Stormwater Management Report

April 30, 2020

7C's Swim School Development

Prepared for:

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Prepared by:

4/30/20

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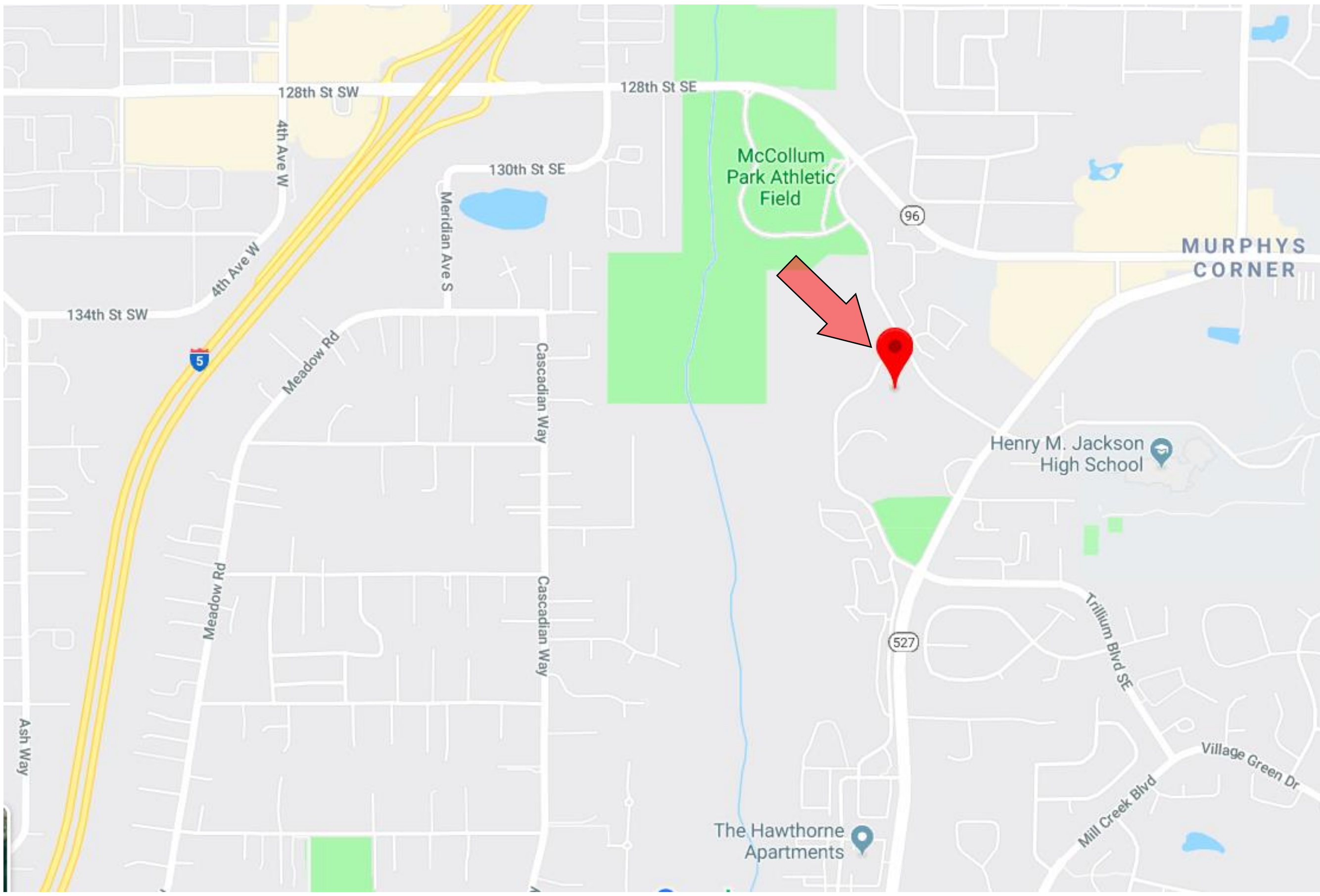
Project Overview

Site Location

The project is located on the southern parcel at the corner of North Creek Dr and Dumas Rd in Mill Creek (Parcel #28053100203700) on a 4.54 acre site.



Code Compliance

The project will comply with:

- [WSDOT] STANDARD SPECIFICATIONS for ROAD, BRIDGE and MUNICIPAL CONSTRUCTION, WSDOT, 2018 Edition with amendments
- [MCDCS] Mill Creek Design and Construction Standards
- [MCMC] Mill Creek Municipal Code
- [SWMMWW] 2012/14 Stormwater Management Manual for Western Washington

Executive Summary

The proposed facility will be a 10,000 sf pool building that will be used as a swim school. Site improvements will include parking, stormwater facilities, and utilities. The site improvements will be on approximately 40% of the total site area. Due to the steep topography of the site and the limited space around the building, three stormwater detention facilities will be used. Water quality will be mitigated by two Biopod systems. One Biopod will be placed at the confluence of two detention facilities at the SW corner of the site, the second Biopod will be placed downstream of the third detention facility on the east side of the site.

Due to the depth of the eastern detention system, a duplex stormwater lift station will be utilized to discharge stormwater from that basin to the south.

An existing wetland is located on the northern portions of the site, however, the proposed development will be downslope from the wetland. The portion of the wetland buffer that will be impacted by the proposed development will be mitigated through buffer averaging.

Existing Conditions

The subject property is undeveloped forest land with an existing wetland. The site is bordered by North Creek Drive to the west and Dumas Road to the north. Adjacent undeveloped lots are to the south and to the east. Overall topography of the site slopes from north to south, as well as to the east and west.

Soils

Site soils consist of approximately 4 to 14 inches of forest duff/topsoil directly underlain by approximately 1 to 2 feet of native, loose to medium-dense, well-graded gravel with sand and varying amounts of organic material (possible weathered till). Underlying the loose to medium-dense, near-surface native soils was very dense, gray, poorly-graded sand with gravel and silt (glacial till). The very dense till was encountered 8 to 9 feet below grade.

Geologic information for the project site was obtained from the Geologic map of the Everett 7.5 minute quadrangle, Snohomish County, Washington (Minard, 1985) published by the U.S. Geological Survey. According to the referenced map, near surface soils in the vicinity of the project site consist of Glacial Till (Qvt). The till generally consists of a nonsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. It is a compact lodgment till and is often locally referred to as Vashon till or hardpan. Native soils encountered during our subsurface exploration were generally consistent with the mapped till deposits is generally consistent with published geological information. No groundwater seepage was encountered in the exploration pits.

As stated on page 15 of the Geotechnical report, based upon an evaluation of the data collected during onsite investigations, it is the opinion of the geotechnical engineer that subsurface conditions are generally unsuitable for the onsite infiltration of stormwater. Additionally, glacially consolidated till soils as found on site within two feet of the surface are considered a restrictive layer by the 2012 Washington State Department of Ecology Stormwater Management Manual for Western Washington (amended December 2014).

Refer to soils report in Appendix B for additional information.

Proposed Conditions

The proposed facility will be a 10,000 sf pool building that will be used as a swim school. Site improvements will include parking, stormwater facilities, and utilities. The site improvements will be on approximately 40% of the total site area.

Pervious/Impervious Areas

Refer to Figure 1 for a graphical depiction of tributary areas. For use in determining stormwater mitigation fees the following areas represent the true pervious/impervious area for the entire site.

Onsite Pervious / Impervious Area

Total impervious surface…………………………………………..……..…..…1.135 ac

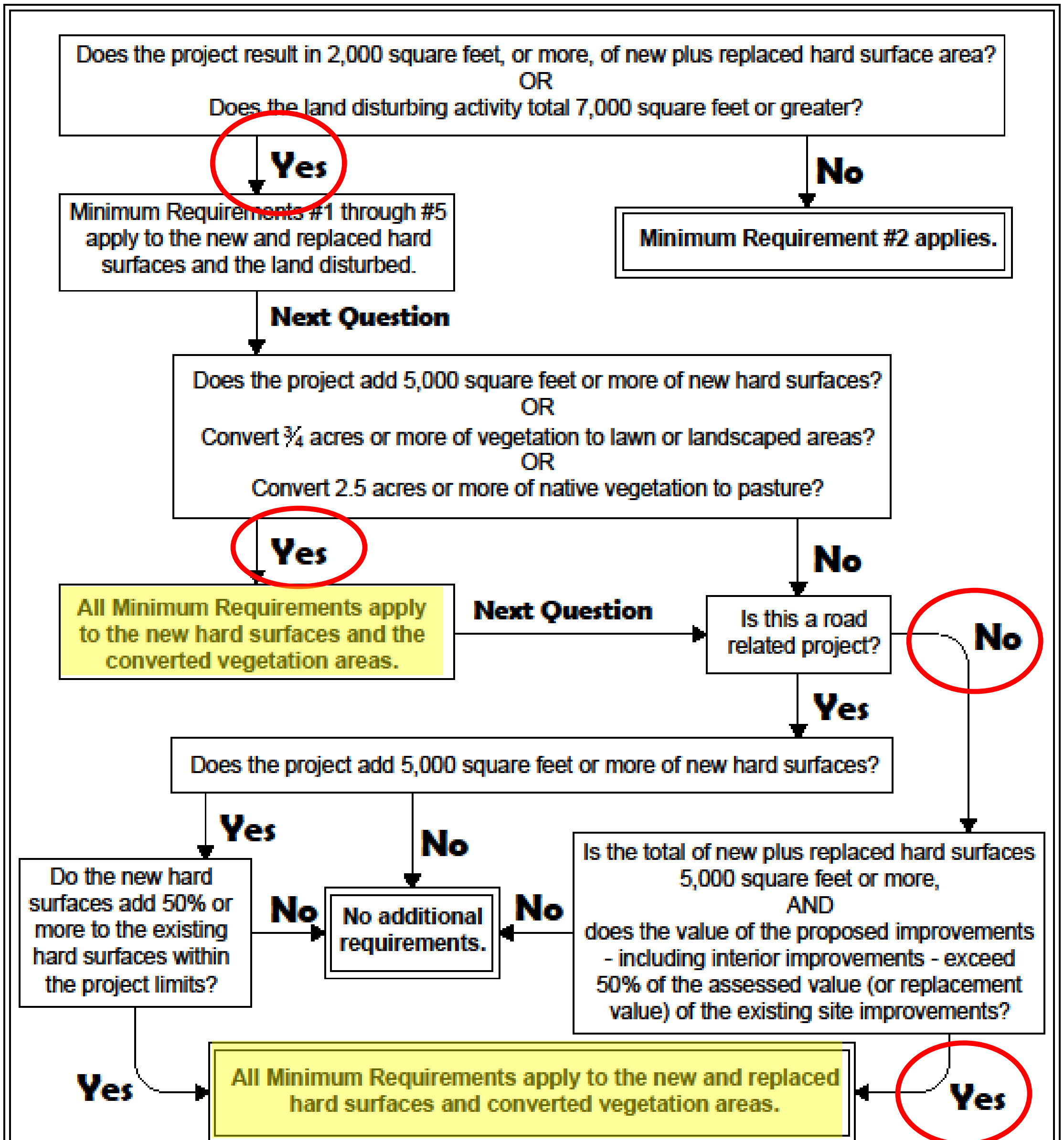
Total pervious surface……………………………………..……………..…..3.466 ac

TOTAL ONSITE AREA………………………………..………………..…..4.601 ac

Minimum Stormwater Management Requirements

Overview of Minimum Requirements

Minimum requirements 1-9 shall apply to the project.



DEPARTMENT OF ECOLOGY State of Washington

Figure I-2.4.2
Flow Chart for Determining Requirements for Redevelopment

Revised June 2015

1-Preparation of Stormwater Site Plans

Stormwater site plans were prepared in accordance with Volume I, Chapter 3 of the SWMMWW.

2-Construction Stormwater Pollution Prevention Plan (SWPPP)

A SWPPP narrative has been prepared and is included in Appendix A and on the plan set along with an erosion control plan being included with the plan set. The erosion potential for the site is moderate.

A sediment trap will be utilized (BMP C240) near the SW and SE corners of the site. Each trap was sized for the full disturbed area equaling 1.76 acres in accordance with BMP C240. The purpose of this is to provide a level of conservancy and ease of construction. The surface area of the traps was determined to be 371 sf or a 20x20 depression. Supporting calculations are included in Appendix E.

3-Source Control of Pollution

The project will not pose any source of pollution for the site. Per Section V-1 of the SWMMWW, high use sites for traffic are defined as an area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area. The project is well below this threshold and is therefore not considered a high use site. The SWPPP provided will address the source control of pollution during the construction phase.

4-Preservation of Natural Drainage Systems and Outfalls

The overall site is tributary to Upper North Creek Basin and currently does not have a concentrated point of confluence, but rather drains evenly along the property lines. A portion of the developed site will drain to a point of connection to the public storm drain system in North Creek Drive, which eventually outfalls to North Creek through Heatherwood Apartments. According to the Drainage Report created for the Heatherwood Apartments development, the stormwater system for Heatherwood Apartments was designed to handle runoff from the subject property under predeveloped and forested conditions. Therefore, the runoff discharged from the developed site will be released at a rate that isat or less than predeveloped and forested conditions using detention and flow control. Therefore the natural drainage system within this subbasin is preserved.

An eastern portion of the existing site drains to the south before it eventually connects with Upper North Creek. A separate stormwater system has been designed for this subbasin, and will discharge to the south, thus preserving the natural drainage system. Refer to Minimum Requirement 8-"Wetland Protection" for discussion of protection of southern wetland.

5-Onsite Stormwater Management

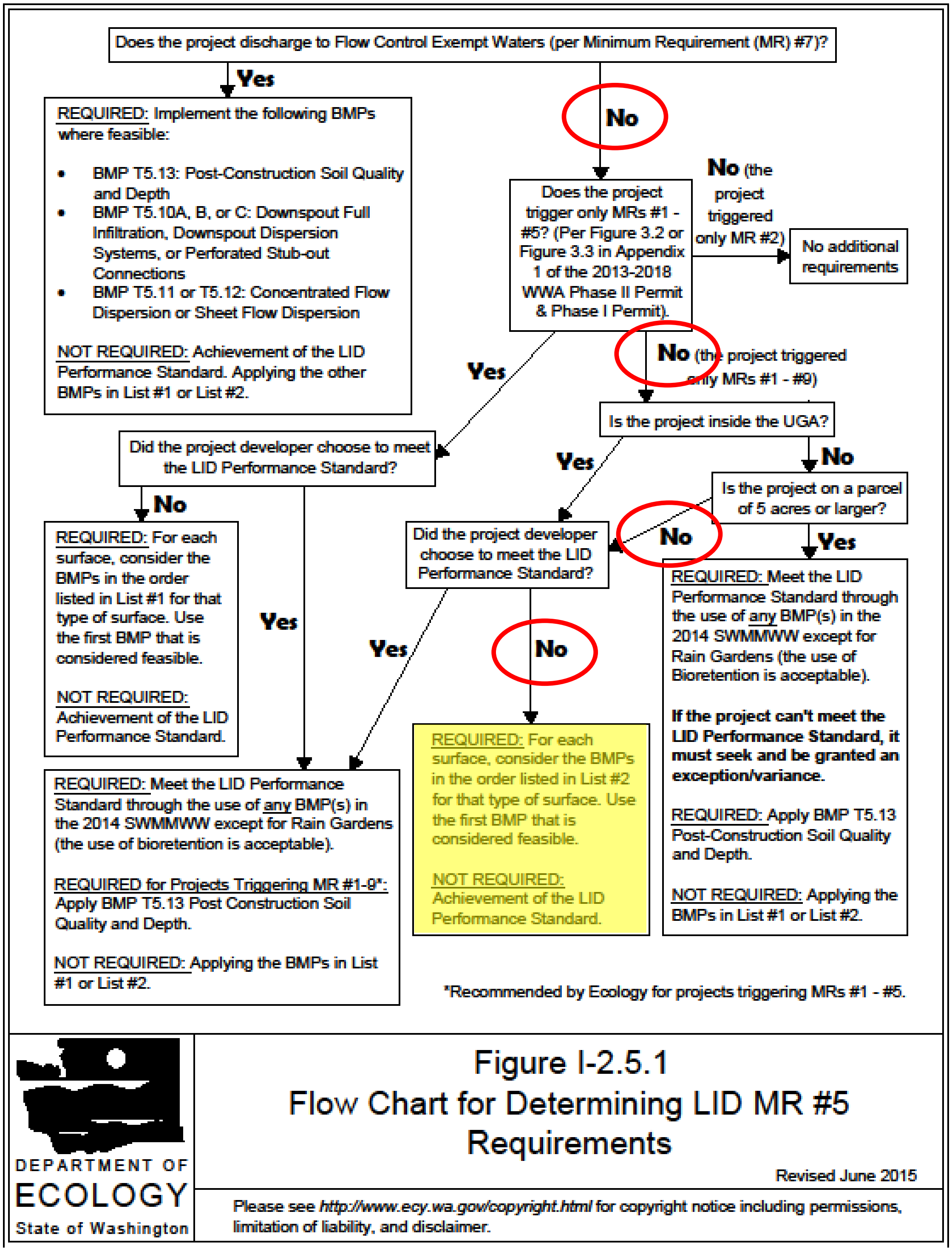


Figure 1 is enclosed detailing the tributary area of each drainage system.

List 2 outlines BMP's for hard surfaces in the following order:

Lawn and Landscape Areas

1. Post construction soil quality and depth in accordance with BMP 5.13 in Volume V, Chapter 5.

   Due to the limited area within the cleared site and the steep topography, existing topsoil will be removed from the site. At completion of clearing, grading, and hardscape, imported topsoil material will be placed in landscape areas in accordance with BMP 5.13.

Roofs

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion, or Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration.

   Not feasible as the site does not retain 65% of the site as native forested area downslope of the proposed site. Per the geotechnical report, infiltration is not feasible on this site.

2. Bioretention (See BMP T7.30: Bioretention Cells, Swales, and Planter Boxes) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

   Not feasible as the site is not suitable for infiltration, per the geotechnical report, and thus below the required 0.3 in/hr rate identified in the infeasibility criteria.

3. Downspout Dispersion Systems in accordance with BMP T5.10B: Downspout Dispersion Systems

   BMP T5.10B is infeasible as the flow path from the point of discharge to the property line is less than the required length, as well as many areas are paved and will not facilitate vegetated flow.

4. Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections

   Perforated stub-out connections are infeasible as the site is not conducive to infiltration and any water introduced into the subsoils may result in perched water traveling through the site undermining pavements and foundations.

Hard Surfaces

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion

   Full dispersion is not applicable as 65% of the site will not be protected in a forest or native condition downslope of the proposed development.

2. Permeable pavement in accordance with BMP T5.15: Permeable Pavements

   Infeasible as onsite soil is not conducive to infiltration, per the geotechnical report.

3. Bioretention BMP's (BMP T7.30: Bioretention Cells, Swales, and Planter Boxes) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

   Not feasible as onsite soil is not conducive to infiltration, per the geotechnical report.

4. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion, or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion

   BMP T5.12 is infeasible as minimum 10-foot flow path per every 20 feet of contributing surface flow path cannot be provided.

Runoff from both pollution and non-pollution generating surfaces will be collected and discharged to StormTech stormwater detention systems, to meet Minimum Requirement 7-Flow Control. Downstream of the detention system, a Biopod system will be used to meet Minimum Requirement 6-Water Quality, prior to discharging to the point of confluence. .

There will be three stormwater detention systems on the developed site. Two detention systems to the west will discharge stormwater in a traditional gravity flow manner (Subbasin B and C). A third detention system (Subbasin D) to the east will utilize a pump lift station to discharge stormwater from its control structure, as it is infeasible to discharge by gravity from this system due to the depth of the system

The lift station will use a duplex pump system for full redundancy; each pump will have capacity to pump the required flow and alternate between pump starts. In the event of a high flow occurring, both pumps will turn on, which doubles the pump capacity. The design flow rate used to size the pump was determined to be the discharge rate of the flow control structure at a stage equal to the riser height of the modeled detention tank in WWHM, as discussed below in Minimum Requirement 7-Flow Control. For Basin D, the design flow rate at max riser stage was determined to be 40.8 gpm (0.091 cfs). This represents the maximum design discharge rate required to meet Minimum Requirement 7. Calculations for sizing the pump and wet well are included in Appendix I. The lift station was placed downstream of the detention system yet upstream of the treatment system in order to avoid excessive depth of the treatment system. The pump discharge pipe will discharge to a catch basin to dissipate pressure and energy prior to gravity flowing to the treatment system.

In the event that flows through the system exceed the capacity of a single pump, the second pump will turn on to address the higher flows. In the event that flows through the system exceed the capacity of both pumps, a very rare occurrence, the water level in the wet well structure will simply rise until it reaches the overflow pipe elevation, and then drains by gravity to the point of compliance to the south. The elevation of the overflow pipe in the wet well structure is below the rim of the catch basins connecting into the system, so no overtopping of structures will occur. In the event of the overflow pipe being plugged, the high water alarm elevation has been set above the overflow elevation, which will sound an alarm to maintenance workers.

The wet well was sized for a minimum cycle time of 60 seconds and a maximum 8 starts per hour. This results in a minimum time between starts, T_{min}, of 6.5 minutes. Based on a 72” diameter manhole for the wetwell, and an inflow of 40.8 gpm, a depth of 2 feet was determined between lead pump on and pump off levels. A depth value of 6” was chosen between the lead pump on and lag pump on. To avoid creating a vortex at the bottom of the wetwell as the pump nears the pump off elevation, a minimum submersion depth of 1 foot was used.

Flows from treatment system and overflow from the wet well structure will be combined prior to penetrating the retaining wall and discharging to the point of compliance to the south through the use of a level spreader. The length of the level spreader was determined by calculating the flow capacity of the perforated holes and comparing that to the anticipated flow from the pump. It was determined that a 15’ length of 8” perforated pipe flowing half full has the flow capacity to disperse 0.22 cfs, which is 10% greater than the maximum pump operating flow rate of 0.2 cfs (90 gpm).

In the event of a power outage and the pumps are inoperable, stormwater will simply fill up in the detention tanks until it reaches the overflow discharge pipe. For the western drainage system, stormwater will flow through the overflow system, bypass the treatment system through the internal bypass mechanism, and flow to the point of connection at the catch basin in the public roadway. For the eastern basin, stormwater will flow through the overflow system directly to the point of connection to the south. In the event of a catastrophic event that caused the overflow system to plug up in both the west and east subbasins, stormwater will simply bubble up out of the lowest catch basin in each subbasin. It is not anticipated that at any time stormwater back up into the building structure or cause a downstream flooding issue.

Upstream Analysis

The upstream area above the proposed site is natural forested area, and will be diverted around the proposed improvements. No impacts from upstream areas are anticipated. The upstream runoff will not be mixed with the onsite stormwater, thus avoiding overloading onsite BMP's.

Downstream Analysis

The entire site is tributary to Upper North Creek Basin, as shown in the City's Drainage Basin Map included in Appendix H. The existing site disperses stormwater along the length of the property lines, however, in general the topography routes dispersed stormwater to the SW and SE portion of the project site. The point of compliance for the majority of the developed site is the existing public storm drain system in North Creek Drive.

Runoff from the northern portion of the project site will be intercepted by an interceptor ditch and discharged to the SE corner of the site. Runoff from the northern portion of the site is fully dispersed within the native vegetation, and is not anticipated to amount to any significant flows that would cause an impact to the downstream area. Quarry spalls will be added to the terminus of the interceptor trench for energy dissipation at the SE corner of the project site. The downstream condition at the SE corner of the project site is heavily vegetated, and as discussed with MR#8, no impacts to the downstream wetland are anticipated.

For discharges to the SW corner of the project site, the public storm drain flows west through Heatherwood Apartments to North Creek. The mitigated flow from the developed site mimics predeveloped flow and meets required flow control requirements. Impacts to the downstream system are not anticipated. Figure 2 below shows the downstream public storm drain system for the portion of the site that drains to the SW.

Figure 3 shows the portion of the site that drains to the SE. For more detailed downstream analysis of predeveloped off-site flows, see Appendix H, Figure 3 (Off-Site Basin Map). Photos of key locations along the downstream system are provided as well. Upon visual observation, the downstream system appears to be in good condition with no evidence of flooding or backwater conditions. The depth of the public system is fairly deep and can accommodate a high HGL flow.

There are two Threshold Discharge Areas (TDA) associated with the subject site. Flows to the east in one TDA eventually discharge to Sitka Creek which then discharges to North Creek. Flows to the south and east in the second TDA eventually discharge to an unnamed watercourse that discharges to North Creek. Flows from the two TDA join approximately one-half mile downstream.

