GRAVEL, with subangular cobbles. [Soil Type 1]						
5	▽						Encountered large boulder and heavy groundwater flow at approximately 6 feet bgs.						
							Bottom of test pit at 7 feet. Ground water encountered at 6 feet. Excavation backfilled loosely with on-site soil on 5/16/2012.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-3
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	60 feet	5 feet	1018	1040

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GC		FILL. Brown, moist to wet, medium dense, silty GRAVEL with sand, cobbles and some boulders. [Soil Type 1]						
5	▽						Increased plasticity of fines at 5 feet bgs.						
							Encountered large boulders at approximately 8 feet bgs. Bottom of test pit at 8 feet. Ground water encountered at 5 feet. Excavation backfilled loosely with on-site soil on 5/16/2012.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-4
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	100 feet	not encountered	1045	1115

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GC		FILL. Gray-brown, damp to wet, loose, rounded GRAVEL with clay, angular cobbles, and boulders. [Soil Type 1]						
							Several 2 to 3-foot diameter boulders encountered at approximately 2 feet bgs.						
							Encountered interlayered pockets of bluish-gray, moist to wet, stiff, CLAY.						
5													
							Encountered subrounded boulders and increased moisture content at approximately 7.5 feet bgs.						
10													
							Bottom of test pit at 12 feet. Ground water not encountered. Excavation backfilled loosely with on-site soil on 5/16/2012.						

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-5
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	80 feet	not encountered	1135	1200

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GC		FILL. Brown, medium dense, wet, sandy GRAVEL with clay, with some boulders. [Soil Type 1]						
							An approximate 2-foot diameter boulder observed in the test pit side wall.						
							Moisture-density gauge test results: wet density = 125.9, dry density = 112.9, percent moisture = 11.6%						
							Moisture-density gauge test results: wet density = 120.1, dry density = 103.1, percent moisture = 16.5%.						
5							Increased sand content observed at test depth and location.						
							Increased moisture content at 5 feet bgs. Bottom of test pit at 5 feet. Ground water not encountered. Excavation backfilled loosely with on-site soil on 5/16/2012.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-6
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	65 feet	not encountered	1205	1245

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
					GC		FILL. Light brown, moist, medium dense, clayey GRAVEL with cobbles. [Soil Type 1]						
	BAG	TP6.1		A-2			Moisture-density gauge test results: wet density = 119.0, dry density = 108.3, percent moisture = 9.9%	13.8	19.5	39	17		
							Moisture-density gauge test results: wet density = 120.1, dry density = 106.4, percent moisture = 12.9%						
							Increased sand and moisture content at 4 feet bgs.						
5							Increased clay content, occasional cobbles, and loose at 5 feet bgs.						
							Organic odor at 8 feet bgs.						
10							Bottom of test pit at 9.5 feet. Ground water not encountered. Excavation backfilled loosely with on-site soil on 5/16/2012.						

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-7
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	55 feet	not encountered	1250	1320

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GW		FILL. Brown to gray, moist, medium dense, GAVEL with cobbles and some clay and sand. Angular boulder encountered at aproximately 1-foot bgs. Difficult excavation. [Soil Type 1]						
				A-5	CL		FILL. Dark gray, moist, stiff, gravelly CLAY with some wood debris. [Soil Type 1]						
	GRAB	TP7.1		A-2	SW		Possibly native soil. Reddish-brown, very moist, dense to very dense, well graded SAND with some gravel and subrounded cobbles. [Soil Type 2]	17.1	2.9	0	0		
5													
							Bottom of test pit at 8 feet. Ground water not encountered.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-8
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	45 feet	not encountered	1335	1350

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
							FILL/Topsoil. Brown sandy SILT, with gravel. [Soil Type 1]						
				A-2	GP		Possibly native soil. Brown, moist, loose to medium dense, poorly graded, sandy GRAVEL with cobbles. Sand is medium- to coarse-textured. [Soil Type 2]						
5							Some rounded boulders encountered at 6 feet bgs.						
10							Bottom of test pit at 10 feet. Ground water not encountered.						

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-9
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	45 feet	not encountered	1400	1410

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-2	GC		FILL. Brown, moist, medium dense, clayey GRAVEL with cobbles and some boulders. [Soil Type 1]						
							Encountered some buried organics at approximately 3.5 feet bgs.						
				A-2	SP		FILL. Light brown, moist, loose, fine-textured SAND. [Soil Type 1]						
5				A-4	CL		FILL. Brown, moist, stiff, CLAY with gravel and cobbles. [Soil Type 1]						
							Encountered a large boulder at approximately 8 feet bgs. Excavator refusal.						
							Bottom of test pit at 8 feet.						
							Ground water not encountered.						
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-10
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	50 feet	not encountered	1415	1430

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-4			FILL/Topsoil. Dark brown, wet, SILT, with roots throughout. Some small rounded boulders encountered. [Soil Type 1]						
				A-4	CL		Brown, moist, soft, CLAY. Excavator Refusal at 3.5' on underlying rock. [Soil Type 1]						
							Bottom of test pit at 3.5 feet. Ground water not encountered.						
5													
10													

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Cascade Business Park	HDJ Design Group, PLLC		12058	TP-11
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
North Bonneville, Washington	L&S	Excavator	JLO	5/16/12
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
See Figure 2	50 feet	not encountered	1435	1630

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
				A-6	CL		FILL. Brown to gray, damp to moist, medium stiff, CLAY with gravel and some cobbles. [Soil Type 1]						
							Color change to dark gray from approximately 3.5 to 4.5 feet bgs.						
5				A-2	GC		Possibly native soil. Light brown to tan, damp, dense, rounded to subangular, clayey GRAVEL. [Soil Type 2]						
							Bottom of test pit at 7 feet. Ground water not encountered.						
10													

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Appendix G
Operations and Maintenance

V-A.23 Maintenance Standards - Bioretention

Table V-A.22: Maintenance Standards - Bioretention

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Facility Footprint				
Earthen side slopes and berms	B, S		Erosion (gullies/ rills) greater than 2 inches deep around inlets, outlet, and alongside slopes	• Eliminate cause of erosion and stabilize damaged area (regrade, rock, vegetation, erosion control matting) • For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures should be put in place until permanent repairs can be made. • Properly designed, constructed and established facilities with appropriate flow velocities should not have erosion problems except perhaps in extreme events. If erosion problems persist, the following should be reassessed: (1) flow volumes from contributing areas and bioretention facility sizing; (2) flow velocities and gradients within the facility; and (3) flow dissipation and erosion protection strategies at the facility inlet.
	A		Erosion of sides causes slope to become a hazard	Take actions to eliminate the hazard and stabilize slopes
	A, S		Settlement greater than 3 inches (relative to undisturbed sections of berm)	Restore to design height
	A, S		Downstream face of berm wet, seeps or leaks evident	Plug any holes and compact berm (may require consultation with engineer, particularly for larger berms)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	A		Any evidence of rodent holes or water piping in berm	• Eradicate rodents (see "Pest control") • Fill holes and compact (may require consultation with engineer, particularly for larger berms)
Concrete sidewalls	A		Cracks or failure of concrete sidewalls	• Repair/ seal cracks • Replace if repair is insufficient
Rockery sidewalls	A		Rockery side walls are insecure	Stabilize rockery sidewalls (may require consultation with engineer, particularly for walls 4 feet or greater in height)
Facility area		All maintenance visits (at least biannually)	Trash and debris present	Clean out trash and debris
Facility bottom area	A, S		Accumulated sediment to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted	• Remove excess sediment • Replace any vegetation damaged or destroyed by sediment accumulation and removal • Mulch newly planted vegetation • Identify and control the sediment source (if feasible) • If accumulated sediment is recurrent, consider adding presettlement or installing berms to create a forebay at the inlet
		During/after fall leaf drop	Accumulated leaves in facility	Remove leaves if there is a risk to clogging outlet structure or water flow is impeded
Low permeability check dams and weirs	A, S		Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, flow control weir or orifice	Clear the blockage
	A, S		Erosion and/or undercutting present	Repair and take preventative measures to prevent future erosion and/or undercutting