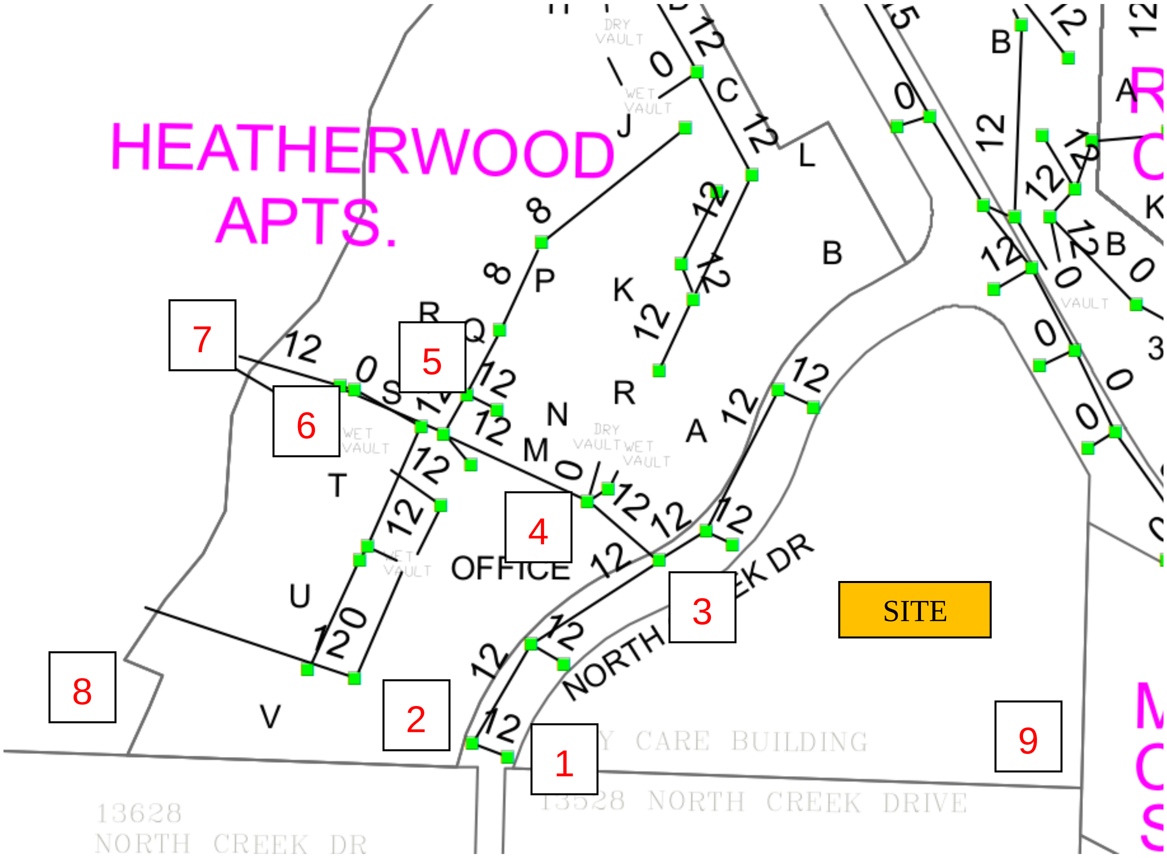

HEATHERWOOD
APTS.
SITE
NORTH CREEK DR
OFFICE
13628
NORTH CREEK DR
13528 NORTH CREEK DRIVE
CARE BUILDING
1
2
3
4
5
6
7
8
9

Figure 2

1-Point of Connection to PSD

2-CB across the street

3-Junction with Apts

4-Type II CB

5-Type II CB

6-Type I CB

7-Outfall to North Creek

8-Downstream North Creek

9-SE corner of site

Refer to Figure 3-Offsite Basin Map for reference to the following photos.

10-Looking NW along N Cr Dr (see Fig. 3)

11-Looking W along N Cr Dr (see Fig. 3)

12-Project site looking south (See Fig 3)

<u>Conveyance System</u>

The onsite conveyance system will consist of 8" pipe with a minimum slope of 0.5%. An 8" pipe at 0.5% slope has a capacity of 0.93 cfs. The peak 100 year flow of the mitigated site at the point of confluence is 0.38 cfs, therefore the conveyance pipe is approximately half full at peak discharge. As such, the onsite conveyance system has sufficient capacity to convey the peak 100 year mitigated flows.

<u>Backwater Analysis</u>

A backwater analysis was performed on four catch basins that discharge to detention systems. Each catch basin is associated with a separate contributary onsite stormwater runoff basin. See the table below for a summary, and see Appendix G for backwater analysis calculations and a tributary area map.

The backwater analysis was performed by first determining which catch basins were at the greatest risk of backwatering. The runoff areas associated with these catch basins were then determined. Western Washington Hydrology Model (WWHM) 2012 was used to determine peak 100-year flows for each runoff area. Using these peak flow rates and the geometry associated with each catch basin and the detention chamber connected, Hydraflow Express for AutoCAD Civil 3D was used to perform the backwater analysis calculations. In all cases, stormwater did not overtop the catch basins.

	Backwater Analysis Table			
Structure ID	CB-6	CB-8	CB-9	CB-12
Contributing Impervious Area (AC)	0.26	0.16	0.24	0.41
Contributing Pervious Area (AC)	0.10	0.01	0.08	0.22
100-Year Q (cfs)	0.35	0.18	0.27	0.59
Rim Elevation (ft)	414.00	423.58	424.04	417.70
Tailwater Elevation (ft)	411.87	421.9	421.9	415.71
Headwater Elevation (ft)	411.87	421.9	421.8	415.71
Analysis Result	OK	OK	OK	OK

6-Runoff Treatment

The site will meet the enhanced level of treatment, as the project does not meet the thresholds for phosphorous removal or oil treatment as described in Section V-3 of the SWMMWW.

Runoff treatment will consist of two underground Biopod systems, manufactured by Oldcastle Precast. The Biopod is listed as an approved technology on the Department of Ecology's website for enhanced treatment. One Biopod will be placed at the confluence of two detention facilities at the SW corner of the site, the second Biopod will be placed downstream of the third detention facility on the east side of the site.

The mitigated 2-yr peak water quality flow at the SW Biopod (Basin B and C) is 0.083 cfs. Calculations are included in Appendix E. A Biopod BPU-48IB has a capacity of 0.086 cfs, which exceeds the anticipated water quality flow rate. The water quality flow at the east Biopod (Basin D) is 0.023 cfs. A Biopod BPU-46IB has a capacity of 0.057 cfs, which exceeds the anticipated water quality flow rate.

7-Flow Control

This requirement will be met through the use of three independent Stormtech Chamber systems. Three systems are needed due to the steep topography and limited site space. The existing onsite soils were modeled as Type D soils, based on statements contained within page 15 of the geotechnical report that state that the upper soil layer is considered a restrictive layer. Existing soil type / land use designation in the WWHM were inputted as "SAT Forest – Steep" to reflect the Type D soils. TerraVista NW contacted WA DOE and confirmed that Type D soils should be modeled under this soil/land use designation in WWHM.

For ease of construction, all three flow control structures were designed with the same orifice and notch dimensions. This avoids mixing up the flow control structures in the field during construction. The riser height was set at an elevation equal to the crown of the detention structure. WWHM calculations are provided in Appendix D that show the proposed detention system meets the required flow control parameters.

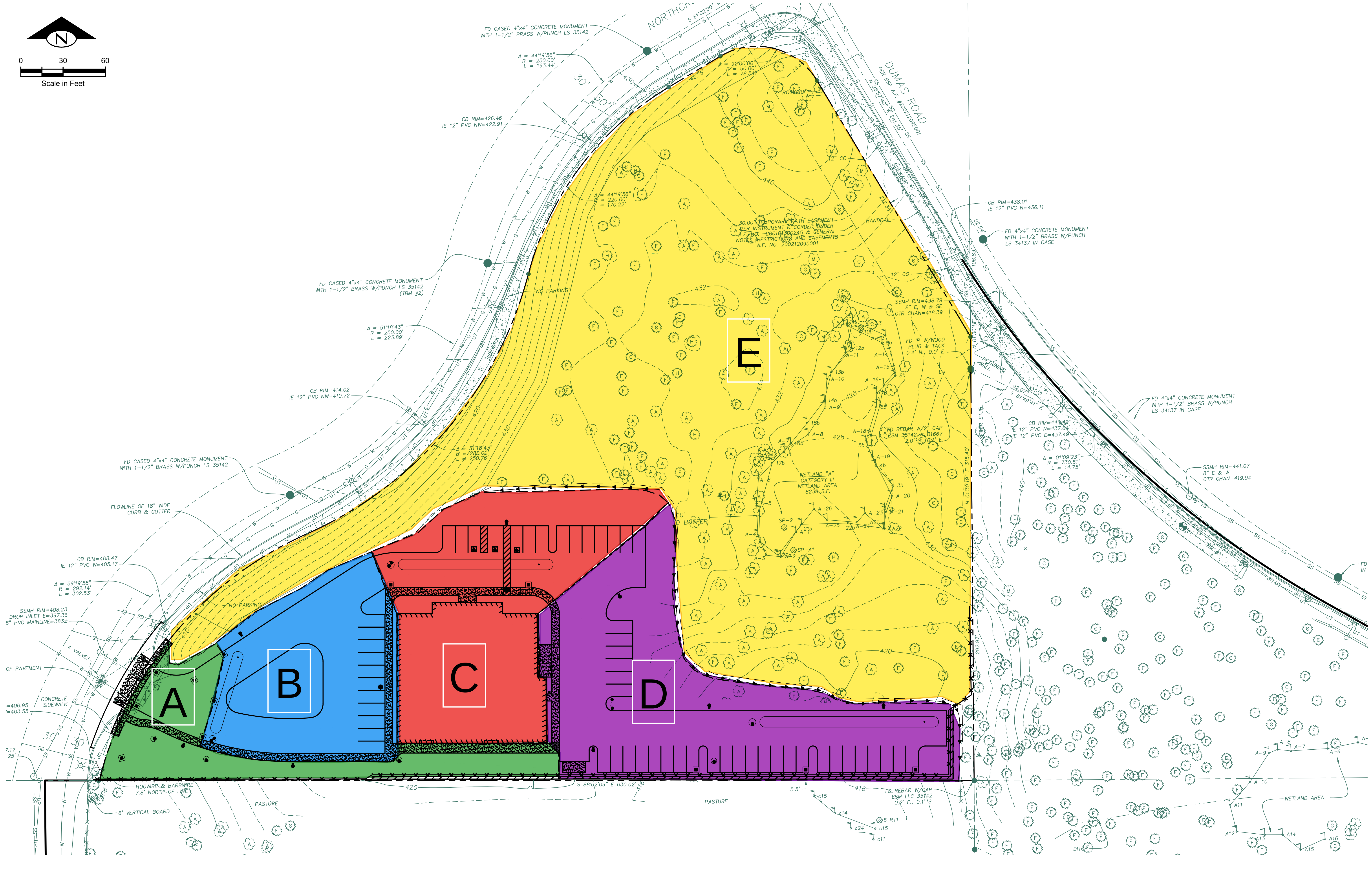
8-Wetland Protection

Per the wetland study performed by Wetland Resources, an existing wetland is present in the north end of the site, however, it is uphill from the proposed development and therefore not impacted. Existing wetlands are present on adjacent parcels to the south and east. The existing wetland to the east is not impacted as the proposed project improvements are downslope.

A portion of the project site in the SE corner is tributary to the existing wetland to the south. The stormwater drainage system within this subbasin will discharge to the south and maintain existing hydrologic conditions and continuous recharge of wetland to the south.

9-Operation and Maintenance

Operation and maintenance procedures are included in Appendix C.


N
0
30
60
Scale in Feet
A
B
C
D
E
DUMAS ROAD
FD CASED 4"x4" CONCRETE MONUMENT WITH 1-1/2" BRASS W/PUNCH LS 35142
CB RIM=426.46
IE 12" PVC NW=422.91
CB RIM=414.02
IE 12" PVC NW=410.72
CB RIM=408.47
IE 12" PVC W=405.17
CB RIM=438.01
IE 12" PVC N=436.11
FD 4"x4" CONCRETE MONUMENT WITH 1-1/2" BRASS W/PUNCH LS 34137 IN CASE
WETLAND "A" CATEGORY III WETLAND AREA 8239 S.F.
FLOWLINE OF 18" WIDE CURB & GUTTER
CONCRETE SIDEWALK
"NO PARKING"
HANDRAIL
RETAINING WALL
PASTURE
WETLAND AREA
HOGWIRE & BARBWIRE 7.8' NORTH OF LINE
6' VERTICAL BOARD
S 88°02'09" E 630.02'
SSMH RIM=441.07
SSMH RIM=408.23

Appendix A

Construction Stormwater Pollution Prevent Plan (SWPPP)

Construction Stormwater General Permit (CSWGP)
Stormwater Pollution Prevention Plan (SWPPP)
for
7C's Swim School

Prepared for:
Department of Ecology
Northwest Region

Permittee / Owner	Developer	Operator / Contractor
7C's Swim School	Same	Coast Construction

[Insert Project Site Location]
Update as necessary.
Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
Steve Rushton	Coast Construction	425-315-4799

SWPPP Prepared By

Name	Organization	Contact Phone Number
Eric Scott	TerraVista NW	425-422-0840

SWPPP Preparation Date
Month / Day / Year

Project Construction Dates

Activity / Phase	Start Date	End Date
Construction	March 2020	Dec 2020

GENERAL INSTRUCTIONS AND CAVEATS

This template presents the recommended structure and content for preparation of a Construction Stormwater General Permit (CSWGP) Stormwater Pollution Prevention Plan (SWPPP).

The Department of Ecology's (Ecology) CSWGP requirements inform the structure and content of this SWPPP template; however, **you must customize this template to reflect the conditions of your site.**

A Construction Stormwater Site Inspection Form can be found on Ecology's website.
https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

Using the SWPPP Template

Each section will include instructions and space for information specific to your project. Please read the instructions for each section and provide the necessary information when prompted. This Word template can be modified electronically. You may add/delete text, copy and paste, edit tables, etc. Some sections may be completed with brief answers while others may require several pages of explanation.

INSTRUCTIONS

Instructions are identified by gray shading, and should **be deleted upon SWPPP completion.** Delete this entire section upon SWPPP completion.

Follow this link to a copy of the Construction Stormwater General Permit:
https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

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List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

Project Information (1.0)
Project/Site Name: 7C's Swim School
Street/Location: *North Creek Road*
City: *Mill Creek* State: *WA* Zip code: *98012*
Subdivision:
Receiving waterbody: *North Creek*

Existing Conditions (1.1)
Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).
Total acreage: *4.54 acres*
Disturbed acreage: *1.73 acres*
Existing structures: *None*
Landscape topography: *Steep*
Drainage patterns: *Runoff*
Existing Vegetation: *Forest*
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes): *Wetland*

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: *None*
Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

List all known or suspected contaminants associated with this site in Table 1. Include contaminants previously remediated.
Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
None	[Insert Text]	[Insert Text]	[Insert Text]

Proposed Construction Activities (1.2)
Description of site development (example: subdivision):

Commercial / Industrial Development

Description of construction activities (example: site preparation, demolition, excavation):

Site preparation, demolition, excavation and fill, paving, and building construction

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

Stormwater will be collected by a conveyance system and routed to three detention systems. A single water qualtity facility will be used at the confluence of the three detention facilties. The outfall of the site will be at an existing CB in North Creek Road.

Description of final stabilization (example: extent of revegetation, paving, landscaping):

Site will be paved as well as seeded with grasses within landscape areas.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

NA

Construction Stormwater Best Management Practices (BMPs) (2.0)
Describe the BMPs identified to control pollutants in stormwater discharges. Depending on the site, multiple BMPs for each element may be necessary. For each element identified:

- Clearly describe the control measure(s).
- Describe the implementation sequence.
- Describe the inspection and maintenance procedures for that specific BMP.
- Identify the responsible party for maintaining BMPs (if your SWPPP is shared by multiple operators, indicate the operator responsible for each BMP).

Categorize each BMP under one of the following elements as listed below:

1. Preserve Vegetation / Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outfalls
9. Control Pollutants
10. Control Dewatering
11. Maintain BMPs
12. Manage the Project
13. Protect Low Impact Development

- BMPs must be consistent with the most current approved edition of the Stormwater Management Manual for Western Washington (SWMMWW) at sites west of the crest of the Cascade Mountains; the Stormwater Management Manual for Eastern Washington (SWMMEW) for sites east of the crest of the Cascade Mountains at the time the general permit was issued; or other Ecology-approved manual.
- Note the location of each BMP on your Site Map in Appendix A.
- Include the corresponding Ecology source control BMPs and runoff conveyance and treatment BMPs in Appendix B.
    - SWMMWW Volume II Chapter 4 Sections 4.1 and 4.2 – https://fortress.wa.gov/ecy/publications/SummaryPages/1410055.html or
    - SWMMEW Chapter 7 Section 7.3.1 and 7.3.2 – https://fortress.wa.gov/ecy/publications/summarypages/0410076.html
    - If it can be justified that a particular element does not apply to the project site, include a written justification in lieu of the BMP description in the text for the appropriate element.

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.
The 12 Elements (2.1)
Element 1: Preserve Vegetation / Mark Clearing Limits (2.1.1)
Describe the methods (signs, fences, etc,) you will use to protect those areas that should not be disturbed.
Describe natural features identified and how each will be protected during construction. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans.

Describe how natural vegetation and native topsoil will be preserved.

List and describe BMPs: BMP C103 – High Visibility Fence, BMP C233-Silt Fence
Installation Schedules: Installed prior to ground breaking
Inspection and Maintenance plan: Inspected weekly and after major precipitation event
Responsible Staff: CESCL

Element 2: Establish Construction Access (2.1.2)
Describe how you will minimize dust generation and vehicles tracking sediment off-site.
Limit vehicle access to one route, if possible.
Recycled concrete used to establish construction ingress or egress may be a stormwater pollutant source that requires treatment prior to discharge.
Street sweeping, street cleaning, or wheel wash/tire baths may be necessary if the stabilized construction access is not effective. All wheel wash wastewater shall be controlled on-site and CANNOT be discharged into waters of the State.
Install site ingress/egress stabilization BMPs according to BMP C105.
Describe how you will clean the affected roadway(s) from sediment which is tracked off-site.

List and describe BMPs: BMP C105-Stabilized Construction Entrance
Installation Schedules: installed at the start of construction
Inspection and Maintenance plan: Inspected and maintained weekly or after significant rainfall event
Responsible Staff: CESCL

Element 3: Control Flow Rates (2.1.3)
Describe how you will protect properties and waterways downstream of the project from increased speed and volume of stormwater discharges due to construction activity.
Construction of stormwater retention and/or detention facilities must be done as one of the first steps in grading.
Assure that detention facilities are functioning properly before constructing site improvements (i.e. impervious surfaces).
If applicable, describe how you will protect areas designed for infiltration from siltation during the construction phase.

Will you construct stormwater retention and/or detention facilities?
Yes **No**

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
Yes **No**

List and describe BMPs: None
Installation Schedules: [Insert text here]
Inspection and Maintenance plan: [Insert text here]
Responsible Staff: [Insert text here]

Element 4: Install Sediment Controls (2.1.4)

Describe how you will minimize sediment discharges from the site. Construct sediment control BMPs as one of the first steps of grading. These BMPs must be functional before other land disturbing activities – especially grading and filling – take place.

Describe the BMPs identified to filter sediment prior to it being discharged to an infiltration system or leaving the construction site.

Describe how you will direct stormwater for maximum infiltration where feasible.

Describe how you will not interfere with the movement of juvenile Salmonids attempting to enter off-channel areas or drainages.

Describe how you will respond if sediment controls are ineffective and turbid water is observed discharging from the site.

Consider the amount, frequency, intensity and duration of precipitation, soil characteristics, and site characteristics when selecting sediment control BMPs.

List and describe BMPs: BMP C233-Silt Fence

Installation Schedules: Installed at start of construction

Inspection and Maintenance plan: Inspect weekly or after rainfall event

Responsible Staff: CESCL

Element 5: Stabilize Soils (2.1.5)
Describe how you will stabilize exposed and unworked soils throughout the life of the project (i.e. temporary and permanent seeding, mulching, erosion control fabrics, etc.).
Describe how you will stabilize soil stockpiles.
Describe how you will minimize the amount of soil exposed throughout the life of the project.
Describe how you will minimize the disturbance of steep slopes.
Describe how you will minimize soil compaction.
Describe how you will stabilize contaminated soil and contaminated soil stockpiles if applicable.
Exposed and unworked soils will be stabilized according to the time period set forth for dry and wet seasons, on the west or east sides of the crest of the Cascade Mountains.

Select your region's table and delete the others.
West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

East of the Cascade Mountains Crest, except the Central Basin*

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	10 days
During the Wet Season	October 1 – June 30	5 days

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.
Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: March 2020 End date: Dec 2020

Will you construct during the wet season?
Yes No

List and describe BMPs: BMP C120-Temp / Permenant Seeding, BMP C123-Plastic Covering, BMP C140-Dust Control
Installation Schedules: Dust control will be used from beginning of construction to final stabiliazation of soi. Plastic covering will be used during the wet season, permanent seeding will be done in the fall.
Inspection and Maintenance plan: Inspect weekly or after rain event
Responsible Staff: CESCL

Element 6: Protect Slopes (2.1.6)
West of the Cascade Mountains Crest
Describe how slopes will be designed, constructed, and protected to minimize erosion.
Temporary pipe slope drains must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used.
The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits.
For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates.
If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as “landscaped area”.
Describe how you will reduce scouring within constructed channels that are cut down a slope.

East of the Cascade Mountain Crest
Describe how slopes will be designed, constructed, and protected to minimize erosion.
Temporary pipe slope drains must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.
Describe how you will reduce scouring within constructed channels that are cut down a slope.

Will steep slopes be present at the site during construction?
Yes No

List and describe BMPs: BMP C120-Temp/Permanent Seeding
Installation Schedules: Installed in the fall
Inspection and Maintenance plan: Inspected weekly to insure germination of seed
Responsible Staff: CESCL

Element 7: Protect Drain Inlets (2.1.7)
Describe how you will protect all operable storm drain inlets so that stormwater runoff does not enter the stormwater conveyance system.
Describe how you will remove sediment that enters the stormwater conveyance system (i.e. filtration, treatment, etc.).
Keep in mind inlet protection may function well for coarse sediment but is less effective in filtering finer particles and dissolved constituents. Inlet protection is the last component of a treatment train and protection of drain inlets include additional sediment and erosion control measures. Inlet protection devices will be cleaned (or removed and replaced), when sediment has filled the device by one third (1/3) or as specified by the manufacturer.
Inlets will be inspected weekly at a minimum and daily during storm events.

List and describe BMPs: BMP C220-Storm Drain Inlet Protection
Installation Schedules: Installed prior to construction
Inspection and Maintenance plan: Inspected weekly or after rain event
Responsible Staff: CESCL

Element 8: Stabilize Channels and Outlets (2.1.8)
Describe how you will prevent downstream erosion where site runoff is to be conveyed in channels, discharged to a stream or, discharged to a natural drainage point.
West of the Cascade Mountains Crest
On-site conveyance channels must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used.
The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits.
For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates.
If using the WWHM to predict flows, bare soil areas should be modeled as “landscaped area”.

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

List and describe BMPs: BMP C202 – Channel Lining
Installation Schedules: Installed prior to construction
Inspection and Maintenance plan: Inspected weekly or after rain event
Responsible Staff: CESCL

Element 9: Control Pollutants (2.1.9)

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (and source, if applicable)
None

Describe how you will handle and dispose of all pollutants, including waste materials and demolition debris, in a manner that does not cause contamination of stormwater.

Describe how you will cover, contain, and protect from vandalism all chemicals, liquid products, petroleum products, and other polluting materials.

Describe how you will manage known contaminants to prevent their discharge with stormwater to waters of the State (i.e. treatment system, off-site disposal).

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

Yes No Provisions of spill prevention plan will be used

If yes, describe spill prevention and control measures in place while conducting maintenance, fueling, and repair of heavy equipment and vehicles.

If yes, also provide the total volume of fuel on-site and capacity of the secondary containment for each fuel tank. Secondary containment structures shall be impervious.

Will wheel wash or tire bath system BMPs be used during construction?

Yes No

If yes, provide disposal methods for wastewater generated by BMPs.

If discharging to the sanitary sewer, include the approval letter from your local sewer district under Correspondence in Appendix C.

Will pH-modifying sources be present on-site?

Yes No If yes, check the source(s).

Table 3 – pH-Modifying Sources

	None
X	Bulk cement
	Cement kiln dust
	Fly ash
	Other cementitious materials
X	New concrete washing or curing waters
	Waste streams generated from concrete grinding and sawing
	Exposed aggregate processes
	Dewatering concrete vaults
X	Concrete pumping and mixer washout waters
	Recycled concrete
	Other (i.e. calcium lignosulfate) [please describe]

Describe BMPs you will use to prevent pH-modifying sources from contaminating stormwater.