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	A		Grade board or top of weir damaged or not level	Restore to level position
Ponded water	B, S		Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.	Determine cause and resolve in the following order: 1. Confirm leaf or debris buildup in the bottom of the facility is not impeding infiltration. If necessary, remove leaf litter/debris. 2. Ensure that underdrain (if present) is not clogged. If necessary, clear underdrain. 3. Check for other water inputs (e.g., groundwater, illicit connections). 4. Verify that the facility is sized appropriately for the contributing area. Confirm that the contributing area has not increased. If steps #1-4 do not solve the problem, the bioretention soil is likely clogged by sediment accumulation at the surface or has become overly compacted. Dig a small hole to observe soil profile and identify compaction depth or clogging front to help determine the soil depth to be removed or otherwise rehabilitated (e.g., tilled). Consultation with an engineer is recommended.
Bioretention soil mix	As needed		Bioretention soil mix protection is needed when performing maintenance requiring entrance into the facility footprint	• Minimize all loading in the facility footprint (foot traffic and other loads) to the degree feasible in order to prevent compaction of bioretention soils. • Never drive equipment or apply heavy loads in facility footprint.

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Because the risk of compaction is higher during saturated soil conditions, any type of loading in the cell (including foot traffic) should be minimized during wet conditions. • Consider measures to distribute loading if heavy foot traffic is required or equipment must be placed in facility. As an example, boards may be placed across soil to distribute loads and minimize compaction. • If compaction occurs, soil must be loosened or otherwise rehabilitated to original design state.
Inlets/Outlets/Pipes				
Splash block inlet	A		Water is not being directed properly to the facility and away from the inlet structure	Reconfigure/ repair blocks to direct water to facility and away from structure
Curb cut inlet/outlet	M during the wet season and before severe storm is forecasted	Weekly during fall leaf drop	Accumulated leaves at curb cuts	Clear leaves (particularly important for key inlets and low points along long, linear facilities)
Pipe inlet/outlet	A		Pipe is damaged	Repair/ replace
	W		Pipe is clogged	Remove roots or debris
	A, S		Sediment, debris, trash, or mulch reducing capacity of inlet/outlet	• Clear the blockage • Identify the source of the blockage and take actions to prevent future blockages
		Weekly during fall leaf drop	Accumulated leaves at inlets/outlets	Clear leaves (particularly important for key inlets and low points along long, linear facilities)
		A	Maintain access for inspections	• Clear vegetation (transplant vegetation when possible) within 1 foot of inlets and outlets, maintain access pathways

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Erosion control at inlet	A		Concentrated flows are causing erosion	Maintain a cover of rock or cobbles or other erosion protection measure (e.g., matting) to protect the ground where concentrated water enters the facility (e.g., a pipe, curb cut or swale)
Trash rack	S		Trash or other debris present on trash rack	Remove/dispose
	A		Bar screen damaged or missing	Repair/replace
Overflow	A, S		Capacity reduced by sediment or debris	Remove sediment or debris/dispose
Underdrain pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	• Plant roots, sediment or debris reducing capacity of underdrain • Prolonged surface ponding (see "Ponded water"	• Jet clean or rotary cut debris/roots from underdrain(s) • If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.
Vegetation				
Facility bottom area and upland slope vegetation	Fall and Spring		Vegetation survival rate falls below 75% within first two years of establishment (unless project O&M manual or record drawing stipulates more or less than 75% survival rate).	• Determine cause of poor vegetation growth and correct condition • Replant as necessary to obtain 75% survival rate or greater. Refer to original planting plan, or approved jurisdictional species list for appropriate plant replacements (See Appendix 3 - Bioretention Plant List, in the *LID Technical Guidance Manual for Puget Sound*, (Hinman and Wulkan, 2012)). • Confirm that plant selection is appropriate for site growing conditions

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Vegetation (general)	As needed		Presence of diseased plants and plant material	• Remove any diseased plants or plant parts and dispose of in an approved location (e.g., commercial landfill) to avoid risk of spreading the disease to other plants • Disinfect gardening tools after pruning to prevent the spread of disease • See the *Pacific Northwest Plant Disease Management Handbook* (Pscheidt and Ocamb, 2016) for information on disease recognition and for additional resources • Replant as necessary according to recommendations provided for "facility bottom area and upland slope vegetation".
Trees and shrubs		All pruning seasons (timing varies by species)	Pruning as needed	• Prune trees and shrubs in a manner appropriate for each species. Pruning should be performed by landscape professionals familiar with proper pruning techniques • All pruning of mature trees should be performed by or under the direct guidance of an ISA certified arborist
	A		Large trees and shrubs interfere with operation of the facility or access for maintenance	• Prune trees and shrubs using most current ANSI A300 standards and ISA BMPs. • Remove trees and shrubs, if necessary.
	Fall and Spring		Standing dead vegetation is present	• Remove standing dead vegetation • Replace dead vegetation within 30 days of reported dead and dying plants (as practical depending on weather/planting season)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• If vegetation replacement is not feasible within 30 days, and absence of vegetation may result in erosion problems, temporary erosion control measures should be put in place immediately. • Determine cause of dead vegetation and address issue, if possible • If specific plants have a high mortality rate, assess the cause and replace with appropriate species. Consultation with a landscape architect is recommended.
	Fall and Spring		Planting beneath mature trees	• When working around and below mature trees, follow the most current ANSI A300 standards and ISA BMPs to the extent practicable (e.g., take care to minimize any damage to tree roots and avoid compaction of soil). • Planting of small shrubs or groundcovers beneath mature trees may be desirable in some cases; such plantings should use mainly plants that come as bulbs, bare root or in 4-inch pots; plants should be in no larger than 1-gallon containers.
	Fall and Spring		Presence of or need for stakes and guys (tree growth, maturation, and support needs)	• Verify location of facility liners and underdrain (if any) prior to stake installation in order to prevent liner puncture or pipe damage • Monitor tree support systems: Repair and adjust as needed to provide support and prevent damage to tree. • Remove tree supports (stakes, guys, etc.) after one growing season or maximum of 1 year. • Backfill stake holes after removal.

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Trees and shrubs adjacent to vehicle travel areas (or areas where visibility needs to be maintained)	A		Vegetation causes some visibility (line of sight) or driver safety issues	• Maintain appropriate height for sight clearance • When continued, regular pruning (more than one time/ growing season) is required to maintain visual sight lines for safety or clearance along a walk or drive, consider relocating the plant to a more appropriate location. • Remove or transplant if continual safety hazard • Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Flowering plants		A	Dead or spent flowers present	Remove spent flowers (deadhead)
Perennials		Fall	Spent plants	Cut back dying or dead and fallen foliage and stems
Emergent vegetation		Spring	Vegetation compromises conveyance	Hand rake sedges and rushes with a small rake or fingers to remove dead foliage before new growth emerges in spring or earlier only if the foliage is blocking water flow (sedges and rushes do not respond well to pruning)
Ornamental grasses (perennial)		Winter and Spring	Dead material from previous year's growing cycle or dead collapsed foliage	• Leave dry foliage for winter interest • Hand rake with a small rake or fingers to remove dead foliage back to within several inches from the soil before new growth emerges in spring or earlier if the foliage collapses and is blocking water flow
Ornamental grasses (evergreen)		Fall and Spring	Dead growth present in spring	• Hand rake with a small rake or fingers to remove dead growth before new growth emerges in spring • Clean, rake, and comb grasses when they become too tall • Cut back to ground or thin every 2-3 years as needed