List and describe BMPs: BMP C151-Concrete Handling, BMP C152-Sawcutting, BMP C154-Concrete Washout
Installation Schedules: *Installed prior to concrete work being performed*
Inspection and Maintenance plan: Inspected weekly
Responsible Staff: CESCL

Adjust pH of stormwater if outside the range of 6.5 to 8.5 su.
Obtain written approval from Ecology before using chemical treatment with the exception of CO_2 or dry ice to modify pH.

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Element 10: Control Dewatering (2.1.10)
Describe where dewatering will occur, including source of the water to be removed. State clearly if dewatering water is contaminated or has the potential to be contaminated.
Water from foundations, vaults, and trenches with characteristics similar to stormwater runoff shall be discharged into a controlled conveyance system before discharging to a sediment trap or sediment pond. Clean dewatering water will not be routed through stormwater sediment ponds.
Only clean, non-turbid dewatering water (such as well-point groundwater) may be discharged to systems tributary to, or directly into, surface waters of the State, provided the dewatering flow does not cause erosion or flooding of receiving waters.
Describe how you will manage dewatering water to prevent the discharge of contaminants to waters of the State, including dewatering water that has comingled with stormwater (i.e. treatment system, off-site disposal).

Dewatering will not be used onsite

Check treatment of disposal option for dewatering water, if applicable:
Table 4 – Dewatering BMPs

	Infiltration
	Transport off-site in a vehicle (vacuum truck for legal disposal)
	Ecology-approved on-site chemical treatment or other suitable treatment technologies
	Sanitary or combined sewer discharge with local sewer district approval (last resort)
	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: NA
Installation Schedules: NA
Inspection and Maintenance plan: NA
Responsible Staff: NA

Element 11: Maintain BMPs (2.1.11)

This section is a list of permit requirements and does not have to be filled out.

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

Element 12: Manage the Project (2.1.12)
The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
  - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
  - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
  - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.
Check all the management BMPs that apply at your site:
Table 5 – Management

X	Design the project to fit the existing topography, soils, and drainage patterns
X	Emphasize erosion control rather than sediment control
X	Minimize the extent and duration of the area exposed
X	Keep runoff velocities low
X	Retain sediment on-site
X	Thoroughly monitor site and maintain all ESC measures
X	Schedule major earthwork during the dry season
	Other (please describe)

Optional: Fill out Table 6 by listing the BMP associated with specific construction activities. Identify the phase of the project (if applicable). To increase awareness of seasonal requirements, indicate if the activity falls within the wet or dry season.

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]
Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Element 13: Protect Low Impact Development (LID) BMPs (2.1.13)
Describe LIDs.
Permittees must protect all Bioretention and Rain Garden facilities from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden facilities. Restore the facilities to their fully functioning condition if they accumulate sediment during construction. Restoring the facility must include removal of sediment and any sediment-laden Bioretention/Rain Garden soils, and replacing the removed soils with soils meeting the design specification.
Permittees must maintain the infiltration capabilities of Bioretention and Rain Garden facilities by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.
Permittees must control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.
Permittees must clean permeable pavements fouled with sediments or no longer passing an initial infiltration test using local stormwater manual methodology or the manufacturer's procedures.
Permittees must keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.
Describe how you will protect LID facilities from sedimentation, protect soils from compaction, and maintain the infiltration capabilities.
Describe how you will clean permeable pavements fouled with sediments.

N/A as there are no biofiltration facilities onsite.

Pollution Prevention Team (3.0)
Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Steve Rushton - Coast	425-315-4799
Resident Engineer	TBD	
Emergency Ecology Contact	TBD	425-649-7000
Emergency Permittee/ Owner Contact	Tim Shoultz-SmartCAP	425-896-8561
Non-Emergency Owner Contact	Same	
Monitoring Personnel		
Ecology Regional Office	[Insert Regional Office]	[Insert General Number]

Monitoring and Sampling Requirements (4.0)
Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

Create your own Site Inspection Form or use the Construction Stormwater Site Inspection Form found on Ecology's website. https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit
File a blank form under Appendix D.
The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.
Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

Complete the following paragraph for sites that discharge to impaired waterbodies for fine sediment, turbidity, phosphorus, or pH:

The receiving waterbody, insert waterbody name, is impaired for: insert impairment. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.
Site Inspection (4.1)
Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.
The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

Stormwater Quality Sampling (4.2)
Turbidity Sampling (4.2.1)
Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.
Method for sampling turbidity:
Check the analysis method you will use:
Table 8 – Turbidity Sampling Method

	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.
If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **<u>or</u>** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours. https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
   - <u>Central Region</u> (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490
   - <u>Eastern Region</u> (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
   - **<u>Northwest Region</u> (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000**
   - <u>Southwest Region</u> (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
   - Turbidity is 25 NTU (or lower).
   - Transparency is 33 cm (or greater).
   - Compliance with the water quality limit for turbidity is achieved.
      - o 1 - 5 NTU over background turbidity, if background is less than 50 NTU
      - o 1% - 10% over background turbidity, if background is 50 NTU or greater
   - The discharge stops or is eliminated.

pH Sampling (4.2.2)
pH monitoring is required for “Significant concrete work” (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project).The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.
For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.
For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.
If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:
Check the analysis method you will use:
Table 8 – pH Sampling Method

	pH meter
	pH test kit
	Wide range pH indicator paper

Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies (5.0)

303(d) Listed Waterbodies (5.1)

The 303(d) status is listed on the Water Quality Atlas: https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d

Circle the applicable answer, if necessary:

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

Yes No

List the impairment(s):

[Insert text here]

The receiving waterbody, insert waterbody name, is impaired for: insert impairment. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.

If yes, discharges must comply with applicable effluent limitations in S8.C and S8.D of the CSWGP.

Describe the method(s) for 303(d) compliance:

List and describe BMPs:

[Insert text here]

TMDL Waterbodies (5.2)

Waste Load Allocation for CWSGP discharges:

[Insert text here]

Describe the method(s) for TMDL compliance:

List and describe BMPs:

[Insert text here]

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

Reporting and Record Keeping (6.0)
Record Keeping (6.1)
This section does not need to be filled out. It is a list of reminders for the permittee.

Site Log Book (6.1.1)
A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

Records Retention (6.1.2)
Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.
Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

Updating the SWPPP (6.1.3)
The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Reporting (6.2)
Discharge Monitoring Reports (6.2.1)
Select and retain applicable paragraph.
Cumulative soil disturbance is less than one (1) acre; therefore, Discharge Monitoring Reports (DMRs) will not be submitted to Ecology because water quality sampling is not being conducted at the site.
Or
Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.
DMRs will be reported online through Ecology’s WQWebDMR System.
To sign up for WQWebDMR go to:

https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance

Notification of Noncompliance (6.2.2)

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- Central Region at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- Eastern Region at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- Southwest Region at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Appendix/Glossary

A. Site Map

The site map must meet the requirements of Special Condition S9.E of the CSWGP

B. BMP Detail

Insert BMPs specification sheets here.
Download BMPs from the Ecology Construction Stormwater website at:
https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

Create your own or download Ecology's template: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

E. Construction Stormwater General Permit (CSWGP)

Download CSWGP: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

F. 303(d) List Waterbodies / TMDL Waterbodies Information

Proposed New Discharge to an Impaired Water Body form
SWPPP Addendum addressing impairment

G. Contaminated Site Information

Administrative Order
Sanitary Discharge Permit
Soil Management Plan
Soil and Groundwater Reports
Maps and Figures Depicting Contamination

H. Engineering Calculations

Appendix B

Geotechnical Report

GEOTEST
741 Marine Drive
Bellingham, WA 98225
20527-67th Avenue NE
Arlington, WA 98223
PHONE
360 733_7318
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December 13, 2018
Project No. 18-0787

Coast Construction Group
328 N. Olympic Avenue
Arlington, WA 98223

Attn.: Mr. Trevor Gaskin

Re: Geotechnical Engineering Report
Proposed 7C's Swim Facility
SW Corner of North Creek Drive and Dumas Road
Mill Creek, WA 98012
(Parcel No. 28053100203700)

Dear Mr. Gaskin:

As requested, GeoTest Services, Inc. (GTS) is pleased to submit this report summarizing the results of our geotechnical evaluation for the proposed 7C's Swim Facility to be constructed at the above referenced address in Mill Creek, Washington (see *Vicinity Map*, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement dated October 11, 2018 and authorized by Mr. Gaskin.

PURPOSE AND SCOPE OF SERVICES

The purpose of this evaluation is to establish general subsurface conditions beneath the site from which conclusions and recommendations for foundation design can be formulated. Specifically, our scope of services includes the following tasks:

- Explore soil and groundwater conditions underlying the site by advancing five test pits to approximate depths of 6.5 to 9 feet below ground surface (BGS).

- Perform laboratory testing on representative samples in order to classify and evaluate the engineering characteristics of the soils encountered. In addition, estimate long-term infiltration rates (if feasible) and determine stormwater treatment potential.

- Provide a written report containing a site plan showing pertinent existing site features and the approximate locations of explorations, a description of surface and subsurface conditions, and exploration logs. The findings and recommendations presented in the report pertain to site preparation and earthwork including approximate stripping depths, reuse of on-site soil, placement and compaction of fill, wet weather earthwork, foundation recommendations, estimates of settlement, foundation and site drainage, soil parameters for lateral load resistance, temporary and permanent slopes, and pavement sections.

PROJECT DESCRIPTION

The irregular-shaped, approximately 4.6-acre parcel is located at the southwest corner of North Creek Drive and Dumas Road in Mill Creek, Washington. GTS was provided with a preliminary site plan of the proposed development. TerraVista NW Consulting Engineers prepared this drawing, which was undated. Based on this drawing and discussions with Ms. Kathy Demoors and Mr. Trevor Gaskin of Coast Construction Group, GTS understands that a new swim facility will be constructed on the southern portion of the subject property. The proposed building will have an approximate footprint of 100 feet by 100 feet. Access to the development will be via a new driveway entrance at the southwest corner of the parcel. Asphalt parking and driveways will surround the proposed building. Preliminary information regarding the proposed building was not available at the time that this report was written. GTS anticipates that the new building will be wood-framed and utilize shallow conventional foundations and slabs-on-grade, with the exception of the swimming pool that would be below grade. The depth and dimensions of the proposed swimming pool was not provided to GTS.

Stormwater infiltration facilities are also proposed for this project if feasible. The type and configuration of proposed facilities was not determined at the time that this report was written.

GTS understands that the proposed development will be limited to the southern portion of the property parallel to the southern property line. As of the writing of this report, GTS understands that no decision has been made as to the development of the remainder of the parcel. Thus, it should be understood that the recommendations presented in this report are only applicable to the proposed pool building and asphalt drive paths.

SITE CONDITIONS

This section presents the general surface and subsurface conditions observed at the project site at the time of the field investigation. Interpretations of the site conditions are based on the results of our review of available information, site reconnaissance, subsurface explorations, and laboratory testing.

Surface Conditions

As previously mentioned in the *Project Description* section of this report, the subject property is located at the southwest corner of North Creek Drive and Dumas Road in Mill Creek, Washington. The subject parcel is the shape of a three-sided polygon. Two sides make a right angle, and the northwestern edge of the parcel borders North Creek Drive. Vegetation is dense across the entirety of the site, and no surface water was observed at the time of visit. The topography across the site varies so that the highest part of the parcel is generally in its center with an elevation of approximately 430 feet. The elevation drops in all directions from the center of the parcel at a gentle to moderate rate. Along the western property line, the ground slopes to the west at an approximate 2.5H: 1V to 3H: 1V inclination over approximately 10 to 15 feet of vertical relief. It appears that the slope was created as a result of the construction of North Creek Drive. A moderate slope approximately 10 feet in height with an approximately 20 percent inclination is situated near the midpoint of the southern property line. The eastern portion of the property contains a wetland with an approximate 110-foot buffer, based on a review of a previous site plan prepared by TerraVista NW.

Bordering the subject property to the south is a maintenance yard that is owned by the City of Mill Creek.

Photo 1 – SW corner of parcel, looking NE into the site. Taken during a reconnaissance visit on September 13, 2018.

Subsurface Soil Conditions

Subsurface conditions were explored by advancing five exploratory test pits (TP-1 through TP-5) on November 15, 2018. The explorations were advanced to depths of between 8.0 and 9.0 feet below ground surface (BGS) using a track-mounted excavator. All excavations were terminated at or near the maximum reach of the equipment. The approximate locations of the explorations are shown on the *Site and Exploration Plan (*Figure 2).

The test pits generally encountered approximately 4 to 14 inches of forest duff/topsoil directly underlain by approximately 1 to 2 feet of native, loose to medium-dense, well-graded gravel with sand and varying amounts of organic material (possible weathered till). Underlying the loose to medium-dense, near-surface native soils was very dense, gray, poorly-graded sand with gravel and silt (glacial till). The very dense till was encountered to the maximum explored depth of each exploration.

Photo 2 shows the soil stratigraphy observed in TP-5, which was representative of other Test Pits on site. See the attached *Test Pit Logs* (Figures 5 through 7) and *Grain Size Analysis* (Figures 8 and 9) for more information regarding the approximate locations of the exploration test pits and subsurface soil conditions encountered.

Photo 2 – A view of TP-5. View facing south. Photo taken on November 15, 2018.

General Geologic Conditions

Geologic information for the project site was obtained from the *Geologic map of the Everett 7.5 minute quadrangle, Snohomish County, Washington* (Minard, 1985) published by the U.S. Geological Survey. According to the referenced map, near surface soils in the vicinity of the project site consist of Glacial Till (Qvt). The till generally consists of a nonsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. It is a compact lodgment till and is often locally referred to as Vashon till or hardpan. Native soils encountered during our subsurface exploration were generally consistent with the mapped till deposits is generally consistent with published geological information.

Groundwater Seepage

At the time of the GTS site visit on November 15, 2018, no groundwater seepage was detected in any of the explorations. In addition, no distinctly mottled or gleyed horizons were encountered within the test pit explorations.

Perched groundwater typically develops when granular or more permeable soil (weathered glacial till) is underlain by more dense or less permeable soil (glacial till). The depositional pattern of these soils is such that looser or more granular soils allow water to pass through the till, only to be restricted once groundwater encounters denser or siltier soils at depth. Perched groundwater conditions were not observed on-site at the time of exploration, but these conditions typically develop in the wet season or after extended periods of rainfall.

The groundwater conditions reported in the exploration logs are for the specific locations and dates indicated, and are not necessarily indicative of other locations and/or times. Groundwater levels are variable and will fluctuate depending on local subsurface conditions, season, precipitation, and changes in land use both on and off-site.

GEOLOGIC HAZARD AREAS

Chapter 18.08 of the Mill Creek Municipal Code addresses Environmentally Critical Areas within the City. The City defines Geologically Hazardous Areas to include erosion hazards, landslide hazards, and seismic hazards. Each of these as they apply to this project is discussed further in the following section.

Erosion Hazard Areas

The City defines Erosion Hazard areas as "lands or areas underlain by soils identified by the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) as having 'severe' or 'very severe' erosion hazards." Based on the Web Soil Survey for Snohomish County, Washington, the proposed development area is underlain by Everett very gravelly sandy loam (0 to 8 percent slopes). Areas underlain by these soils on slopes that are over 15 percent in inclination are defined as Erosion Hazards by the City.

The following recommendations are intended to limit the development of potential risks including excessive erosion and near-surface soil instability:

- All clearing and grading activities for the proposed development will need to incorporate Best Management Practices (BMPs) for erosion control in compliance with current City of Mill Creek codes and standards.
- GTS recommends that appropriate silt fencing be incorporated into the construction plan for erosion control.
- Removal of vegetation or trees without proper mitigation may increase the risk of failure of the surficial soils on the slope during periods of wet weather. No additional changes to existing slope vegetation are planned as a part of the proposed construction, other than normal maintenance and pruning.
- Organic waste or other debris should not be dumped onto the face of site slopes. These materials can retain water, smother the existing native vegetation, and cause instability on the slope face.
- Proper drainage controls have a significant effect on erosion. Collected site drainage should be directed to an appropriate discharge location. No water should be allowed to flow uncontrolled over the top of a steep slope.
- All areas disturbed by construction practices should be vegetated or otherwise protected to the limit the potential for erosion as soon as practical during and after construction. Areas requiring immediate protection from the effects of erosion should be covered with either plastic, mulch, or erosion control blankets.

In addition to the preceding recommendations, typical erosion control measures during construction will be required. These measures can include a rocked construction entrance or downslope silt fencing, depending on the regulations of the City of Mill Creek. No other mitigations are required to address erosion hazards on the property.

Landslide Hazard Areas

Landslide Hazard Areas in the City of Mill Creek include slopes that are over 40 percent inclination with at least 10 feet of vertical relief and areas meeting all three of the following criteria: Slopes over 15 percent, hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock, and wet season springs or groundwater seepage.

The slope along the western property line appears to have an approximate inclination of 2.5H: 1V to 3H: 1V over approximately 10 to 15 feet of vertical relief. This slope appears to have been created as a result of previous grading for North Creek Drive. Thus, this slope would not be considered as a Landslide Hazard Area. Another potential steep slope is situated adjacent to the southeast corner of the proposed building. Although this slope appears to be over 15 percent inclination and is underlain by permeable soils over glacial till, GTS did not observe any wet season springs or groundwater seepage in the explorations. It would not appear that this slope is a Landslide Hazard, and thus it is GTS's opinion that no mitigations are required to address landslide hazards on the property.

Seismic Hazard Areas

The City defines Seismic Hazard Areas are areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting. Based on the online interactive *Geologic Map of Washington State*, published by the Washington State Department of Natural Resources, the subject site is rated as a very low liquefaction susceptibility area. However, this map only provides an estimate of the likelihood that soil will liquefy as a result of earthquake shaking and is meant as a general guide to delineate areas prone to liquefaction. Though no known faults are mapped in the vicinity of the site, the Pacific Northwest is prone very large regional seismic events with a mean recurrence interval of approximately 475 years. Conventional construction techniques in the area do not typically include mitigation for liquefaction hazards based on the mapped site rating or the type of anticipated construction.

Due to the presence of very dense glacial till soils underlying the subject property, it does not appear that the property is located within a Seismic Hazard Area. No other mitigations are required to address seismic hazards on the property.

CONCLUSIONS AND RECOMMENDATIONS

Based upon an evaluation of the data collected during this investigation, it appears that subsurface conditions at the site are suitable for the proposed development provided that the recommendations contained herein are incorporated into the project design.

The test pits generally exposed 4 to 14 inches of forest duff/topsoil and approximately 1 to 2 feet of loose to medium-dense native soils (weathered till with variable amounts of organics) overlying dense to very dense glacial till. GTS recommends that the topsoil and loose fill soils (if present) be removed from the building footprint down to the native, weathered or unweathered glacial till soils. The proposed building can then be constructed with conventional continuous or individual spread foundations bearing directly on firm and unyielding native soil, or on compacted structural fill placed atop firm and unyielding native soil. Dense, unweathered soils encountered at depth are unlikely to require much preparation. Please note that the weathered till that was observed in our explorations contained varying amounts of organics. If foundations are to be supported on the near-surface weathered till, the foundation subgrades should be free of organics and then compacted to a firm and unyielding condition with a smooth-drum roller, vibratory hoe-pack, or other appropriate piece of construction equipment. Further recommendations regarding the placement and compaction of structural fill can be found in the *Structural Fill and Compaction* section of this report.

Perched groundwater was not observed within any of the test pit explorations performed on November 15, 2018. Although no perched groundwater was observed, the native soils are glacially consolidated. GTS would expect perched water to be found during wet weather months. Therefore, it appears that the native soils are not suitable for the conventional infiltration of stormwater.

Site Preparation and Earthwork

The portions of the site to be occupied by the proposed building foundations, slab areas, and pavement, hardscape, and walkways should be prepared by removing existing forest duff, topsoil, organic material and loose/soft, upper portions of the subgrade soils. All proposed building foundations, slab areas, pavement, hardscape, and walkways may be placed on native, non-organic, weathered or unweathered glacial till soil, or existing firm and unyielding fill material after removal of any soft or medium dense soil, and organic soil.

GTS anticipates approximately 1 to 1.5 feet of surface stripping to reach suitable weathered glacial till soils, and approximately 2 to 3.5 feet of stripping to reach unweathered glacial till soils, in most locations. After site stripping has occurred, the exposed subgrade under all areas to be occupied by soil-supported floor slabs, spread or continuous foundations, pavement or new sidewalk areas should be evaluated to confirm a firm and unyielding condition and proof rolled with a loaded dump truck, large self-propelled vibrating roller, hoe-pack, or similar piece of equipment applicable to the size of the excavation.

Soils disturbed during excavation should be recompacted prior to placement of structural fill or foundation elements. Recompaction of the near-surface soils does not reduce or eliminate the need for overexcavation, where required, of near-surface loose soils or fill material below foundation elements. The purpose of recompacting and proof rolling near-surface soils is to identify possible loose or soft soil deposits and recompact, if feasible, the soil disturbed during site excavation activities.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation cannot be readily compacted and should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under wet conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Structural Fill and Compaction

Structural fill used to obtain final elevations for footings and soil-supported floor slabs must be properly placed and compacted. Suitable, non-organic, predominantly granular soil may be used for fill material provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. Material containing topsoil, wood, trash, organic material, or construction debris is unsuitable for reuse as structural fill and should be properly disposed off-site or placed in non-structural areas.

Soils containing more than 5 percent fines are considered moisture sensitive. These soils are difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than 2 percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given layer of compactive effort.

Reuse of On-site Soil

Near-surface, non-organic, native soils are suitable for reuse as structural fill when placed at optimum moisture contents as determined by ASTM D1557, and if allowed for in the project plans and specifications. The weathered and unweathered glacial till soils contain high percentages of fines and should be considered moisture-sensitive. Reuse of the unweathered glacial till soils may be considerably more difficult to use at or near perched groundwater elevations (if present) and during the wet weather season (typically October through May).

If using on-site materials, the contractor and owner should be prepared to manage over optimum moisture content soils. The moisture content of the site soils may be very difficult to control during periods of wet weather, and as such is not recommended.

Imported Structural Fill

GTS recommends that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) or a well-graded crushed rock. GTS recommends that structural fill for dry weather construction meet Washington State Department of Transportation (WSDOT) Standard Specification 9-03.14(2) for "Select Borrow" with the added requirement that 100 percent pass a 4-inch-square sieve. Soil containing more than about 5 percent fines (that portion passing the U.S. No. 200 sieve) cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum.

Accordingly, GTS recommends that imported structural fill for wet weather construction meet WSDOT Standard Specification 9-03.14(1) for "Gravel Borrow" with the added requirement that no more than 5 percent pass the U.S. No. 200 sieve. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even "clean" imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with fill soils at a more suitable range of moisture contents.

Backfill and Compaction

Structural fill should be placed in horizontal lifts approximately 8 to 10 inches in loose thickness and be thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. The top of the compacted structural fill should extend outside all foundations and other structural improvements a minimum distance equal to the thickness of the fill. GTS recommends that compaction be tested periodically throughout the fill placement.

Wet Weather Earthwork

Earthwork taking place during the wet weather months or during extended periods of heavy precipitation can be difficult to perform when working with fine-grained soils such as glacial till. If construction is carried out during wet weather, GTS recommends that structural fill consist of imported, clean, well-graded sand or sand and gravel as described in the *Imported Structural Fill* section of this report. If earthwork is to be performed in wet weather or under wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped of topsoil and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel 'working mats' over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades.

Seismic Design Considerations

The Pacific Northwest is seismically active, and the site could be subject to shaking from a moderate to major earthquake. Consequently, moderate levels of shaking should be accounted for during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

For structures designed using the seismic design provisions of the 2015 International Building Code, the native soil that underlie the site within the upper 100 feet are classified as Site Class D, according to 2010 ASCE -7 Standard – Table 20.3-1, Site Class Definitions. The corresponding values for calculating a design response spectrum for the assumed soil profile type are considered appropriate for the site.

Please reference the following values for seismic structural design purposes:

Conterminous 48 States – 2015 International Building Code
Zip Code 98012
Central Latitude = 47.879722, Central Longitude = -122.219740

<u>Short Period (0.2 sec) Spectral Acceleration</u>

Maximum Considered Earthquake (MCE) Value of $S_s = 1.407$ (g)
Site Response Coefficient, $F_a = 1.000$ (Site Class D)
Adjusted spectral response acceleration for Site Class D, $S_{MS} = S_s \times F_a = 1.407$ (g)
Design spectral response acceleration for Site Class D, $S_{DS} = 2/3 \times SM_s = 0.938$ (g)

One Second Period (1 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of $S_1 = 0.547$ (g)
Site Response Coefficient, $F_v = 1.500$ (Site Class D)
Adjusted spectral response acceleration for Site Class D, $S_{M1} = S_1 \times F_v = 0.820$ (g)
Design spectral response acceleration for Site Class D, $S_{D1} = 2/3 \times SM_1 = 0.547$(g)

Foundation Support

Foundation support for the proposed improvements may be provided by continuous and individual spread footings founded directly on firm and unyielding, native, weathered or unweathered glacial till soils, or on compacted structural fill placed over these competent, native soils. GTS recommends that qualified geotechnical personnel confirm that suitable bearing conditions have been reached prior to placement of structural fill or foundation formwork.

To provide proper support, GTS recommends that existing topsoil and fill (if present) be removed from beneath the building foundation areas down to the native soils. Dense, unweathered soils are unlikely to require much preparation. Please note that the weathered till that was observed in our explorations contained varying amounts of organics. If foundations are to be supported on the near-surface weathered till, the foundation subgrades should be free of organics and then compacted to a firm and unyielding condition with a smooth-drum roller, vibratory hoe-pack, or other appropriate piece of construction equipment. Once suitable bearing conditions have been confirmed, then foundations can bear directly on native soils or on properly compacted structural fill.

Continuous and isolated spread footings should be founded 18 inches, minimum, below the lowest adjacent final grade for freeze/thaw protection. The footings should be sized in accordance with the structural engineer's prescribed design criteria and seismic considerations.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous and individual spread footings founded directly on firm and unyielding native soil, or on compacted structural fill placed atop these soils, may be proportioned using a net allowable soil bearing pressure of 2,500 pounds per square foot (psf) for compacted structural fill over weathered glacial till. The weathered glacial till was generally encountered approximately 1 to 1.5 feet BGS in the explorations. If the footings bear directly on unweathered glacial till encountered approximately 2 to 3.5 feet BGS in the explorations, a net allowable soil bearing pressure of 3,000 psf can be used.

The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level resulting from the total of all dead plus live loads, exclusive of the weight of the footing or any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. If construction is accomplished as recommended and at the maximum allowable soil bearing pressure, GTS estimates the total settlement of building foundations to be less than one inch, and differential settlement between two adjacent load-bearing components supported on competent soil to be less than about one half the total settlement. The soil response to applied stresses caused by building and other loads is expected to be predominantly elastic in nature, with most of the settlement occurring during construction as loads are applied.

Floor Support

Conventional slab-on-grade floor construction appears feasible for the planned site improvements. Floor slabs may be supported on properly placed and compacted structural fill placed over properly prepared native soil. Prior to placement of any new structural fill for slab subgrade preparation, the native soil subgrade should be proof-rolled as recommended in the *Site Preparation and Earthwork* section of this report and approved for continued construction.

GTS recommends that interior concrete slab-on-grade floors be underlain with a minimum 6 inch layer of clean, compacted, free-draining gravel with less than 3 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. If desired, additional protection against water intrusion below the slab could include a slab underdrain system to collect and direct water towards an approved discharge point.

To help reduce the potential for water vapor migration through floor slabs, a continuous 10-mil minimum thick polyethylene sheet with tape-sealed joints should be installed below the slab to serve as an impermeable vapor barrier. The vapor barrier should be installed and sealed in accordance with the manufacturer's instructions.

The American Concrete Institute (ACI) guidelines suggest that the slab may either be poured directly on the vapor barrier or on a granular curing layer placed over the vapor barrier depending on construction conditions. GTS recommends that the architect or structural engineer specify if a curing layer should be used. If moisture control within the building is critical, GTS recommends that the vapor barrier be observed by a representative of GTS to confirm that openings have been properly sealed. Use of a curing layer is recommended during drier months of the year and/or when limited rain is expected during the slab-on-grade construction process. If the slab is constructed during the wet season and exposed to rain after construction, GTS does not recommend the use of curing layer as excessive moisture emissions through the slab may occur.

Exterior concrete slabs-on-grade, such as sidewalks, may be supported directly on undisturbed native soil or on properly placed and compacted structural fill; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material.

Resistance to Lateral Loads

The lateral earth pressures that develop against retaining walls will depend on the method of backfill placement, degree of compaction, slope of backfill, type of backfill material, provisions for drainage, magnitude and location of any adjacent surcharge loads, and the degree to which the wall can yield laterally during or after placement of backfill. If the wall is allowed to rotate or yield so the top of the wall moves an amount equal to or greater than about 0.001 to 0.002 times its height (a yielding wall), the soil pressure exerted comprises the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted comprises the at-rest soil pressure. Wall restraint may develop if a rigid structural network is constructed prior to backfilling or if the wall is inherently stiff.

GTS recommends that yielding walls under drained conditions be designed for an equivalent fluid density of 35 pounds per cubic foot (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 55 pcf for structural fill in at-rest conditions. Design of walls should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the wall. To account for uniform surcharge pressures, a uniformly distributed lateral pressure should be added to the lateral soil pressures. This uniform pressure should be equal to 35 percent of the vertical surcharge pressure for yielding walls and 50 percent for nonyielding walls. GTS also recommends that a seismic surcharge pressure of 12H be included where H is the wall height in feet. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the wall.

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations is equivalent to a fluid with a density of 300 pcf. The recommended value includes a safety factor of 1.5. In order to calculate this passive resistance, GTS presumes that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth, and drained conditions will prevent the buildup of hydrostatic pressure in the compacted fill. In design computations, the upper 12 inches of passive resistance should be omitted if the soil is not covered by floor slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should be disregarded. Retaining walls should include a drain system constructed in general accordance with the recommendations presented in the *Foundation and Site Drainage* section of this report.

An allowable coefficient of base friction of 0.35 for structural fill, applied to vertical dead loads only, may be used between the base of the footing and the underlying imported granular structural fill and/or suitable native deposits. If passive and frictional resistance are applied together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. A safety factor of about 1.5 is included in the base friction design value. GTS does not recommend increasing the coefficient of friction to resist seismic or wind loads.

Foundation and Site Drainage

To reduce the potential for groundwater and surface water to seep into interior spaces, GTS recommends that an exterior footing drain system be constructed around the perimeter of new building foundations as shown in the *Typical Footing Drain Section* (Figure 3). The drain should consist of a minimum 4-inch diameter perforated pipe, surrounded by a minimum 12 inches of filtering media. The pipe should be sloped to carry discharge to an approved collection system. The filtering media may consist of open-graded drain rock wrapped by a nonwoven geotextile fabric such as Mirafi 140N (or equivalent) or with a graded sand and gravel filter. For foundations supporting retaining walls, drainage backfill should be carried up the back of the wall and be at least 12-inches wide. The drainage backfill should extend from the foundation drain to within approximately 1 foot of the finished grade and consist of open-graded drain rock containing less than 3 percent by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drain pipe should be placed slightly below the elevation of the footing or 12 inches below the adjacent floor slab grade, whichever is deeper, so that water will not seep through walls or floor slabs. The drain system should include cleanouts to allow for periodic maintenance and inspection.

As the subject property is underlain by glacial till, water that collects under the slab may not be able to drain. Additional protection against water intrusion below the slab could include a slab underdrain system to collect and direct water, if present, toward an approved discharge point. Passive drainage and adequate site planning could also help mitigate the potential for water to collect under the slab.

Positive surface gradients should be provided adjacent to the proposed building to direct surface water away from the building and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains, but should be separately discharged directly to the stormwater collection system or similar municipality-approved outlet. Pavement and sidewalk areas, if present, should be sloped and drainage gradients should be maintained to carry surface water away from the building towards an approved stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

GTS understands that a swimming pool will be incorporated as part of the proposed development. Water could potentially collect below the swimming pool, as these elements would be placed below existing site grades and in soils that are considered low permeability. Where appropriate, GTS recommends that the swimming pool have adequate water stops and waterproofing to resist the intrusion of water.

Additional measures such as gravity drains or sumps may also need to be incorporated into the drainage design for these elements. Although gravity drains are preferred, these drains may not be feasible due to the planned depth of the proposed swimming pool. Multiple sumps would likely be needed if water is present behind pool walls. As glacial till will not drain, water that makes its way behind the pool will remain there unless it is removed. The pool designer's recommendations should be followed if such a situation arises.

GTS recommends that additional information regarding pool size and depth be provided for our review in order to determine risk of damage due to hydrostatic forces acting on the pool. GTS is available to work with the project team to evaluate what mitigations may be required to reduce these risks.

Utilities

Utility trenches must be properly backfilled and compacted to reduce cracking or localized loss of foundation, slab, or pavement support. Excavations for new shallow underground utilities will expose medium-dense to very dense to dense weathered or unweathered glacial till.

Trench backfill in improved areas (beneath structures, pavements, sidewalks, etc.) should consist of structural fill as defined in the *Imported Structural Fill* section in this report. Outside of improved areas, trench backfill may consist of reused native deposits or clean fill provided the backfill can be compacted to the project specifications. Trench backfill should be placed and compacted in general accordance with the recommendations presented for structural fill and compaction.

The native glacial till soil is generally dense to very dense and is not expected to drain efficiently. Utility trench backfill is likely to be more permeable than the native soils. As such, up-gradient utility trenches have the potential to route subsurface sources of water towards new construction. GTS recommends that low-permeability trench dams and water stops be considered should utility trenches be installed up-gradient of any planned structures. Prior to implementing these mitigations, a review of the trench depth and gradients should be performed to determine if these mitigations should be included in the final design.

Surcharge loads on trench support systems due to construction equipment, stockpiled material, and vehicle traffic should be included in the design of any anticipated shoring system. The contractor should implement measures to prevent surface water runoff from entering trenches and excavations. In addition, vibration as a result of construction activities and traffic may cause caving of the trench walls.

The contractor is responsible for trench configurations. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored by the contractor during excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring. If groundwater or groundwater seepage is present, and the trench is not properly dewatered, the soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider than under dewatered conditions.

Temporary and Permanent Slopes

The contractor is responsible for construction slope configurations and maintenance of safe working conditions, including temporary excavation stability, as this party is able to monitor the construction activities and has direct control over the means and methods of construction. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored during and after excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring.

Temporary excavations in excess of 4 feet in depth should be shored or sloped in accordance with Safety Standards for Construction Work, WAC 296-155-66403.

Temporary unsupported excavations in the native soils encountered at the project site are classified as a Type B soil according to WAC 296-155-66403 and may be sloped as steep as 1H: 1V (Horizontal: Vertical). All soils encountered are classified as Type C soil in the presence of groundwater seepage. Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop. Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather.

If permanent cut or fill slopes are used for this project, GTS recommends that these slopes be designed for inclinations of 2H: 1V or flatter. If used for this project, slopes for detention ponds should be designed for inclinations of 3H: 1V or flatter. All permanent cut slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction. Permanent slopes requiring immediate protection from the effects of erosion should be covered with either mulch or erosion control netting/blankets. Areas requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

Pavement Subgrade Preparation

Selection of a pavement section is typically a choice relative to higher initial cost and lower long term maintenance fees or lower initial cost and more frequent maintenance fees. For this reason, GTS recommends that the owner participate in the selection of proposed pavement improvements planned for the site. Site grading plans should include provisions for sloping of the subgrade soils in proposed pavement areas, so that passive drainage of the pavement section(s) can proceed uninterrupted during the life of the project. The proposed pavement areas should be prepared as indicated in the *Site Preparation and Earthwork* section of this report.

Flexible Pavement Sections

GTS anticipates that asphalt pavement will be used for new passenger vehicle access drives and parking areas. We recommend that a standard, or 'light duty,' pavement section consist of 2.5 inches of ½-inch HMA asphalt above 8 inches of crushed surfacing base course (CSBC) meeting criteria set forth in the Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9[3].

Areas that will be accessed by more heavily loaded vehicles, semi and garbage trucks, etc., such as the main drive paths, will require a thicker asphalt section and should be designed using a paving section consisting 4 inches of Class ½-inch HMA asphalt surfacing above 8 inches of CSBC meeting criteria set forth in the Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9[3].

GTS is available to further consult, review and/or modify our pavement section recommendations based on further discussion and/or analysis with the project team/owner. The above pavement sections are initial recommendations and may be accepted and/or modified by the site civil engineer based on the actual finished site grading elevations and/or the owner's preferences.

Concrete Sidewalks and Hardscapes

We anticipate that Portland cement concrete (PCC) will be used for walkways and hardscapes. We recommend a concrete sidewalk and hardscape section consisting of 4 inches of PCC surfacing above a minimum of 4 inches of CSTC. It is assumed that sidewalks and hardscape sections will be placed over a firm and unyielding subgrade as previously addressed herein.

Stormwater Infiltration Potential

Based upon an evaluation of the data collected during this investigation, it is our opinion that subsurface conditions are generally unsuitable for the onsite infiltration of stormwater. GTS observed native soils on-site consisting of very dense, glacially compacted soils. Glacially consolidated till soils as found on site within two feet of the surface are considered a restrictive layer by the 2012 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (amended December 2014). We recommend that the design team consider connecting the new building and site stormwater facilities to the existing municipal storm system to properly convey collected stormwater to a suitable disposal area.

Stormwater mitigation utilizing Low Impact Development (LID) methods may be considered on-site. GTS is available to discuss the potential for partial infiltration and/or LID facilities.

Stormwater Pollutant Treatment

Prior to off-site discharge, stormwater may require some form of pollutant pretreatment with an amended soil. The reuse of on-site topsoil is often the most sustainable and cost-effective method for pollutant treatment purposes. Cation exchange capacities and organic contents of site topsoil and shallow subsurface soils were tested to determine their pollutant treatment suitability.

Cation Exchange Capacity and Organic Content Testing

Two composite samples were collected during our subsurface explorations for pollutant treatment purposes. Cation exchange capacity (CEC) and organic content (LOI) tests were performed by Northwest Agricultural Consultants. Laboratory test results are presented in Table 1.

TABLE 1
Cation Exchange Capacity, Organic Content, and pH Laboratory Test Results

Test Pit ID	Sample Depth (ft)	Geologic Unit	Cation Exchange Capacity (meq/100 grams)	Organic Content (%)	pH
TP-1	1.0	Topsoil	9.0	3.54	5.2
TP-2	1.5	Weathered Till	4.2	1.59	5.5
TP-3	0.5	Topsoil	13.3	6.15	5.2
TP-5	3.0	Weathered Till	7.9	2.90	5.4

Based on the results listed in Table 1, the fine-grained, near-surface topsoil and weathered till appear to be suitable for on-site pollutant treatment purposes based on the 2012 *Stormwater Management Manual for Western Washington* (amended December 2014). The Manual also states that cation exchange capacity must be greater than 5.0 meq/100 grams for treatment purposes. Low rates of infiltration can be expected if the on-site soils are amended due to their high silt contents.

Geotechnical Consultation and Construction Monitoring

GTS recommends that we be involved in the project review process. The purpose of the review is to verify that the recommendations presented in this report have been properly interpreted and incorporated in the design and specifications.

GTS recommends that geotechnical construction monitoring services be provided. These services should include observation by GTS personnel during structural fill placement, compaction activities and subgrade preparation operations to confirm that design subgrade conditions are obtained beneath the proposed building. We also recommend that periodic field density testing be performed to verify that the appropriate degree of compaction is obtained. The purpose of these services is to observe compliance with the design concepts, specifications, and recommendations contained within the report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services, Inc. would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GTS is also available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete, reinforced masonry, and structural steel. These services are supported by our fully accredited materials testing laboratory.

USE OF THIS REPORT

GeoTest Services, Inc. has prepared this report for the exclusive use of Coast Construction Group, and its design consultants for specific application to the design of the proposed 7C's Swim Facility to be constructed at North Creek Drive and Dumas Road in Mill Creek, Washington. Use of this report by others or for another project is at the user's sole risk. Within the limitations of scope, schedule, and budget, our services have been conducted in accordance with generally accepted practices of the geotechnical engineering profession; no other warranty, either expressed or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that these conditions are representative of subsurface conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth of our explorations at the time of our exploration program, a brief geological reconnaissance of the area, and review of published geological information for the site. GTS assumes that the explorations are representative of the subsurface conditions throughout the site during the preparation of our recommendations. If variations in subsurface conditions are encountered during construction, GTS should be notified to review the recommendations of this report, and revise if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, GTS recommends that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. is not responsible for job site safety on this project, and this responsibility is specifically disclaimed.

GTS appreciates the opportunity to provide geotechnical services on this project and looks forward to assisting you during the construction phase. If you have any questions regarding the information contained in this report, or if we may be of further service, please contact the undersigned.

Respectfully Submitted,
GeoTest Services, Inc.

Erin N Belsvik

GERRY D. BAUTISTA
STATE OF WASHINGTON
51531
REGISTERED
PROFESSIONAL ENGINEER

12/13/2018

Erin N. Belsvik, E.I.T.
Project Engineer

Gerry D. Bautista, Jr., P.E.
Project Geotechnical Engineer

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Typical Footing and Wall Drain Section
	Figure 4	Soil Classification System and Key
	Figures 5-8	Test Pit Logs
	Figure 9-10	Grain Size Analysis
	(1 page)	Cation Exchange Capacity, pH and Organic Content Results
	(3 pages)	GeoTest – Report Limitations and Guidelines for its Use

References:

Minard, J.P., 1985, *Geologic map of the Everett 7.5-minute quadrangle, Snohomish County, Washington.* U.S. Geological Survey Miscellaneous Field Studies Map MF-1748, 1 sheet, scale 1:24,000.

Mill Creek (Washington) Municipal Code (Section 18.06), 2018.

Snohomish County Planning and Development Services Map Portal, Snohomish County (Washington).

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington, 2012 (amended December 2014)*.

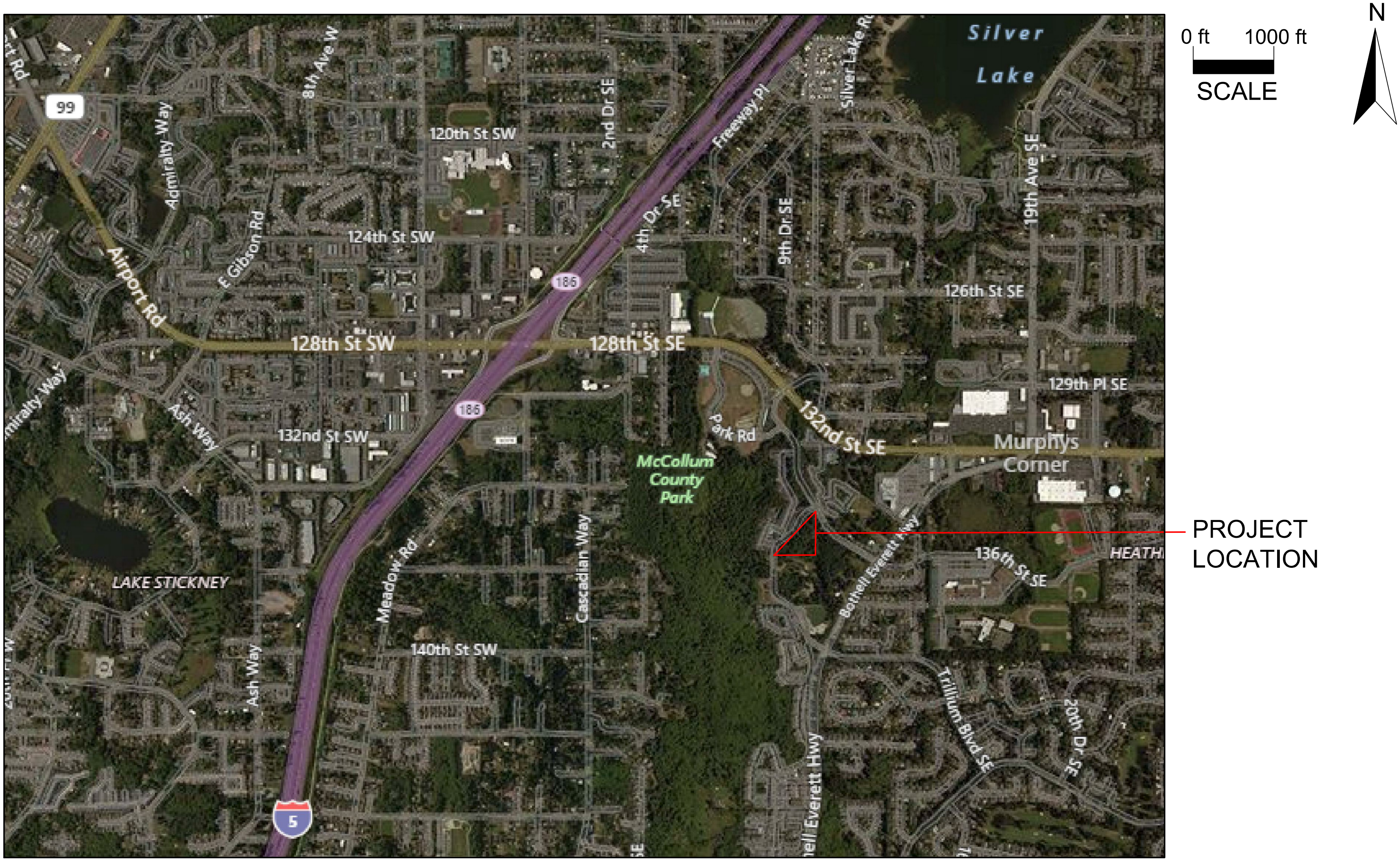
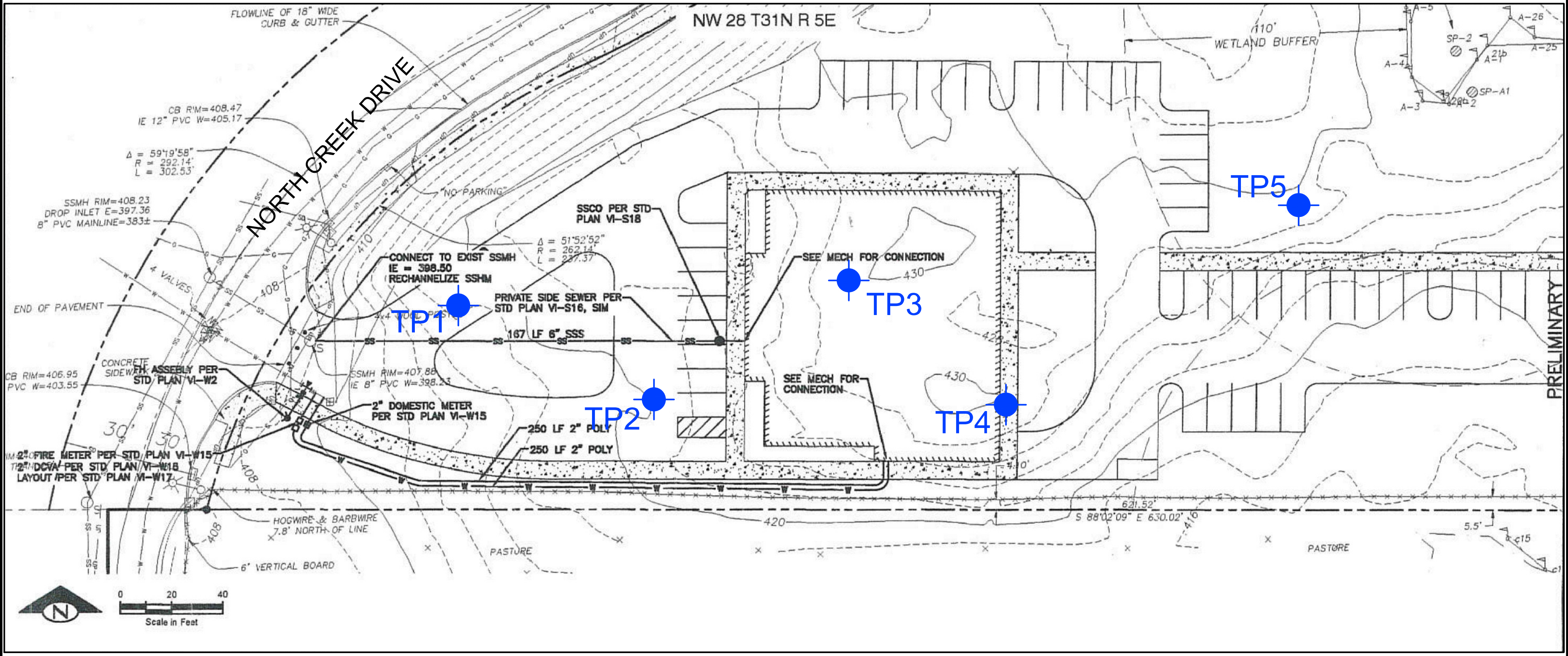


IMAGE REFERENCED FROM BING MAPS

FIGURE NO. GTS-1	GeoTest Services Inc.	7C's SWIM SCHOOL SWC of NORTH CREEK DRIVE & DUMAS ROAD MILL CREEK, WASHINGTON 98223	VICINITY MAP
GTS JOB NO: 18-0787			

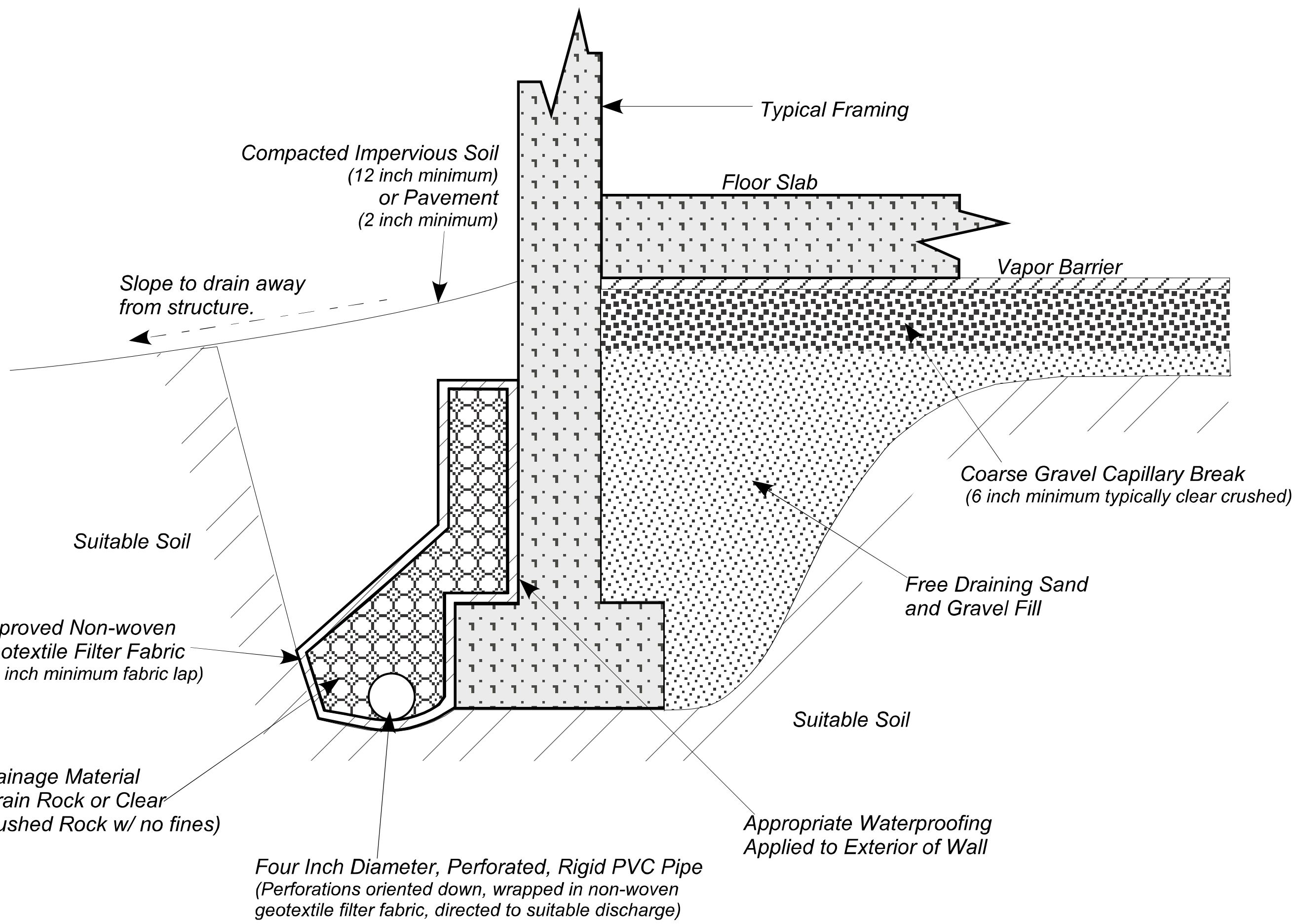


TP# - APPROXIMATE TEST PIT LOCATION

SITE PLAN REFERENCED FROM TERRAVISTA NW CONSULTING ENGINEERS
SCALE AND ORIENTATION AS SHOWN

FIGURE NO. GTS-2	GeoTest Services Inc.	7C's SWIM SCHOOL SWC of NORTH CREEK DRIVE & DUMAS ROAD MILL CREEK, WASHINGTON 98223	SITE AND EXPLORATION PLAN
GTS JOB NO: 18-0787			

SHALLOW FOOTINGS WITH INTERIOR SLAB-ON-GRADE



Notes:
Footings Should be properly buried for frost protection in accordance with International Building Code or local building codes (Typically 18 inches below exterior finished grades)

The footing drain will need to be modified from this typical drawing to fit the dimensions of the planned monolithic footing and slab configuration

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fax: (360) 733-7418

Date: 11-30-18	By: EB	Scale: None	Project 18-0787

TYPICAL FOOTING & WALL DRAIN SECTION
7C's SWIM SCHOOL
SWC OF NORTH CREEK DRIVE & DUMAS ROAD
MILL CREEK, WASHINGTON 98223

Figure 3

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[(1)(2)]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

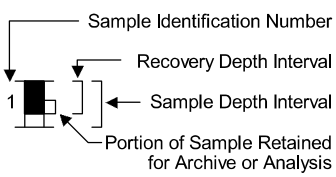
Notes: 1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.

2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Other - See text if applicable

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

GEOTEST

7C's Swim School
Mill Creek, Washington

Soil Classification System and Key

Figure 4

TP-1

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 418 Excavated By: Coast Construction Group/Erin Belsvik	
0					WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
1	S1	d			GW	Loose to medium dense, brown, moist, well-graded GRAVEL with SAND and organics (Possible Weathered Till).	
2	S2	d	W = 7 GS		GW		
3					GP-GM	Rootlets extend to 2.0 feet Very dense, grey, damp to moist, poorly graded GRAVEL with sand and silt (Glacial Till).	
5	S3	d					
7.5	S4	d	W = 7 GS				

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

TP-2

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 420 Excavated By: Coast Construction Group/Erin Belsvik	
0					WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
1.25					SP	Loose to medium dense, brown, moist, well-graded SAND, with gravel and organics (Possible Weathered Till).	
1.75	S5	d					
2.5					SP-SM	Rootlets extend to 2.5 feet Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).	
3.25	S6	d	W = 3 GS				
6.25	S7	d					
8.25	S8	d	W = 7 GS				

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST

7C's Swim School Mill Creek, Washington	Log of Test Pits	Figure 5 (1 of 3)

TP-3

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 430

Excavated By: Coast Construction Group/Erin Belsvik

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Description	Groundwater
0	S9	d		WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
				GW	Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).	
2	S10	d		SP-SM	Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).	
6	S11	d	W = 6 GS			

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.0 ft.

TP-4

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 430

Excavated By: Coast Construction Group/Erin Belsvik

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Description	Groundwater
0				WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
				GW	Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).	
2	S12		W = 8 GS			
3				SP-SM	Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).	
4	S13		W = 8 GS			
7	S14					
8	S15					

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST

7C's Swim School
Mill Creek, Washington

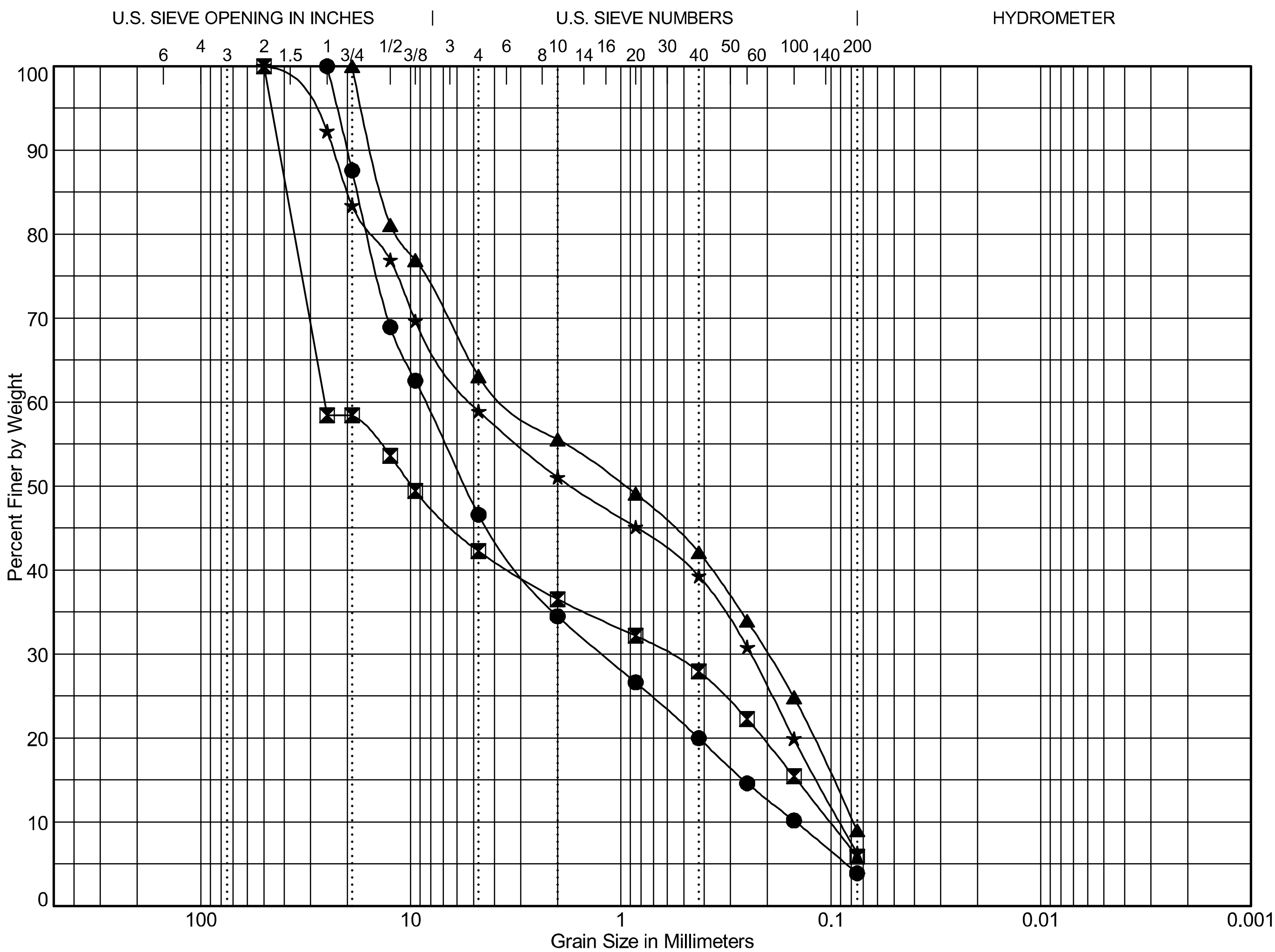
Log of Test Pits

TP-5

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 428 Excavated By: Coast Construction Group/Erin Belsvik	
0					WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
2					GW	Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).	
	S16	d					
4	S17	d			SP-SM	Very dense, grey, dry, poorly graded SAND with gravel and silt (Glacial Till).	
6	S18	d	W = 7 GS				
8							
	S19	d					
10							
12							

Test Pit Completed 11/15/18
Total Depth of Test Pit = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	TP-1	2.5	WELL-GRADED GRAVEL with SAND (GW)				1.20	57.78
⧗	TP-1	7.5	POORLY GRADED GRAVEL with SAND and SILT (GP-GM)				0.14	254.37
▲	TP-2	3.0	POORLY GRADED SAND with GRAVEL and SILT (SP-SM)				0.15	42.50
★	TP-2	8.0	POORLY GRADED SAND with GRAVEL and SILT (SP-SM)				0.13	56.28

Point		Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-1	2.5	25	8.499	5.506	1.226	0.147	12.4	41.0	12.1	14.5	16.1	3.9
⧗	TP-1	7.5	50	25.667	9.856	0.596	0.101	41.6	16.2	5.7	8.6	22.0	5.9
▲	TP-2	3.0	19	3.329	0.958	0.2	0.078	0.0	36.9	7.5	13.4	33.1	9.0
★	TP-2	8.0	50	5.09	1.718	0.24	0.09	16.6	24.5	7.9	11.7	33.0	6.3

$C_c = D_{30}^2/(D_{60} * D_{10})$

$C_u = D_{60}/D_{10}$

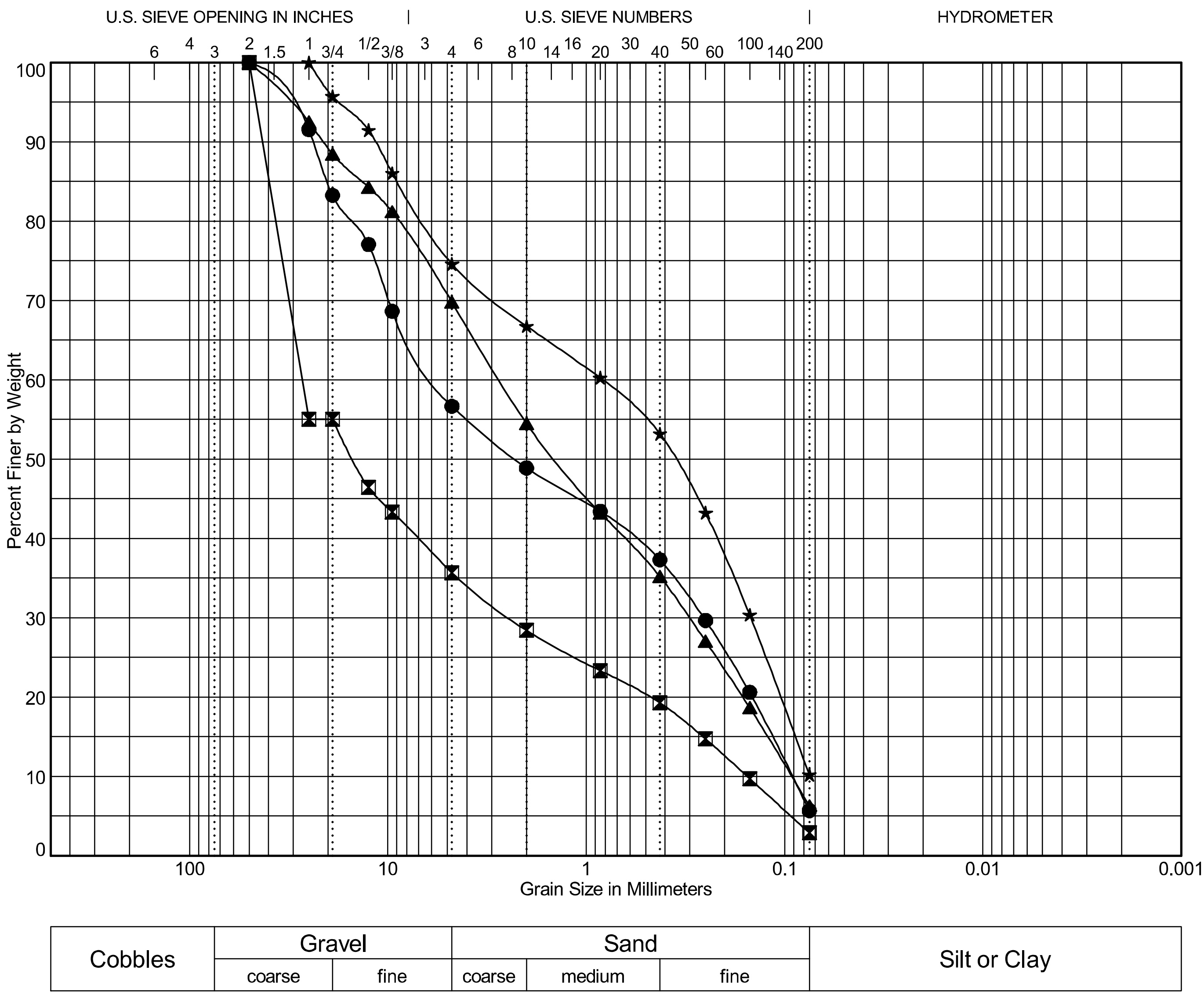
To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

7C's Swim School
Mill Creek, Washington

Grain Size Test Data

Figure 8



Point	Depth	Classification	LL	PL	PI	C_c	C_u
● TP-3	6.5	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.12	62.86
⧗ TP-4	2.0	WELL-GRADED GRAVEL with SAND (GW)				1.40	175.29
▲ TP-4	4.0	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.36	29.61
★ TP-5	6.0	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.36	11.12

Point	Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
● TP-3	6.5	50	5.759	2.263	0.256	0.092	16.7	26.6	7.8	11.6	31.6	5.7
⧗ TP-4	2.0	50	27.001	14.883	2.415	0.154	45.0	19.3	7.3	9.1	16.4	2.9
▲ TP-4	4.0	50	2.731	1.422	0.303	0.092	11.5	18.7	15.3	19.3	28.9	6.3
★ TP-5	6.0	25	0.828	0.358	0.148		4.2	21.1	7.8	13.6	43.0	10.2

$C_c = D_{30}^2/(D_{60} * D_{10})$
$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

7C's Swim School
Mill Creek, Washington

Grain Size Test Data

Figure 9

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited
NAPT

GeoTest Services Inc.
741 Marine Drive
Bellingham, WA 98225

Report: 46758-1
Date: November 19, 2018
Project No: 18-0787
Project Name: 7C's Swim School

Sample ID	**pH**	**Organic Matter**	**Cation Exchange Capacity**
TP-1 @ 1.0'	5.2	3.54%	9.0 meq/100g
TP-2 @ 1.5'	5.5	1.59%	4.2 meq/100g
TP-3 @ 0.5'	5.2	6.15%	13.3 meq/100g
TP-5 @ 3.0'	5.4	2.90%	7.9 meq/100g
Method	**SM 4500-H^+ B**	**ASTM D2974**	**EPA 9081**

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE[1]

Subsurface issues may cause construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help:

Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

At GeoTest our geotechnical engineers and geologists structure their services to meet specific needs of our clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of an owner, a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineer who prepared it. And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report is Based on a Unique Set of Project-Specific Factors

GeoTest's geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the clients goals, objectives, and risk management preferences; the general nature of the structure involved its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless GeoTest, who conducted the study specifically states otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed, for example, from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed construction,
- alterations in drainage designs; or
- composition of the design team; the passage of time; man-made alterations and construction whether on or adjacent to the site; or by natural alterations and events, such as floods, earthquakes or groundwater fluctuations; or project ownership.

Always inform GeoTest's geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. Do not rely on the findings and conclusions of this report, whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact GeoTest before applying the report to determine if it is still relevant. A minor amount of additional testing or analysis will help determine if the report remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

Our site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoTest's engineers and geologists review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining GeoTest who developed this report to provide construction observation is the most effective method of managing the risks associated with anticipated or unanticipated conditions.

A Report's Recommendations are *Not* Final

Do not over-rely on the construction recommendations included in this report. Those recommendations are not final, because geotechnical engineers or geologists develop them principally from judgment and opinion. GeoTest's geotechnical engineers or geologists can finalize their recommendations only by observing actual subsurface conditions revealed during construction. GeoTest cannot assume responsibility or liability for the report's recommendations if our firm does not perform the construction observation.

A Geotechnical Engineering or Geologic Report may be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. Lower that risk by having GeoTest confer with appropriate members of the design team after submitting the report. Also, we suggest retaining GeoTest to review pertinent elements of the design teams plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having GeoTest participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do not Redraw the Exploration Logs

Our geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors of omissions, the logs included in this report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable; but recognizes that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, consider advising the contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the GeoTest and/or to conduct

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. In addition, it is recommended that a contingency for unanticipated conditions be included in your project budget and schedule.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering or geology is far less exact than other engineering disciplines. This lack of understanding can create unrealistic expectations that can lead to disappointments, claims, and disputes. To help reduce risk, GeoTest includes an explanatory limitations section in our reports. Read these provisions closely. Ask questions and we encourage our clients or their representative to contact our office if you are unclear as to how these provisions apply to your project.

Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

The equipment, techniques, and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated containments, etc. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. Do not rely on environmental report prepared for some one else.

Obtain Professional Assistance to Deal with Biological Pollutants

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all such strategies should be devised for the express purpose of prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional biological pollutant prevention consultant. Because just a small amount of water or moisture can lead to the development of severe biological infestations, a number of prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of this study, the geotechnical engineer or geologist in charge of this project is not a biological pollutant prevention consultant; none of the services preformed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

January 8, 2020
Project No. 18-0787

Coast Construction Group
328 N. Olympic Avenue
Arlington, WA 98223

Attn.: Mr. Trevor Gaskin

Re: Addendum to Geotechnical Engineering Report
Proposed 7C's Swim Facility
SW Corner of North Creek Drive and Dumas Road
Mill Creek, WA 98012
(Parcel No. 28053100203700)

Dear Trevor:

GeoTest Services, Inc. (GeoTest) previously prepared a *Geotechnical Engineering Report* for the above referenced project, dated December 13, 2018. Since this report was written, TerraVista NW (Civil Engineer) has begun the preliminary civil design for this project, including stormwater management plans. The City of Mill Creek is requesting clarification on hydrologic soil units for the native soils underlying the subject property. In addition, the Client (Coast Construction) has requested clarification regarding the proposed pavement sections to be used on this project.

HYDROLOGIC SOIL TYPES

Based on the USDA Natural Resources Conservation Service map for Snohomish County Area, Washington, the subject property is mapped as two soil types:

- Alderwood Gravelly Sandy Loam (0 to 8 percent slopes), Soil Group B; and
- Everett Very Gravelly Sandy Loam (0 to 8 percent slopes), Soil Group A.

It should be noted that the information given in the Web Soil Survey is only intended to describe near-surface soils for agricultural purposes.

Per Chapter 7 of the National Engineering Handbook, Group A soils have low runoff potential when thoroughly wet. These soils have typically less than 10 percent clay and more than 90 percent sand and gravel and have gravel or sand textures. Group B soils have moderately low runoff potential when thoroughly wet. These soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures.

The native, very dense, Glacial Till soils that were encountered in our subsurface explorations appear to contain about 90 percent sand based on the USDA textural classification. Thus, these soils would typically be classified as Group A soils. Although these soils appear to have the material properties of a Group A soil, the native soils are still glacially consolidated. Preliminary infiltration rates that are calculated per the procedures given in the *Stormwater Management Manual for Western Washington* assume loose, unconsolidated soil and only take into account the material properties of the soil. Thus, it can reasonably be expected that loose soils would drain more efficiently than dense soils assuming the same sand and silt contents.

As the native soils were very dense and difficult to excavate in the field with a tracked excavator, GeoTest would typically apply a further reduction factor to calculated infiltration rates in these soils. GeoTest anticipates that perched groundwater seepage may be encountered atop very dense, glacially consolidated soils depending on the time of year. Furthermore, unweathered Glacial Till is typically classified as a Restriction Layer per the *Stormwater Manual.* Thus, it is GeoTest's opinion that the native Glacial Till soils encountered on this site are more indicative of a Group D soil based on the observed silt content, the dense to very dense, glacially consolidated nature of the soil, and the presence of wetlands to the north and east of the project area. Thus, the native soils do not appear to be suitable for conventional stormwater infiltration.

The drawings that GeoTest reviewed for this letter indicate that infiltration is not being considered for this project. However, if these plans change, GeoTest must be contacted to confirm the viability of our current recommendations.

PAVEMENT SECTION

GeoTest also understands that the Client is requesting clarification regarding the two recommended pavement sections given in the December 2018 geotechnical report. The Client and Civil Engineer have requested that GeoTest provide an opinion as to the suitability of using one uniform pavement section for the entire development. GeoTest understands that the Client is proposing to use one uniform pavement section consisting of 3 inches of asphalt overlying 8 inches of crushed stabilized base course (CSBC). Based on discussions with the Civil Engineer, GeoTest understands that the drive lanes would only receive sporadic heavy traffic (ex. garbage trucks once a week). It is GeoTest's opinion that this revised pavement section should be acceptable, provided that the Client can accept potentially increased maintenance due to the reduced pavement thickness along the drive lanes. However, it is still GeoTest's opinion that the minimum 8-inch thickness of CSBC be maintained, due to the low permeability of the underlying Glacial Till soils.

GeoTest appreciates the opportunity to provide geotechnical services for this project. Should you have any further questions regarding the information contained within the letter, or if we may be of service in other regards, please contact the undersigned.

Respectfully,
GeoTest Services, Inc.

1/8/2020

01/08/2020

Gerry D. Bautista, Jr., P.E.
Project Geotechnical Engineer

Edwardo Garcia, P.E.
Geotechnical Department Manager

REFERENCES

Gariepy, D., Graul, C., Heye, A., Howie, D., Labib, F., and Song, K. (n.d.), *2019 Stormwater Management Manual for Western Washington* (2019 SMMWW) (pp. 1-1108) (United States, Washington State Department of Ecology).

GeoTest Services, Inc., *Geotechnical Engineering Report, Proposed 7C's Swim Facility, SW Corner of North Creek Drive and Dumas Road, Mill Creek, WA.* Project No. 18-0787, December 13, 2018.

Part 630 National Engineering Handbook, Chapter 1 – Hydrologic Soil Groups. United States Department of Agriculture Natural Resources Conservation Service, May 2007.

Web Soil Survey for Snohomish County Area, Washington. United States Department of Agriculture Natural Resources Conservation Service. Retrieved on December 18, 2019.

Appendix C

Operation and Maintenance

The following maintenance standards are as described in Volume V, Section 4.6.6, Table 5.3 of the SWMMWW.

Table V-4.5.2(3)
Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and /or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.

		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance	Manhole is closed
	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 (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5)

Table V-4.5.2(4) Maintenance Standards - Control Structure/Flow Restrictor			
Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash 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 securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.

		Gate is rusted over 50% of its surface area.	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.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

Table V-4.5.2(5)
Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and 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%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent 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 six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent 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).	Top slab is free of holes and cracks
		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	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.	Basin replaced or repaired to design standards.
		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.	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.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	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	Latter 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 and meets design standards.

Table V-4.5.2(15) Maintenance Standards - Manufactured Media Filters			
Maintenance Component	Defect	Condition When Maintenance Is Needed	Results Expected When Maintenance is Performed
Below Ground Vault	Sediment Accumulation on Media	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.

		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Table V-4.5.2(18)
Maintenance Standards - Catchbasin 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 Normal 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.

Appendix D

Drainage Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	7Cs Site Model
Site Name:	
Site Address:	
City:	
Report Date:	4/14/2020
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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 SITE

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Forest, Steep	3.975
Pervious Total	3.975
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.975

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin B

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
SAT, Lawn, Mod	0.08	
Pervious Total	0.08	
Impervious Land Use	acre	
ROADS STEEP	0.277	
Impervious Total	0.277	
Basin Total	0.357	

Element Flows To:

Surface	Interflow	Groundwater
StormTech B	StormTech B	

Basin C

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Steep	0.12
Pervious Total	0.12
Impervious Land Use	acre
ROADS STEEP	0.162
ROOF TOPS FLAT	0.226
Impervious Total	0.388
Basin Total	0.508

Element Flows To:

Surface	Interflow	Groundwater
StormTech C	StormTech C	StormTech C

Basin A

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Steep	0.175
Pervious Total	0.175
Impervious Land Use	acre
ROADS STEEP	0.065
Impervious Total	0.065
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater
Outfall	Outfall	

Basin E

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Steep	2.87
Pervious Total	2.87
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.87

Element Flows To:

Surface	Interflow	Groundwater
Outfall	Outfall	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech B

Chamber Model: 4500
Dimensions
Max Row Length: 200
Number of Chambers: 12
Number of Endcaps: 2
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.020 ft.
Notch Height: 1.050 ft.
Orifice 1 Diameter: 0.75 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2
Outfall

StormTech Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.010	0.000	0.000	0.000
0.0833	0.010	0.000	0.004	0.000
0.1667	0.010	0.000	0.006	0.000
0.2500	0.010	0.001	0.007	0.000
0.3333	0.010	0.001	0.008	0.000
0.4167	0.010	0.001	0.009	0.000
0.5000	0.010	0.002	0.010	0.000
0.5833	0.010	0.002	0.011	0.000
0.6667	0.010	0.002	0.012	0.000
0.7500	0.010	0.003	0.013	0.000
0.8333	0.010	0.003	0.013	0.000
0.9167	0.010	0.004	0.014	0.000
1.0000	0.010	0.005	0.015	0.000
1.0833	0.010	0.006	0.015	0.000
1.1667	0.010	0.006	0.016	0.000
1.2500	0.010	0.007	0.017	0.000
1.3333	0.010	0.008	0.017	0.000
1.4167	0.010	0.009	0.018	0.000
1.5000	0.010	0.009	0.018	0.000
1.5833	0.010	0.010	0.019	0.000
1.6667	0.010	0.011	0.019	0.000
1.7500	0.010	0.011	0.020	0.000
1.8333	0.010	0.012	0.020	0.000
1.9167	0.010	0.013	0.021	0.000
2.0000	0.010	0.014	0.021	0.000
2.0833	0.010	0.014	0.022	0.000
2.1667	0.010	0.015	0.022	0.000
2.2500	0.010	0.016	0.022	0.000
2.3333	0.010	0.017	0.023	0.000
2.4167	0.010	0.017	0.023	0.000
2.5000	0.010	0.018	0.024	0.000
2.5833	0.010	0.019	0.024	0.000
2.6667	0.010	0.019	0.024	0.000

2.7500	0.010	0.020	0.025	0.000
2.8333	0.010	0.021	0.025	0.000
2.9167	0.010	0.021	0.026	0.000
3.0000	0.010	0.022	0.026	0.000
3.0833	0.010	0.023	0.026	0.000
3.1667	0.010	0.023	0.027	0.000
3.2500	0.010	0.024	0.027	0.000
3.3333	0.010	0.025	0.027	0.000
3.4167	0.010	0.025	0.028	0.000
3.5000	0.010	0.026	0.028	0.000
3.5833	0.010	0.027	0.028	0.000
3.6667	0.010	0.027	0.029	0.000
3.7500	0.010	0.028	0.029	0.000
3.8333	0.010	0.029	0.029	0.000
3.9167	0.010	0.029	0.030	0.000
4.0000	0.010	0.030	0.031	0.000
4.0833	0.010	0.031	0.034	0.000
4.1667	0.010	0.031	0.037	0.000
4.2500	0.010	0.032	0.041	0.000
4.3333	0.010	0.032	0.046	0.000
4.4167	0.010	0.033	0.051	0.000
4.5000	0.010	0.034	0.056	0.000
4.5833	0.010	0.034	0.062	0.000
4.6667	0.010	0.035	0.067	0.000
4.7500	0.010	0.035	0.073	0.000
4.8333	0.010	0.036	0.079	0.000
4.9167	0.010	0.036	0.084	0.000
5.0000	0.010	0.037	0.091	0.000
5.0833	0.010	0.037	0.346	0.000
5.1667	0.010	0.038	0.795	0.000
5.2500	0.010	0.038	1.309	0.000
5.3333	0.010	0.039	1.776	0.000
5.4167	0.010	0.039	2.105	0.000
5.5000	0.010	0.039	2.296	0.000
5.5833	0.010	0.040	2.499	0.000
5.6667	0.010	0.040	2.665	0.000
5.7500	0.010	0.040	2.821	0.000
5.8333	0.010	0.041	2.969	0.000
5.9167	0.010	0.041	3.110	0.000
6.0000	0.010	0.041	3.244	0.000
6.0833	0.010	0.042	3.373	0.000
6.1667	0.010	0.042	3.497	0.000
6.2500	0.010	0.042	3.616	0.000
6.3333	0.010	0.043	3.732	0.000
6.4167	0.010	0.043	3.844	0.000
6.5000	0.010	0.043	3.953	0.000
6.5833	0.010	0.044	4.059	0.000
6.6667	0.010	0.044	4.162	0.000
6.7500	0.010	0.044	4.263	0.000

StormTech C

Chamber Model:	4500	
Dimensions		
Max Row Length:	200	
Number of Chambers:	25	
Number of Endcaps:	2	
Top Stone Depth:	12	
Bottom Stone Depth:	9	
Discharge Structure		
Riser Height:	5 ft.	
Riser Diameter:	12 in.	
Notch Type:	Rectangular	
Notch Width:	0.020 ft.	
Notch Height:	1.050 ft.	
Orifice 1 Diameter:	0.75 in.	Elevation:0 ft.
Element Flows To:		

Outlet 1 Outlet 2
Outfall

StormTech Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.021	0.000	0.000	0.000
0.0833	0.021	0.000	0.004	0.000
0.1667	0.021	0.001	0.006	0.000
0.2500	0.021	0.002	0.007	0.000
0.3333	0.021	0.002	0.008	0.000
0.4167	0.021	0.003	0.009	0.000
0.5000	0.021	0.004	0.010	0.000
0.5833	0.021	0.004	0.011	0.000
0.6667	0.021	0.005	0.012	0.000
0.7500	0.021	0.006	0.013	0.000
0.8333	0.021	0.007	0.013	0.000
0.9167	0.021	0.009	0.014	0.000
1.0000	0.021	0.011	0.015	0.000
1.0833	0.021	0.012	0.015	0.000
1.1667	0.021	0.014	0.016	0.000
1.2500	0.021	0.015	0.017	0.000
1.3333	0.021	0.017	0.017	0.000
1.4167	0.021	0.018	0.018	0.000
1.5000	0.021	0.020	0.018	0.000
1.5833	0.021	0.021	0.019	0.000
1.6667	0.021	0.023	0.019	0.000
1.7500	0.021	0.024	0.020	0.000
1.8333	0.021	0.026	0.020	0.000
1.9167	0.021	0.027	0.021	0.000
2.0000	0.021	0.029	0.021	0.000
2.0833	0.021	0.031	0.022	0.000
2.1667	0.021	0.032	0.022	0.000
2.2500	0.021	0.033	0.022	0.000
2.3333	0.021	0.035	0.023	0.000
2.4167	0.021	0.036	0.023	0.000
2.5000	0.021	0.038	0.024	0.000
2.5833	0.021	0.039	0.024	0.000
2.6667	0.021	0.041	0.024	0.000
2.7500	0.021	0.042	0.025	0.000
2.8333	0.021	0.044	0.025	0.000

2.9167	0.021	0.045	0.026	0.000
3.0000	0.021	0.047	0.026	0.000
3.0833	0.021	0.048	0.026	0.000
3.1667	0.021	0.049	0.027	0.000
3.2500	0.021	0.051	0.027	0.000
3.3333	0.021	0.052	0.027	0.000
3.4167	0.021	0.054	0.028	0.000
3.5000	0.021	0.055	0.028	0.000
3.5833	0.021	0.056	0.028	0.000
3.6667	0.021	0.058	0.029	0.000
3.7500	0.021	0.059	0.029	0.000
3.8333	0.021	0.060	0.029	0.000
3.9167	0.021	0.062	0.030	0.000
4.0000	0.021	0.063	0.031	0.000
4.0833	0.021	0.064	0.034	0.000
4.1667	0.021	0.065	0.037	0.000
4.2500	0.021	0.067	0.041	0.000
4.3333	0.021	0.068	0.046	0.000
4.4167	0.021	0.069	0.051	0.000
4.5000	0.021	0.070	0.056	0.000
4.5833	0.021	0.071	0.062	0.000
4.6667	0.021	0.073	0.067	0.000
4.7500	0.021	0.074	0.073	0.000
4.8333	0.021	0.075	0.079	0.000
4.9167	0.021	0.076	0.084	0.000
5.0000	0.021	0.077	0.091	0.000
5.0833	0.021	0.078	0.346	0.000
5.1667	0.021	0.079	0.795	0.000
5.2500	0.021	0.080	1.309	0.000
5.3333	0.021	0.081	1.776	0.000
5.4167	0.021	0.082	2.105	0.000
5.5000	0.021	0.082	2.296	0.000
5.5833	0.021	0.083	2.499	0.000
5.6667	0.021	0.084	2.665	0.000
5.7500	0.021	0.084	2.821	0.000
5.8333	0.021	0.085	2.969	0.000
5.9167	0.021	0.086	3.110	0.000
6.0000	0.021	0.087	3.244	0.000
6.0833	0.021	0.087	3.373	0.000
6.1667	0.021	0.088	3.497	0.000
6.2500	0.021	0.089	3.616	0.000
6.3333	0.021	0.089	3.732	0.000
6.4167	0.021	0.090	3.844	0.000
6.5000	0.021	0.091	3.953	0.000
6.5833	0.021	0.091	4.059	0.000
6.6667	0.021	0.092	4.162	0.000
6.7500	0.021	0.093	4.263	0.000

Outfall

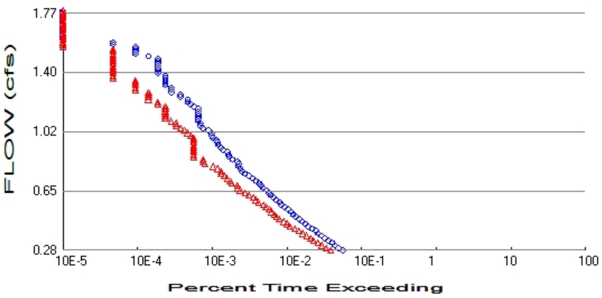
Discharge Structure

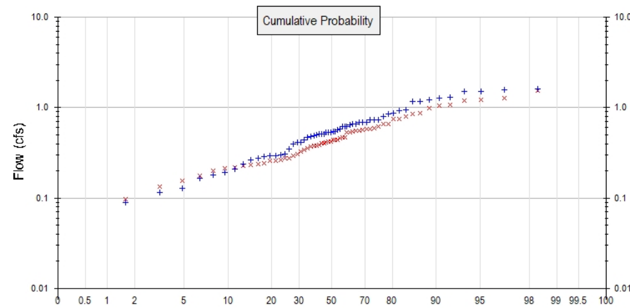
Riser Height:	0 ft.
Riser Diameter:	0 in.

Element Flows To:

Outlet 1	Outlet 2

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.975
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.245
Total Impervious Area: 0.73

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.551544
5 year	1.010022
10 year	1.287643
25 year	1.587889
50 year	1.774111
100 year	1.931318

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.433292
5 year	0.720671
10 year	0.924054
25 year	1.189211
50 year	1.390076
100 year	1.592303

Annual Peaks
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.005	0.064
1950	0.624	0.571
1951	0.583	0.533
1952	0.115	0.157
1953	0.128	0.212
1954	1.568	1.283
1955	1.214	0.806
1956	0.667	0.551
1957	1.171	0.855
1958	0.863	0.747

1959	0.731	0.657
1960	0.537	0.400
1961	0.846	0.421
1962	0.347	0.343
1963	0.410	0.390
1964	0.741	0.587
1965	0.513	0.443
1966	0.296	0.260
1967	0.693	0.555
1968	0.285	0.458
1969	0.443	0.436
1970	0.474	0.380
1971	0.944	0.866
1972	0.655	0.532
1973	0.489	0.177
1974	0.685	0.576
1975	0.533	0.376
1976	0.642	0.545
1977	0.615	0.216
1978	0.543	0.258
1979	1.313	1.080
1980	0.191	0.199
1981	0.618	0.243
1982	0.574	0.467
1983	0.541	0.418
1984	0.496	0.372
1985	0.923	0.755
1986	1.604	1.191
1987	0.741	0.614
1988	0.207	0.233
1989	0.295	0.297
1990	0.181	0.275
1991	0.413	0.409
1992	0.302	0.327
1993	0.265	0.266
1994	0.305	0.133
1995	0.274	0.308
1996	1.180	0.994
1997	1.500	1.548
1998	0.515	0.273
1999	0.538	0.468
2000	0.800	0.658
2001	0.089	0.098
2002	0.478	0.416
2003	0.237	0.226
2004	0.165	0.236
2005	0.511	0.444
2006	1.510	1.222
2007	1.266	1.054
2008	0.687	0.581
2009	0.399	0.354

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	1.6045	1.5482
2	1.5679	1.2832
3	1.5103	1.2218

4	1.4996	1.1911
5	1.3135	1.0800
6	1.2659	1.0541
7	1.2136	0.9940
8	1.1802	0.8656
9	1.1707	0.8551
10	0.9438	0.8062
11	0.9229	0.7554
12	0.8633	0.7475
13	0.8460	0.6578
14	0.7999	0.6567
15	0.7413	0.6141
16	0.7408	0.5870
17	0.7315	0.5811
18	0.6927	0.5763
19	0.6868	0.5709
20	0.6853	0.5546
21	0.6667	0.5506
22	0.6549	0.5445
23	0.6418	0.5326
24	0.6235	0.5318
25	0.6176	0.4680
26	0.6150	0.4666
27	0.5828	0.4585
28	0.5745	0.4435
29	0.5432	0.4430
30	0.5406	0.4362
31	0.5385	0.4208
32	0.5370	0.4177
33	0.5325	0.4161
34	0.5154	0.4087
35	0.5127	0.4003
36	0.5108	0.3901
37	0.4963	0.3797
38	0.4886	0.3755
39	0.4775	0.3717
40	0.4742	0.3541
41	0.4430	0.3428
42	0.4125	0.3267
43	0.4096	0.3081
44	0.3985	0.2966
45	0.3474	0.2749
46	0.3047	0.2732
47	0.3018	0.2657
48	0.2960	0.2596
49	0.2948	0.2582
50	0.2853	0.2427
51	0.2736	0.2363
52	0.2648	0.2334
53	0.2366	0.2260
54	0.2068	0.2159
55	0.1912	0.2124
56	0.1808	0.1994
57	0.1646	0.1773
58	0.1276	0.1565
59	0.1147	0.1332
60	0.0892	0.0978
61	0.0053	0.0638

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2758	1205	823	68	Pass
0.2909	1052	720	68	Pass
0.3060	948	623	65	Pass
0.3212	858	554	64	Pass
0.3363	764	486	63	Pass
0.3514	689	440	63	Pass
0.3666	618	393	63	Pass
0.3817	562	347	61	Pass
0.3968	517	309	59	Pass
0.4120	461	271	58	Pass
0.4271	410	235	57	Pass
0.4423	375	213	56	Pass
0.4574	345	194	56	Pass
0.4725	314	168	53	Pass
0.4877	282	155	54	Pass
0.5028	256	145	56	Pass
0.5179	242	133	54	Pass
0.5331	220	124	56	Pass
0.5482	200	112	56	Pass
0.5633	181	103	56	Pass
0.5785	172	89	51	Pass
0.5936	153	81	52	Pass
0.6087	141	76	53	Pass
0.6239	129	66	51	Pass
0.6390	121	59	48	Pass
0.6541	114	51	44	Pass
0.6693	103	47	45	Pass
0.6844	96	46	47	Pass
0.6995	91	39	42	Pass
0.7147	82	37	45	Pass
0.7298	74	34	45	Pass
0.7449	66	31	46	Pass
0.7601	58	28	48	Pass
0.7752	54	28	51	Pass
0.7904	51	25	49	Pass
0.8055	48	22	45	Pass
0.8206	48	17	35	Pass
0.8358	47	16	34	Pass
0.8509	40	16	40	Pass
0.8660	36	12	33	Pass
0.8812	35	12	34	Pass
0.8963	34	12	35	Pass
0.9114	30	12	40	Pass
0.9266	28	12	42	Pass
0.9417	26	12	46	Pass
0.9568	25	12	48	Pass
0.9720	24	12	50	Pass
0.9871	22	12	54	Pass
1.0022	21	11	52	Pass
1.0174	21	10	47	Pass
1.0325	19	9	47	Pass
1.0476	16	8	50	Pass
1.0628	15	7	46	Pass

1.0779	15	7	46	Pass
1.0930	14	6	42	Pass
1.1082	14	5	35	Pass
1.1233	14	5	35	Pass
1.1385	14	5	35	Pass
1.1536	14	5	35	Pass
1.1687	14	5	35	Pass
1.1839	12	5	41	Pass
1.1990	11	4	36	Pass
1.2141	10	4	40	Pass
1.2293	10	3	30	Pass
1.2444	8	3	37	Pass
1.2595	8	3	37	Pass
1.2747	6	3	50	Pass
1.2898	6	2	33	Pass
1.3049	6	2	33	Pass
1.3201	5	2	40	Pass
1.3352	5	2	40	Pass
1.3503	5	2	40	Pass
1.3655	5	1	20	Pass
1.3806	5	1	20	Pass
1.3957	4	1	25	Pass
1.4109	4	1	25	Pass
1.4260	4	1	25	Pass
1.4411	4	1	25	Pass
1.4563	4	1	25	Pass
1.4714	4	1	25	Pass
1.4866	4	1	25	Pass
1.5017	3	1	33	Pass
1.5168	2	1	50	Pass
1.5320	2	1	50	Pass
1.5471	2	1	50	Pass
1.5622	2	0	0	Pass
1.5774	1	0	0	Pass
1.5925	1	0	0	Pass
1.6076	0	0	0	Pass
1.6228	0	0	0	Pass
1.6379	0	0	0	Pass
1.6530	0	0	0	Pass
1.6682	0	0	0	Pass
1.6833	0	0	0	Pass
1.6984	0	0	0	Pass
1.7136	0	0	0	Pass
1.7287	0	0	0	Pass
1.7438	0	0	0	Pass
1.7590	0	0	0	Pass
1.7741	0	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.1283 acre-feet
On-line facility target flow:	0.1445 cfs.
Adjusted for 15 min:	0.1445 cfs.
Off-line facility target flow:	0.0675 cfs.
Adjusted for 15 min:	0.0675 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
Outfall POC	☐	177.87			☐	0.00			
StormTech B	☐	42.75			☐	0.00			
StormTech C	☐	65.11			☐	0.00			
Total Volume Infiltrated		285.72	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

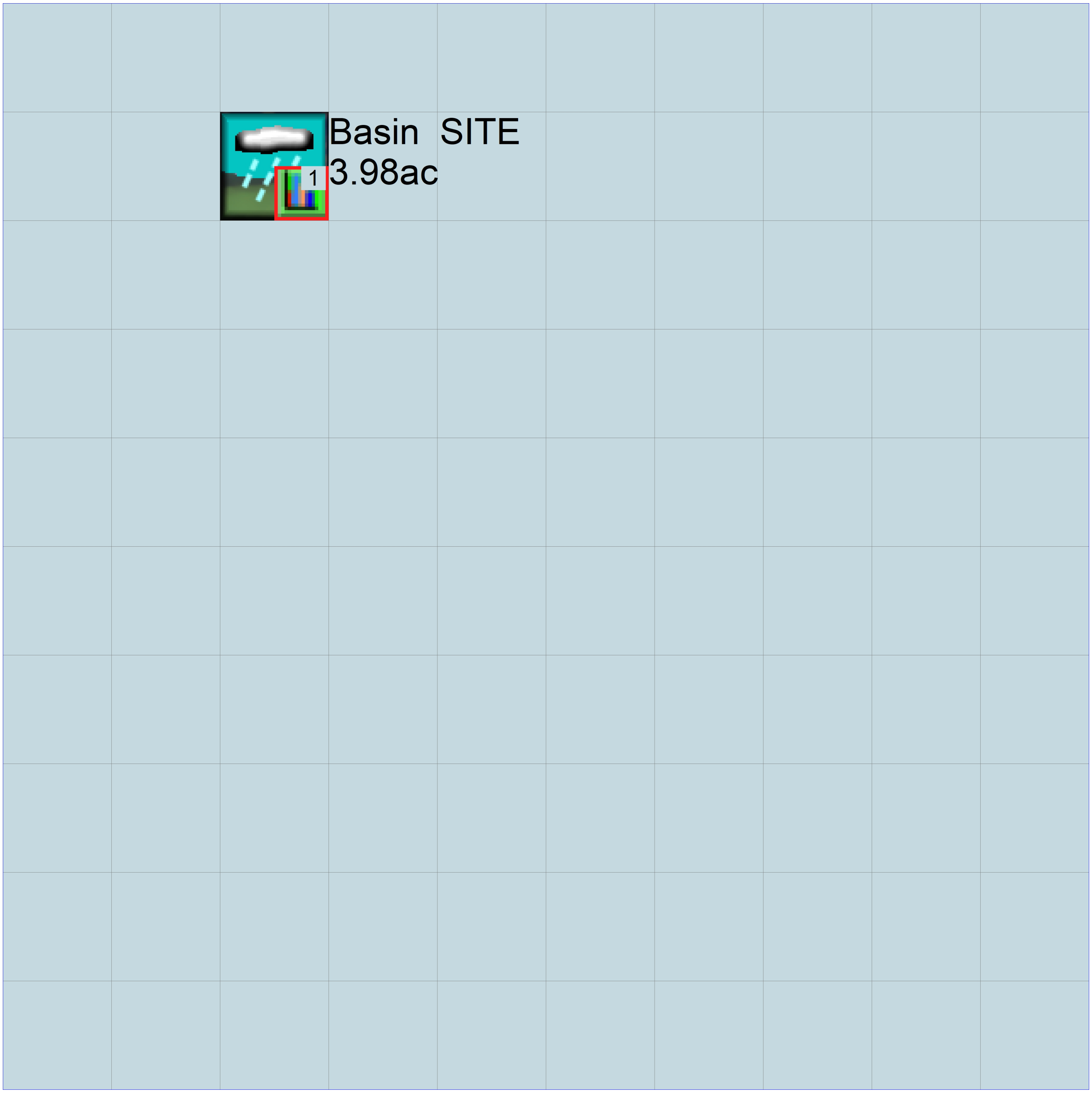
PERLND Changes

No PERLND changes have been made.

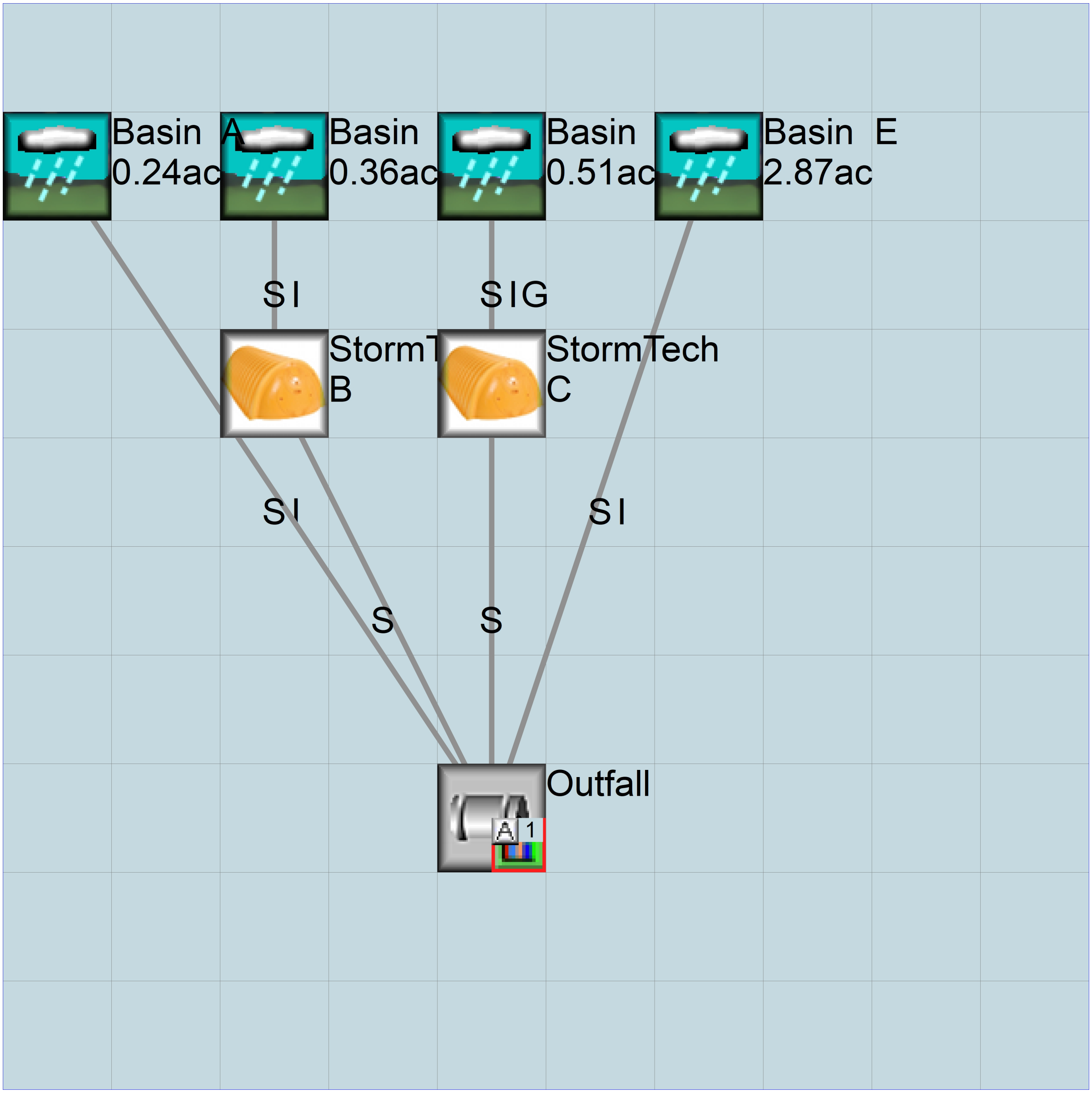
IMPLND Changes

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   7Cs Site Model.wdm
MESSU      25   Pre7Cs Site Model.MES
           27   Pre7Cs Site Model.L61
           28   Pre7Cs Site Model.L62
           30   POC7Cs Site Model1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      21
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  SITE                 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           ***
   21     SAT, Forest, Steep      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 ***
   21         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  *********
   21         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 ***
   21         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
   21             0         4         2       100       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   21             0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   21           0.2         3       0.5         1       0.7       0.8
  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
   21             0         0         0         0       4.2         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  SITE***
PERLND  21                       3.975     COPY   501     12
PERLND  21                       3.975     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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   7Cs Site Model.wdm
MESSU      25   Mit7Cs Site Model.MES
           27   Mit7Cs Site Model.L61
           28   Mit7Cs Site Model.L62
           30   POC7Cs Site Model1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      IMPLND       3
      PERLND      27
      IMPLND       4
      RCHRES       1
      RCHRES       2
      RCHRES       3
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Outfall                     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           ***
   26      SAT, Lawn, Mod          1    1    1    1   27    0
   27      SAT, Lawn, Steep        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 ***
   26         0    0    1    0    0    0    0    0    0    0    0    0
```

```
   27         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  *********
   26         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   27         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 ***
   26         0    0    0    0    0    0    0    0    0    0    0
   27         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
   26             0         4         1       100      0.01       0.5     0.996
   27             0         4         1       100       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26             0         0        10         2         0         0      0.35
   27             0         0        10         2         0         0      0.35
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26           0.1         3       0.5         1       0.7       0.4
   27           0.1         3       0.5         1       0.7       0.4
  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
   26             0         0         0         0       4.2         1         0
   27             0         0         0         0       4.2         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    3      ROADS/STEEP            1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    3         0    0    1    0    0    0
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    3         0    0    4    0    0    0    1    9
    4         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     ***
    3         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    3            400       0.1       0.1      0.05
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    3              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    3              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  B***
PERLND  26                        0.08     RCHRES   1      2
PERLND  26                        0.08     RCHRES   1      3
IMPLND   3                       0.277     RCHRES   1      5
Basin  C***
PERLND  27                        0.12     RCHRES   2      2
PERLND  27                        0.12     RCHRES   2      3
PERLND  27                        0.12     RCHRES   2      4
IMPLND   3                       0.162     RCHRES   2      5
IMPLND   4                       0.226     RCHRES   2      5
Basin  A***
PERLND  27                       0.175     RCHRES   3      2
PERLND  27                       0.175     RCHRES   3      3
IMPLND   3                       0.065     RCHRES   3      5
Basin  E***
PERLND  27                        2.87     RCHRES   3      2
PERLND  27                        2.87     RCHRES   3      3

******Routing******
RCHRES   1                           1     RCHRES   3      6
RCHRES   1                                 COPY     1     16
PERLND  27                       0.175     COPY     1     12
IMPLND   3                       0.065     COPY     1     15
PERLND  27                       0.175     COPY     1     13
PERLND  27                        2.87     COPY     1     12
PERLND  27                        2.87     COPY     1     13
RCHRES   2                           1     RCHRES   3      6
RCHRES   2                                 COPY     1     16
RCHRES   3                           1     COPY   501     16
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                              ***
    1     StormTech  B           1    1    1    1   28    0    1
    2     StormTech  C           1    1    1    1   28    0    1
    3     Outfall                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
    3         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
    3         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  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    3        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      0.04       0.0       4.0       0.5       0.0
    2             2      0.04       0.0       4.0       0.5       0.0
    3             3      0.01       0.0       0.0       0.5       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  0.0  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
    3           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
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   81    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.011556  0.000000  0.000000
  0.083333  0.011556  0.000386  0.004406
```

0.166667	0.011556	0.000771	0.006232
0.250000	0.011556	0.001155	0.007632
0.333333	0.011556	0.001541	0.008813
0.416667	0.011556	0.001926	0.009853
0.500000	0.011556	0.002311	0.010794
0.583333	0.011556	0.002696	0.011658
0.666667	0.011556	0.003082	0.012463
0.750000	0.011556	0.003467	0.013219
0.833333	0.011556	0.004298	0.013934
0.916667	0.011556	0.005127	0.014615
1.000000	0.011556	0.005955	0.015264
1.083333	0.011556	0.006780	0.015888
1.166667	0.011556	0.007604	0.016487
1.250000	0.011556	0.008426	0.017066
1.333333	0.011556	0.009246	0.017626
1.416667	0.011556	0.010064	0.018168
1.500000	0.011556	0.010880	0.018695
1.583333	0.011556	0.011693	0.019207
1.666667	0.011556	0.012504	0.019706
1.750000	0.011556	0.013312	0.020193
1.833333	0.011556	0.014118	0.020668
1.916667	0.011556	0.014920	0.021133
2.000000	0.011556	0.015720	0.021587
2.083333	0.011556	0.016517	0.022032
2.166667	0.011556	0.017310	0.022469
2.250000	0.011556	0.018100	0.022897
2.333333	0.011556	0.018886	0.023317
2.416667	0.011556	0.019669	0.023730
2.500000	0.011556	0.020448	0.024135
2.583333	0.011556	0.021223	0.024534
2.666667	0.011556	0.021994	0.024927
2.750000	0.011556	0.022761	0.025313
2.833333	0.011556	0.023524	0.025694
2.916667	0.011556	0.024281	0.026069
3.000000	0.011556	0.025035	0.026439
3.083333	0.011556	0.025783	0.026803
3.166667	0.011556	0.026526	0.027163
3.250000	0.011556	0.027264	0.027518
3.333333	0.011556	0.027997	0.027869
3.416667	0.011556	0.028723	0.028215
3.500000	0.011556	0.029445	0.028557
3.583333	0.011556	0.030160	0.028895
3.666667	0.011556	0.030868	0.029229
3.750000	0.011556	0.031571	0.029559
3.833333	0.011556	0.032266	0.029886
3.916667	0.011556	0.032954	0.030209
4.000000	0.011556	0.033635	0.031266
4.083333	0.011556	0.034309	0.034001
4.166667	0.011556	0.034974	0.037584
4.250000	0.011556	0.035631	0.041755
4.333333	0.011556	0.036279	0.046370
4.416667	0.011556	0.036918	0.051330
4.500000	0.011556	0.037547	0.056558
4.583333	0.011556	0.038166	0.061995
4.666667	0.011556	0.038775	0.067590
4.750000	0.011556	0.039371	0.073298
4.833333	0.011556	0.039955	0.079082
4.916667	0.011556	0.040526	0.084907
5.000000	0.011556	0.041082	0.091458
5.083333	0.011556	0.041622	0.346033
5.166667	0.011556	0.042143	0.795454
5.250000	0.011556	0.042642	1.309856
5.333333	0.011556	0.043104	1.776045
5.416667	0.011556	0.043536	2.105936
5.500000	0.011556	0.043957	2.296459
5.583333	0.011556	0.044370	2.498964
5.666667	0.011556	0.044774	2.665324
5.750000	0.011556	0.045166	2.821588
5.833333	0.011556	0.045601	2.969398
5.916667	0.011556	0.045987	3.109996

```
6.000000  0.011556  0.046371  3.244346
6.083333  0.011556  0.046757  3.373213
6.166667  0.011556  0.047142  3.497221
6.250000  0.011556  0.047527  3.616880
6.333333  0.011556  0.047912  3.732620
6.416667  0.011556  0.048297  3.844802
6.500000  0.011556  0.048683  3.953736
6.583333  0.011556  0.049068  4.059689
6.666667  0.011556  0.049453  4.162893
END FTABLE  1
FTABLE      2
 81    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.022467  0.000000  0.000000
0.083333  0.022467  0.000750  0.004406
0.166667  0.022467  0.001499  0.006232
0.250000  0.022467  0.002246  0.007632
0.333333  0.022467  0.002996  0.008813
0.416667  0.022467  0.003745  0.009853
0.500000  0.022467  0.004493  0.010794
0.583333  0.022467  0.005242  0.011658
0.666667  0.022467  0.005991  0.012463
0.750000  0.022467  0.006740  0.013219
0.833333  0.022467  0.008388  0.013934
0.916667  0.022467  0.010031  0.014615
1.000000  0.022467  0.011671  0.015264
1.083333  0.022467  0.013307  0.015888
1.166667  0.022467  0.014941  0.016487
1.250000  0.022467  0.016570  0.017066
1.333333  0.022467  0.018196  0.017626
1.416667  0.022467  0.019817  0.018168
1.500000  0.022467  0.021434  0.018695
1.583333  0.022467  0.023047  0.019207
1.666667  0.022467  0.024655  0.019706
1.750000  0.022467  0.026257  0.020193
1.833333  0.022467  0.027855  0.020668
1.916667  0.022467  0.029446  0.021133
2.000000  0.022467  0.031032  0.021587
2.083333  0.022467  0.032612  0.022032
2.166667  0.022467  0.034186  0.022469
2.250000  0.022467  0.035752  0.022897
2.333333  0.022467  0.037313  0.023317
2.416667  0.022467  0.038866  0.023730
2.500000  0.022467  0.040411  0.024135
2.583333  0.022467  0.041949  0.024534
2.666667  0.022467  0.043478  0.024927
2.750000  0.022467  0.045000  0.025313
2.833333  0.022467  0.046512  0.025694
2.916667  0.022467  0.048016  0.026069
3.000000  0.022467  0.049510  0.026439
3.083333  0.022467  0.050995  0.026803
3.166667  0.022467  0.052470  0.027163
3.250000  0.022467  0.053934  0.027518
3.333333  0.022467  0.055387  0.027869
3.416667  0.022467  0.056830  0.028215
3.500000  0.022467  0.058260  0.028557
3.583333  0.022467  0.059679  0.028895
3.666667  0.022467  0.061085  0.029229
3.750000  0.022467  0.062478  0.029559
3.833333  0.022467  0.063858  0.029886
3.916667  0.022467  0.065223  0.030209
4.000000  0.022467  0.066574  0.031266
4.083333  0.022467  0.067909  0.034001
4.166667  0.022467  0.069229  0.037584
4.250000  0.022467  0.070531  0.041755
4.333333  0.022467  0.071816  0.046370
4.416667  0.022467  0.073083  0.051330
4.500000  0.022467  0.074330  0.056558
4.583333  0.022467  0.075556  0.061995
```

4.666667	0.022467	0.076761	0.067590
4.750000	0.022467	0.077942	0.073298
4.833333	0.022467	0.079098	0.079082
4.916667	0.022467	0.080228	0.084907
5.000000	0.022467	0.081327	0.091458
5.083333	0.022467	0.082393	0.346033
5.166667	0.022467	0.083421	0.795454
5.250000	0.022467	0.084402	1.309856
5.333333	0.022467	0.085310	1.776045
5.416667	0.022467	0.086153	2.105936
5.500000	0.022467	0.086975	2.296459
5.583333	0.022467	0.087781	2.498964
5.666667	0.022467	0.088570	2.665324
5.750000	0.022467	0.089333	2.821588
5.833333	0.022467	0.090132	2.969398
5.916667	0.022467	0.090882	3.109996
6.000000	0.022467	0.091629	3.244346
6.083333	0.022467	0.092378	3.373213
6.166667	0.022467	0.093127	3.497221
6.250000	0.022467	0.093876	3.616880
6.333333	0.022467	0.094625	3.732620
6.416667	0.022467	0.095374	3.844802
6.500000	0.022467	0.096123	3.953736
6.583333	0.022467	0.096872	4.059689
6.666667	0.022467	0.097621	4.162893

END FTABLE 2
FTABLE 3
91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.000000	0.000000	0.000000		
0.033333	0.000014	0.000000	0.013700		
0.066667	0.000020	0.000001	0.061090		
0.100000	0.000025	0.000002	0.146048		
0.133333	0.000028	0.000003	0.270501		
0.166667	0.000032	0.000004	0.435601		
0.200000	0.000034	0.000005	0.642056		
0.233333	0.000037	0.000006	0.890275		
0.266667	0.000039	0.000007	1.180454		
0.300000	0.000041	0.000008	1.512621		
0.333333	0.000043	0.000010	1.886670		
0.366667	0.000045	0.000011	2.302391		
0.400000	0.000047	0.000013	2.759475		
0.433333	0.000048	0.000014	3.257540		
0.466667	0.000050	0.000016	3.796129		
0.500000	0.000051	0.000018	4.374729		
0.533333	0.000053	0.000020	4.992768		
0.566667	0.000054	0.000021	5.649626		
0.600000	0.000055	0.000023	6.344637		
0.633333	0.000056	0.000025	7.077093		
0.666667	0.000057	0.000027	7.846248		
0.700000	0.000058	0.000029	8.651319		
0.733333	0.000059	0.000031	9.491494		
0.766667	0.000060	0.000033	10.36592		
0.800000	0.000061	0.000035	11.27372		
0.833333	0.000062	0.000037	12.21400		
0.866667	0.000062	0.000039	13.18580		
0.900000	0.000063	0.000041	14.18818		
0.933333	0.000064	0.000043	15.22015		
0.966667	0.000064	0.000045	16.28070		
1.000000	0.000065	0.000047	17.36880		
1.033333	0.000065	0.000050	18.48339		
1.066667	0.000066	0.000052	19.62338		
1.100000	0.000066	0.000054	20.78769		
1.133333	0.000067	0.000056	21.97518		
1.166667	0.000067	0.000058	23.18472		
1.200000	0.000067	0.000061	24.41513		
1.233333	0.000068	0.000063	25.66523		
1.266667	0.000068	0.000065	26.93381		
1.300000	0.000068	0.000067	28.21966		

```
  1.333333  0.000068  0.000070  29.52150
  1.366667  0.000069  0.000072  30.83807
  1.400000  0.000069  0.000074  32.16809
  1.433333  0.000069  0.000077  33.51024
  1.466667  0.000069  0.000079  34.86317
  1.500000  0.000069  0.000081  36.22555
  1.533333  0.000069  0.000083  37.59597
  1.566667  0.000069  0.000086  38.97305
  1.600000  0.000069  0.000088  40.35534
  1.633333  0.000069  0.000090  41.74141
  1.666667  0.000068  0.000093  43.12977
  1.700000  0.000068  0.000095  44.51891
  1.733333  0.000068  0.000097  45.90730
  1.766667  0.000068  0.000099  47.29338
  1.800000  0.000067  0.000102  48.67555
  1.833333  0.000067  0.000104  50.05220
  1.866667  0.000067  0.000106  51.42166
  1.900000  0.000066  0.000108  52.78223
  1.933333  0.000066  0.000111  54.13218
  1.966667  0.000065  0.000113  55.46973
  2.000000  0.000065  0.000115  56.79306
  2.033333  0.000064  0.000117  58.10030
  2.066667  0.000064  0.000119  59.38954
  2.100000  0.000063  0.000121  60.65878
  2.133333  0.000062  0.000123  61.90599
  2.166667  0.000062  0.000125  63.12906
  2.200000  0.000061  0.000128  64.32580
  2.233333  0.000060  0.000130  65.49393
  2.266667  0.000059  0.000132  66.63109
  2.300000  0.000058  0.000133  67.73480
  2.333333  0.000057  0.000135  68.80246
  2.366667  0.000056  0.000137  69.83135
  2.400000  0.000055  0.000139  70.81854
  2.433333  0.000054  0.000141  71.76096
  2.466667  0.000053  0.000143  72.65530
  2.500000  0.000051  0.000144  73.49798
  2.533333  0.000050  0.000146  74.28511
  2.566667  0.000048  0.000148  75.01243
  2.600000  0.000047  0.000149  75.67516
  2.633333  0.000045  0.000151  76.26796
  2.666667  0.000043  0.000152  76.78469
  2.700000  0.000041  0.000154  77.21818
  2.733333  0.000039  0.000155  77.55987
  2.766667  0.000037  0.000156  77.79922
  2.800000  0.000034  0.000158  77.92280
  2.833333  0.000032  0.000159  77.92280
  2.866667  0.000028  0.000160  77.92280
  2.900000  0.000025  0.000161  77.92280
  2.933333  0.000020  0.000161  77.92280
  2.966667  0.000014  0.000162  77.92280
  3.000000  0.001000  0.000162  77.92280
  END FTABLE  3
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   3 HYDR   RO      1 1        1     WDM   1002 FLOW     ENGL      REPL
RCHRES   3 HYDR   STAGE   1 1        1     WDM   1003 STAG     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       2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK       3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK       4
PERLND     PWATER AGWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    4

  MASS-LINK       5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  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

  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

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	7Cs Basin D Detention
Site Name:	7C's
Site Address:	
City:	Mill Creek
Report Date:	4/30/2020
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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 D

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Forest, Steep	0.626
Pervious Total	0.626
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.626

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin D

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
C, Lawn, Mod	0.221	
Pervious Total	0.221	
Impervious Land Use	acre	
ROADS MOD	0.405	
Impervious Total	0.405	
Basin Total	0.626	

Element Flows To:

Surface	Interflow	Groundwater
StormTech D	StormTech D	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech D

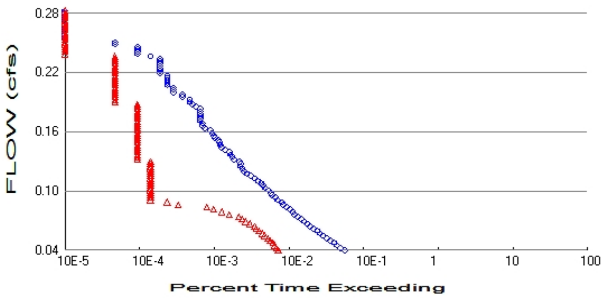
Chamber Model: 4500
Dimensions
Max Row Length: 150
Number of Chambers: 30
Number of Endcaps: 2
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.020 ft.
Notch Height: 1.050 ft.
Orifice 1 Diameter: 0.75 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

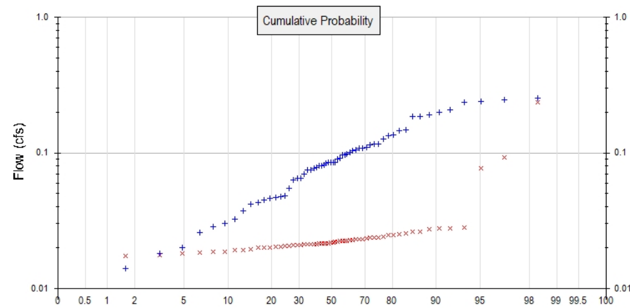
StormTech Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.026	0.000	0.000	0.000
0.0833	0.026	0.000	0.004	0.000
0.1667	0.026	0.001	0.006	0.000
0.2500	0.026	0.002	0.007	0.000
0.3333	0.026	0.003	0.008	0.000
0.4167	0.026	0.004	0.009	0.000
0.5000	0.026	0.005	0.010	0.000
0.5833	0.026	0.006	0.011	0.000
0.6667	0.026	0.007	0.012	0.000
0.7500	0.026	0.008	0.013	0.000
0.8333	0.026	0.010	0.013	0.000
0.9167	0.026	0.011	0.014	0.000
1.0000	0.026	0.013	0.015	0.000
1.0833	0.026	0.015	0.015	0.000
1.1667	0.026	0.017	0.016	0.000
1.2500	0.026	0.019	0.017	0.000
1.3333	0.026	0.021	0.017	0.000
1.4167	0.026	0.023	0.018	0.000
1.5000	0.026	0.025	0.018	0.000
1.5833	0.026	0.027	0.019	0.000
1.6667	0.026	0.029	0.019	0.000
1.7500	0.026	0.031	0.020	0.000
1.8333	0.026	0.033	0.020	0.000
1.9167	0.026	0.035	0.021	0.000
2.0000	0.026	0.036	0.021	0.000
2.0833	0.026	0.038	0.022	0.000
2.1667	0.026	0.040	0.022	0.000
2.2500	0.026	0.042	0.022	0.000
2.3333	0.026	0.044	0.023	0.000
2.4167	0.026	0.046	0.023	0.000
2.5000	0.026	0.048	0.024	0.000
2.5833	0.026	0.049	0.024	0.000
2.6667	0.026	0.051	0.024	0.000

2.7500	0.026	0.053	0.025	0.000
2.8333	0.026	0.055	0.025	0.000
2.9167	0.026	0.057	0.026	0.000
3.0000	0.026	0.058	0.026	0.000
3.0833	0.026	0.060	0.026	0.000
3.1667	0.026	0.062	0.027	0.000
3.2500	0.026	0.064	0.027	0.000
3.3333	0.026	0.065	0.027	0.000
3.4167	0.026	0.067	0.028	0.000
3.5000	0.026	0.069	0.028	0.000
3.5833	0.026	0.071	0.028	0.000
3.6667	0.026	0.072	0.029	0.000
3.7500	0.026	0.074	0.029	0.000
3.8333	0.026	0.076	0.029	0.000
3.9167	0.026	0.077	0.030	0.000
4.0000	0.026	0.079	0.031	0.000
4.0833	0.026	0.080	0.034	0.000
4.1667	0.026	0.082	0.037	0.000
4.2500	0.026	0.084	0.041	0.000
4.3333	0.026	0.085	0.046	0.000
4.4167	0.026	0.087	0.051	0.000
4.5000	0.026	0.088	0.056	0.000
4.5833	0.026	0.089	0.062	0.000
4.6667	0.026	0.091	0.067	0.000
4.7500	0.026	0.092	0.073	0.000
4.8333	0.026	0.094	0.079	0.000
4.9167	0.026	0.095	0.084	0.000
5.0000	0.026	0.096	0.091	0.000
5.0833	0.026	0.098	0.346	0.000
5.1667	0.026	0.099	0.795	0.000
5.2500	0.026	0.100	1.309	0.000
5.3333	0.026	0.101	1.776	0.000
5.4167	0.026	0.102	2.105	0.000
5.5000	0.026	0.103	2.296	0.000
5.5833	0.026	0.104	2.499	0.000
5.6667	0.026	0.105	2.665	0.000
5.7500	0.026	0.106	2.821	0.000
5.8333	0.026	0.107	2.969	0.000
5.9167	0.026	0.108	3.110	0.000
6.0000	0.026	0.109	3.244	0.000
6.0833	0.026	0.109	3.373	0.000
6.1667	0.026	0.110	3.497	0.000
6.2500	0.026	0.111	3.616	0.000
6.3333	0.026	0.112	3.732	0.000
6.4167	0.026	0.113	3.844	0.000
6.5000	0.026	0.114	3.953	0.000
6.5833	0.026	0.115	4.059	0.000
6.6667	0.026	0.116	4.162	0.000
6.7500	0.026	0.117	4.263	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.626
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.221
Total Impervious Area: 0.405

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.086859
5 year	0.159062
10 year	0.202783
25 year	0.250067
50 year	0.279394
100 year	0.304152

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.022937
5 year	0.032841
10 year	0.040406
25 year	0.051183
50 year	0.060143
100 year	0.069944

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.001	0.021
1950	0.098	0.022
1951	0.092	0.021
1952	0.018	0.019
1953	0.020	0.018
1954	0.247	0.021
1955	0.191	0.024
1956	0.105	0.024
1957	0.184	0.025
1958	0.136	0.023

1959	0.115	0.022
1960	0.085	0.024
1961	0.133	0.025
1962	0.055	0.022
1963	0.065	0.022
1964	0.117	0.021
1965	0.081	0.021
1966	0.047	0.018
1967	0.109	0.022
1968	0.045	0.026
1969	0.070	0.021
1970	0.075	0.019
1971	0.149	0.022
1972	0.103	0.023
1973	0.077	0.019
1974	0.108	0.020
1975	0.084	0.019
1976	0.101	0.023
1977	0.097	0.021
1978	0.086	0.018
1979	0.207	0.026
1980	0.030	0.020
1981	0.097	0.020
1982	0.090	0.028
1983	0.085	0.022
1984	0.078	0.024
1985	0.145	0.025
1986	0.253	0.077
1987	0.117	0.027
1988	0.033	0.023
1989	0.046	0.017
1990	0.028	0.021
1991	0.065	0.022
1992	0.048	0.019
1993	0.042	0.020
1994	0.048	0.022
1995	0.043	0.023
1996	0.186	0.026
1997	0.236	0.237
1998	0.081	0.020
1999	0.085	0.022
2000	0.126	0.023
2001	0.014	0.017
2002	0.075	0.021
2003	0.037	0.020
2004	0.026	0.028
2005	0.080	0.022
2006	0.238	0.028
2007	0.199	0.022
2008	0.108	0.093
2009	0.063	0.021

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2527	0.2372
2	0.2469	0.0928
3	0.2378	0.0769

4	0.2362	0.0280
5	0.2069	0.0278
6	0.1994	0.0276
7	0.1911	0.0272
8	0.1859	0.0262
9	0.1844	0.0261
10	0.1486	0.0255
11	0.1453	0.0252
12	0.1360	0.0247
13	0.1332	0.0246
14	0.1260	0.0240
15	0.1167	0.0236
16	0.1167	0.0236
17	0.1152	0.0236
18	0.1091	0.0233
19	0.1082	0.0232
20	0.1079	0.0230
21	0.1050	0.0230
22	0.1031	0.0228
23	0.1011	0.0226
24	0.0982	0.0224
25	0.0973	0.0224
26	0.0968	0.0223
27	0.0918	0.0223
28	0.0905	0.0222
29	0.0855	0.0220
30	0.0851	0.0217
31	0.0848	0.0216
32	0.0846	0.0216
33	0.0839	0.0216
34	0.0812	0.0215
35	0.0807	0.0215
36	0.0804	0.0214
37	0.0782	0.0213
38	0.0769	0.0213
39	0.0752	0.0212
40	0.0747	0.0211
41	0.0698	0.0211
42	0.0650	0.0209
43	0.0645	0.0209
44	0.0628	0.0208
45	0.0547	0.0207
46	0.0480	0.0205
47	0.0475	0.0204
48	0.0466	0.0202
49	0.0464	0.0201
50	0.0449	0.0199
51	0.0431	0.0199
52	0.0417	0.0195
53	0.0373	0.0192
54	0.0326	0.0191
55	0.0301	0.0187
56	0.0285	0.0187
57	0.0259	0.0184
58	0.0201	0.0181
59	0.0181	0.0176
60	0.0141	0.0174
61	0.0008	0.0174

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0434	1195	153	12	Pass
0.0458	1046	145	13	Pass
0.0482	948	138	14	Pass
0.0506	858	130	15	Pass
0.0530	764	119	15	Pass
0.0553	686	111	16	Pass
0.0577	613	101	16	Pass
0.0601	561	93	16	Pass
0.0625	514	84	16	Pass
0.0649	458	78	17	Pass
0.0673	410	74	18	Pass
0.0696	375	64	17	Pass
0.0720	344	56	16	Pass
0.0744	313	50	15	Pass
0.0768	281	45	16	Pass
0.0792	255	34	13	Pass
0.0816	240	27	11	Pass
0.0839	220	21	9	Pass
0.0863	200	17	8	Pass
0.0887	181	7	3	Pass
0.0911	171	5	2	Pass
0.0935	152	3	1	Pass
0.0959	140	3	2	Pass
0.0982	127	3	2	Pass
0.1006	121	3	2	Pass
0.1030	114	3	2	Pass
0.1054	103	3	2	Pass
0.1078	96	3	3	Pass
0.1102	91	3	3	Pass
0.1126	82	3	3	Pass
0.1149	74	3	4	Pass
0.1173	66	3	4	Pass
0.1197	58	3	5	Pass
0.1221	54	3	5	Pass
0.1245	51	3	5	Pass
0.1269	48	3	6	Pass
0.1292	48	3	6	Pass
0.1316	47	3	6	Pass
0.1340	39	2	5	Pass
0.1364	37	2	5	Pass
0.1388	35	2	5	Pass
0.1412	34	2	5	Pass
0.1435	30	2	6	Pass
0.1459	27	2	7	Pass
0.1483	26	2	7	Pass
0.1507	25	2	8	Pass
0.1531	24	2	8	Pass
0.1555	22	2	9	Pass
0.1578	21	2	9	Pass
0.1602	20	2	10	Pass
0.1626	19	2	10	Pass
0.1650	16	2	12	Pass
0.1674	15	2	13	Pass

0.1698	15	2	13	Pass
0.1721	14	2	14	Pass
0.1745	14	2	14	Pass
0.1769	14	2	14	Pass
0.1793	14	2	14	Pass
0.1817	14	2	14	Pass
0.1841	14	2	14	Pass
0.1864	12	2	16	Pass
0.1888	11	2	18	Pass
0.1912	10	1	10	Pass
0.1936	10	1	10	Pass
0.1960	8	1	12	Pass
0.1984	8	1	12	Pass
0.2007	6	1	16	Pass
0.2031	6	1	16	Pass
0.2055	6	1	16	Pass
0.2079	5	1	20	Pass
0.2103	5	1	20	Pass
0.2127	5	1	20	Pass
0.2150	5	1	20	Pass
0.2174	5	1	20	Pass
0.2198	4	1	25	Pass
0.2222	4	1	25	Pass
0.2246	4	1	25	Pass
0.2270	4	1	25	Pass
0.2293	4	1	25	Pass
0.2317	4	1	25	Pass
0.2341	4	1	25	Pass
0.2365	3	1	33	Pass
0.2389	2	0	0	Pass
0.2413	2	0	0	Pass
0.2436	2	0	0	Pass
0.2460	2	0	0	Pass
0.2484	1	0	0	Pass
0.2508	1	0	0	Pass
0.2532	0	0	0	Pass
0.2556	0	0	0	Pass
0.2579	0	0	0	Pass
0.2603	0	0	0	Pass
0.2627	0	0	0	Pass
0.2651	0	0	0	Pass
0.2675	0	0	0	Pass
0.2699	0	0	0	Pass
0.2722	0	0	0	Pass
0.2746	0	0	0	Pass
0.2770	0	0	0	Pass
0.2794	0	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0326 acre-feet
On-line facility target flow:	0.0176 cfs.
Adjusted for 15 min:	0.0176 cfs.
Off-line facility target flow:	0.0119 cfs.
Adjusted for 15 min:	0.0119 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
StormTech D POC	☐	73.70			☐	0.00			
Total Volume Infiltrated		73.70	0.00	0.00		0.00	0.00	0%	No Treat. Credit
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.

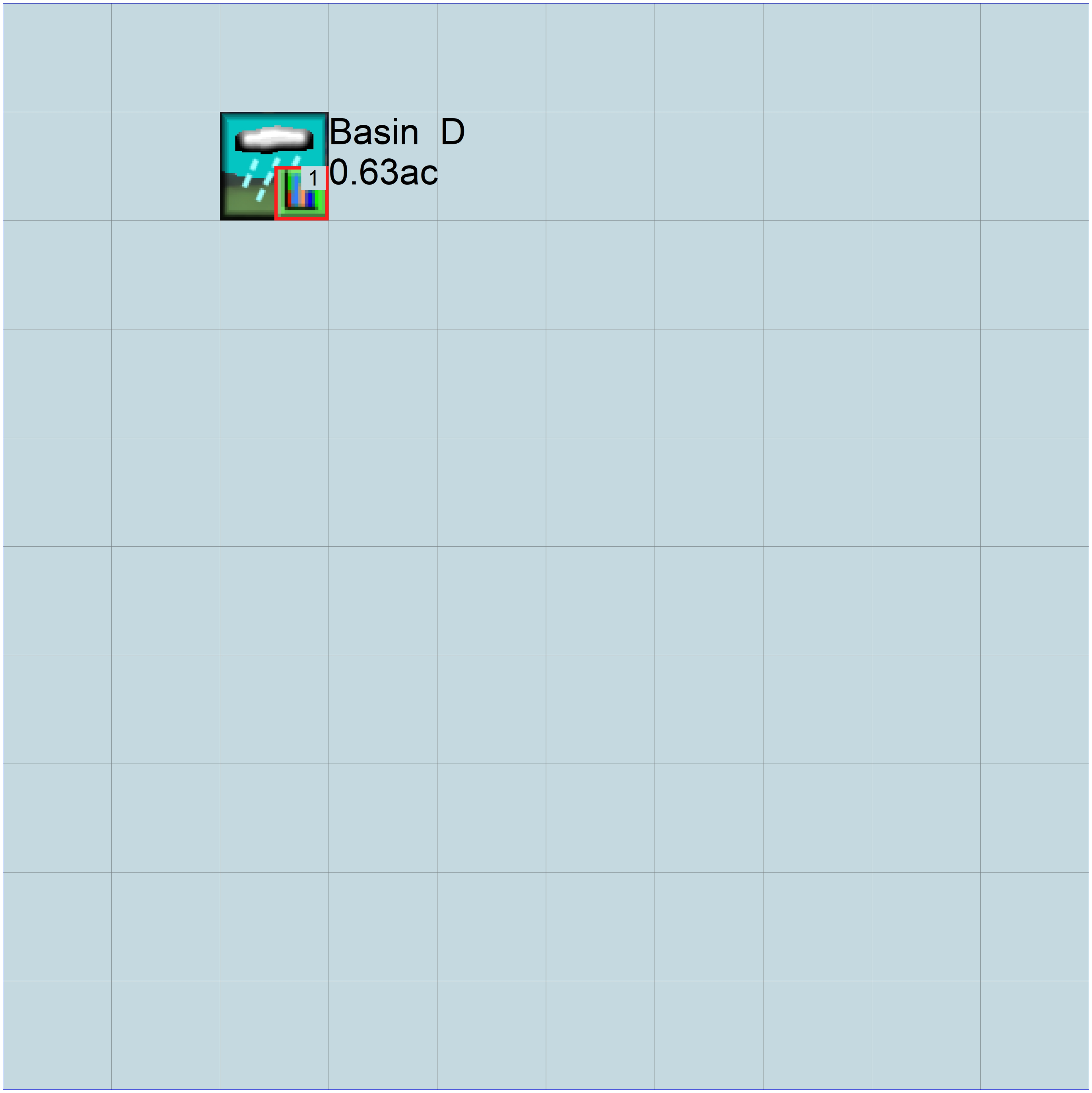
PERLND Changes

No PERLND changes have been made.

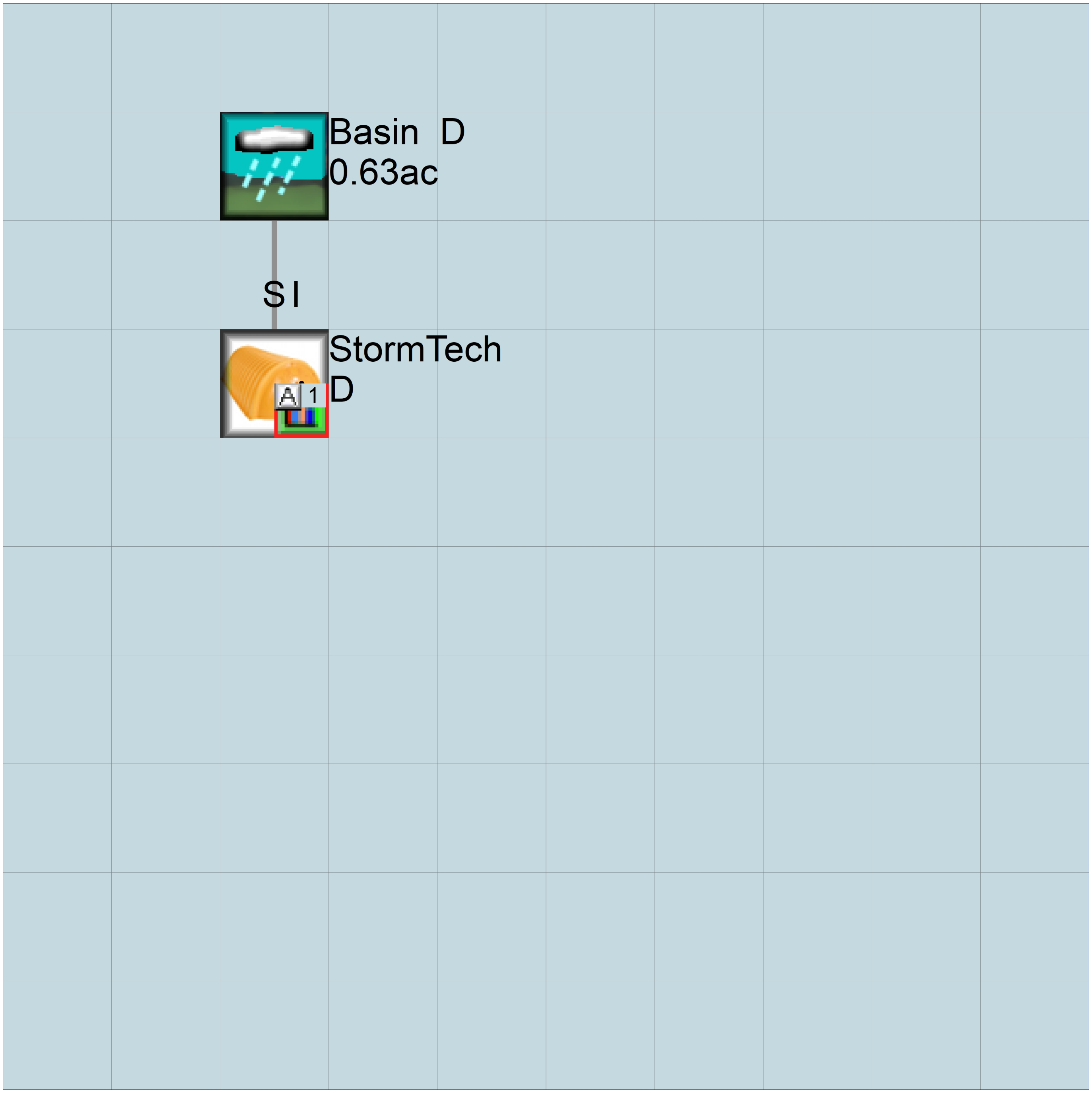
IMPLND Changes

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   7Cs Basin D Detention.wdm
MESSU      25   Pre7Cs Basin D Detention.MES
           27   Pre7Cs Basin D Detention.L61
           28   Pre7Cs Basin D Detention.L62
           30   POC7Cs Basin D Detention1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      21
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  D                    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           ***
   21     SAT, Forest, Steep      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 ***
   21         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  *********
   21         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 ***
   21         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
   21             0         4         2       100       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   21             0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   21           0.2         3       0.5         1       0.7       0.8
  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
   21             0         0         0         0       4.2         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  D***
PERLND  21                       0.626     COPY   501     12
PERLND  21                       0.626     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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   7Cs Basin D Detention.wdm
MESSU      25   Mit7Cs Basin D Detention.MES
           27   Mit7Cs Basin D Detention.L61
           28   Mit7Cs Basin D Detention.L62
           30   POC7Cs Basin D Detention1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      17
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  D                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           ***
   17      C, Lawn, Mod           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 ***
   17         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  *********
```

```
 17         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 ***
 17         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
 17              0       4.5      0.03       400       0.1       0.5     0.996
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 17              0         0         2         2         0         0         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                                     ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 17            0.1      0.25      0.25         6       0.5      0.25
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
 17              0         0         0         0       2.5         1         0
END PWAT-STATE1

END PERLND

IMPLND
GEN-INFO
  <PLS ><-------Name------->   Unit-systems   Printer ***
  # -  #                     User  t-series Engl Metr ***
                                   in  out            ***
  2      ROADS/MOD              1    1    1   27    0
END GEN-INFO
*** Section IWATER***

ACTIVITY
  <PLS > ************* Active Sections *****************************
  # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  2         0    0    1    0    0    0
END ACTIVITY

PRINT-INFO
  <ILS > ******** Print-flags ******** PIVL  PYR
  # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  2         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     ***
  2         0    0    0    0    0
END IWAT-PARM1

IWAT-PARM2
  <PLS >      IWATER input info: Part 2         ***
  # -  # ***  LSUR     SLSUR      NSUR     RETSC
  2            400      0.05       0.1      0.08
END IWAT-PARM2

IWAT-PARM3
  <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
    2             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  D***
PERLND  17                       0.221     RCHRES   1      2
PERLND  17                       0.221     RCHRES   1      3
IMPLND   2                       0.405     RCHRES   1      5

******Routing******
PERLND  17                       0.221     COPY     1     12
IMPLND   2                       0.405     COPY     1     15
PERLND  17                       0.221     COPY     1     13
RCHRES   1                           1     COPY   501     16
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                           ***
    1     StormTech  D            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
  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
  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  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      0.03       0.0       4.0       0.5       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  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
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   81    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.026663  0.000000  0.000000
  0.083333  0.026663  0.000890  0.004406
  0.166667  0.026663  0.001779  0.006232
  0.250000  0.026663  0.002665  0.007632
  0.333333  0.026663  0.003555  0.008813
  0.416667  0.026663  0.004444  0.009853
  0.500000  0.026663  0.005333  0.010794
  0.583333  0.026663  0.006222  0.011658
  0.666667  0.026663  0.007110  0.012463
  0.750000  0.026663  0.007999  0.013219
  0.833333  0.026663  0.009961  0.013934
  0.916667  0.026663  0.011917  0.014615
  1.000000  0.026663  0.013869  0.015264
  1.083333  0.026663  0.015817  0.015888
  1.166667  0.026663  0.017762  0.016487
  1.250000  0.026663  0.019702  0.017066
  1.333333  0.026663  0.021638  0.017626
  1.416667  0.026663  0.023568  0.018168
  1.500000  0.026663  0.025494  0.018695
  1.583333  0.026663  0.027414  0.019207
  1.666667  0.026663  0.029328  0.019706
  1.750000  0.026663  0.031236  0.020193
  1.833333  0.026663  0.033138  0.020668
  1.916667  0.026663  0.035033  0.021133
  2.000000  0.026663  0.036922  0.021587
  2.083333  0.026663  0.038803  0.022032
  2.166667  0.026663  0.040676  0.022469
  2.250000  0.026663  0.042542  0.022897
  2.333333  0.026663  0.044400  0.023317
  2.416667  0.026663  0.046249  0.023730
  2.500000  0.026663  0.048089  0.024135
  2.583333  0.026663  0.049920  0.024534
  2.666667  0.026663  0.051741  0.024927
  2.750000  0.026663  0.053553  0.025313
  2.833333  0.026663  0.055354  0.025694
  2.916667  0.026663  0.057145  0.026069
  3.000000  0.026663  0.058924  0.026439
  3.083333  0.026663  0.060692  0.026803
  3.166667  0.026663  0.062448  0.027163
  3.250000  0.026663  0.064191  0.027518
  3.333333  0.026663  0.065922  0.027869
  3.416667  0.026663  0.067640  0.028215
  3.500000  0.026663  0.069343  0.028557
  3.583333  0.026663  0.071033  0.028895
  3.666667  0.026663  0.072707  0.029229
  3.750000  0.026663  0.074366  0.029559
  3.833333  0.026663  0.076008  0.029886
  3.916667  0.026663  0.077634  0.030209
  4.000000  0.026663  0.079243  0.031266
  4.083333  0.026663  0.080833  0.034001
  4.166667  0.026663  0.082404  0.037584
  4.250000  0.026663  0.083955  0.041755
```

```
  4.333333  0.026663  0.085484  0.046370
  4.416667  0.026663  0.086992  0.051330
  4.500000  0.026663  0.088477  0.056558
  4.583333  0.026663  0.089937  0.061995
  4.666667  0.026663  0.091371  0.067590
  4.750000  0.026663  0.092777  0.073298
  4.833333  0.026663  0.094153  0.079082
  4.916667  0.026663  0.095497  0.084907
  5.000000  0.026663  0.096806  0.091458
  5.083333  0.026663  0.098074  0.346033
  5.166667  0.026663  0.099297  0.795454
  5.250000  0.026663  0.100464  1.309856
  5.333333  0.026663  0.101542  1.776045
  5.416667  0.026663  0.102544  2.105936
  5.500000  0.026663  0.103520  2.296459
  5.583333  0.026663  0.104478  2.498964
  5.666667  0.026663  0.105415  2.665324
  5.750000  0.026663  0.106321  2.821588
  5.833333  0.026663  0.107260  2.969398
  5.916667  0.026663  0.108149  3.109996
  6.000000  0.026663  0.109035  3.244346
  6.083333  0.026663  0.109925  3.373213
  6.166667  0.026663  0.110814  3.497221
  6.250000  0.026663  0.111703  3.616880
  6.333333  0.026663  0.112592  3.732620
  6.416667  0.026663  0.113480  3.844802
  6.500000  0.026663  0.114369  3.953736
  6.583333  0.026663  0.115258  4.059689
  6.666667  0.026663  0.116147  4.162893
  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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     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        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  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

  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

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Appendix E

Water Quality Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	7Cs WQ Model
Site Name:	
Site Address:	
City:	
Report Date:	4/14/2020
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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 SITE

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Forest, Steep	1.105
Pervious Total	1.105
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.105

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin B

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Mod	0.08
Pervious Total	0.08
Impervious Land Use	acre
ROADS STEEP	0.277
Impervious Total	0.277
Basin Total	0.357

Element Flows To:

Surface	Interflow	Groundwater
StormTech B	StormTech B	

Basin C

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Steep	0.12
Pervious Total	0.12
Impervious Land Use	acre
ROADS STEEP	0.162
ROOF TOPS FLAT	0.226
Impervious Total	0.388
Basin Total	0.508

Element Flows To:

Surface	Interflow	Groundwater
StormTech C	StormTech C	StormTech C

Basin A

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Steep	0.175
Pervious Total	0.175
Impervious Land Use	acre
ROADS STEEP	0.065
Impervious Total	0.065
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater
Outfall	Outfall	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech B

Chamber Model: 4500
Dimensions
Max Row Length: 200
Number of Chambers: 12
Number of Endcaps: 2
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.020 ft.
Notch Height: 1.050 ft.
Orifice 1 Diameter: 0.75 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2
Outfall

StormTech Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.010	0.000	0.000	0.000
0.0833	0.010	0.000	0.004	0.000
0.1667	0.010	0.000	0.006	0.000
0.2500	0.010	0.001	0.007	0.000
0.3333	0.010	0.001	0.008	0.000
0.4167	0.010	0.001	0.009	0.000