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Noxious weeds		M (March - October, preceding seed dispersal)	Listed noxious vegetation is present (refer to current county noxious weed list)	• By law, class A & B noxious weeds must be removed, bagged and disposed as garbage immediately • Reasonable attempts must be made to remove and dispose of class C noxious weeds • It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality; use of herbicides and pesticides may be prohibited in some jurisdictions • Apply mulch after weed removal (see "Mulch")
Weeds		M (March - October, preceding seed dispersal)	Weeds are present	• Remove weeds with their roots manually with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate • Follow IPM protocols for weed management (see "Additional Maintenance Resources" section for more information on IPM protocols)
Excessive vegetation		Once in early to mid- May and once in early- to mid- September	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil	• Edge or trim groundcovers and shrubs at facility edge • Avoid mechanical blade-type edger and do not use edger or trimmer within 2 feet of tree trunks • While some clippings can be left in the facility to replenish organic material in the soil, excessive leaf litter can cause surface soil clogging
	As needed		Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety	• Determine whether pruning or other routine maintenance is adequate to maintain proper plant density and aesthetics

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Determine if planting type should be replaced to avoid ongoing maintenance issues (an aggressive grower under perfect growing conditions should be transplanted to a location where it will not impact flow) • Remove plants that are weak, broken or not true to form; replace in-kind • Thin grass or plants impacting facility function without leaving visual holes or bare soil areas • Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
	As needed		Vegetation blocking curb cuts, causing excessive sediment buildup and flow bypass	Remove vegetation and sediment buildup
Mulch				
Mulch		Following weeding	Bare spots (without mulch cover) are present or mulch depth less than 2 inches	• Supplement mulch with hand tools to a depth of 2 to 3 inches • Replenish mulch per O&M manual. Often coarse compost is used in the bottom of the facility and arborist wood chips are used on side slopes and rim (above typical water levels) • Keep all mulch away from woody stems
Watering				
Irrigation system (if any)		Based on manufacturer's instructions	Irrigation system present	Follow manufacturer's instructions for O&M
	A		Sprinklers or drip irrigation not directed/located to properly water plants	Redirect sprinklers or move drip irrigation to desired areas

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		

Summer watering (first year)		Once every 1-2 weeks or as needed during prolonged dry periods	Trees, shrubs and groundcovers in first year of establishment period	• 10 to 15 gallons per tree
				• 3 to 5 gallons per shrub
				• 2 gallons water per square foot for groundcover areas
				• Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist
				• Use soaker hoses or spot water with a shower type wand when irrigation system is not present
				  ○ Pulse water to enhance soil absorption, when feasible
				  ○ Pre-moisten soil to break surface tension of dry or hydrophobic soils/mulch, followed by several more passes. With this method , each pass increases soil absorption and allows more water to infiltrate prior to runoff
				• Add a tree bag or slow-release watering device (e.g., bucket with a perforated bottom) for watering newly installed trees when irrigation system is not present

Summer watering (second and third years)		Once every 2-4 weeks or as needed during prolonged dry periods	Trees, shrubs and groundcovers in second or third year of establishment period	• 10 to 15 gallons per tree • 3 to 5 gallons per shrub • 2 gallons water per square foot for groundcover areas • Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist • Use soaker hoses or spot water with a shower type wand when irrigation system is not present ○ Pulse water to enhance soil absorption, when feasible

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				◦ Pre-moisten soil to break surface tension of dry or hydrophobic soils/mulch, followed by several more passes. With this method , each pass increases soil absorption and allows more water to infiltrate prior to runoff
Summer watering (after establishment)		As needed	Established vegetation (after 3 years)	• Plants are typically selected to be drought tolerant and not require regular watering after establishment; however, trees may take up to 5 years of watering to become fully established • Identify trigger mechanisms for drought-stress (e.g., leaf wilt, leaf senescence, etc.) of different species and water immediately after initial signs of stress appear • Water during drought conditions or more often if necessary to maintain plant cover
Pest Control				
Mosquitoes	B, S		Standing water remains for more than 3 days after the end of a storm	• Identify the cause of the standing water and take appropriate actions to address the problem (see "Ponded water") • To facilitate maintenance, manually remove standing water and direct to the storm drainage system (if runoff is from non pollution-generating surfaces) or sanitary sewer system (if runoff is from pollution-generating surfaces) after getting approval from sanitary sewer authority.

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Use of pesticides or *Bacillus thuringiensis israelensis* (Bti) may be considered only as a temporary measure while addressing the standing water cause. If overflow to a surface water will occur within 2 weeks after pesticide use, apply for coverage under the Aquatic Mosquito Control NPDES General Permit.
Nuisance animals	As needed		Nuisance animals causing erosion, damaging plants, or depositing large volumes of feces	• Reduce site conditions that attract nuisance species where possible (e.g., plant shrubs and tall grasses to reduce open areas for geese, etc.) • Place predator decoys • Follow IPM protocols for specific nuisance animal issues (see "Additional Maintenance Resources" section for more information on IPM protocols) • Remove pet waste regularly • For public and right-of-way sites consider adding garbage cans with dog bags for picking up pet waste.
Insect pests	Every site visit associated with vegetation management		Signs of pests, such as wilting leaves, chewed leaves and bark, spotting or other indicators	• Reduce hiding places for pests by removing diseased and dead plants • For infestations, follow IPM protocols (see "Additional Maintenance Resources" section for more information on IPM protocols)

Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".

[a] Frequency: A = Annually; B = Biannually (twice per year); M = Monthly; W = At least one visit should occur during the wet season (for debris/clog related maintenance, this inspection/maintenance visit should occur in the early fall, after deciduous trees have lost their leaves); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).

IPM - Integrated Pest Management

ISA - International Society of Arboriculture

V-A.7 Maintenance Standards - Catch Basins

Table V-A.6: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g. methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e. separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
		Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See V-A.2 Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (if applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

V-A.10 Maintenance Standards - Typical Biofiltration Swale

Table V-A.9: Maintenance Standards - Typical Biofiltration Swale

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains, or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.
	Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10% of the swale bottom.	Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that the flow is not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
	Trash and Debris Accumulation	Trash and debris accumulated in the bio-swale.	Remove trash and debris from biofiltration swale.
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

Washington State Department of Ecology

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V-A.13 Maintenance Standards - Wetponds

Table V-A.12: Maintenance Standards - Wetponds

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Water Level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Any trash and debris > 5 cubic feet (cf) per 1,000 square feet (sf). (This is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation that may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by state or local regulations. (Apply requirements of adopted integrated pest management policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department). Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies required.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if wetpond is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with the Washington State Department of Ecology Dam Safety Office if pond ≥ 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the wetpond.	Wetpond is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted integrated pest management policies.
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, Vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove. If dead, diseased, or dying trees are identified. (Use a certified arborist to determine health of tree or removal requirements.)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard trees.
Side Slopes of Pond	Erosion	Eroded damage > 2 inches deep where cause of damage is still present	Slopes should be stabilized using appropriate erosion control measure(s);

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms, a licensed engineer in the state of Washington should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment > 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the wetpond.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (if applicable)	Liner is visible and has > three 0.25-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a licensed engineer in the state of Washington with geotechnical expertise be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms Over 4 Feet in Height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms > 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.	Trees should be removed. If root system is small (base < 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a licensed engineer in the state of Washington with geotechnical expertise be called in to	Piping eliminated. Erosion potential resolved.

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		inspect and evaluate condition and recommend repair of condition.)	
Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Only one layer of rock exists above native soil in area ≥ 5 sf, or any exposure of native soil at the top of outflow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.

V-A.20 Maintenance Standards - Catch Basin Inserts

Table V-A.19: Maintenance Standards - Catch Basin Inserts

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

V-A.6 Maintenance Standards - Control Structures

Table V-A.5: Maintenance Standards - Control Structures

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (includes sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Clean-out Gate	Damaged or Missing	Clean-out gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Access Opening	See V-A.5 Maintenance Standards - Tanks and Vaults		
Catch Basin	See V-A.7 Maintenance Standards - Catch Basins		

V-A.8 Maintenance Standards - Debris Barriers (e.g. Trash Racks)

Table V-A.7: Maintenance Standards - Debris Barriers (e.g. Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than 3/4 inch. Bars in place according to design. Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe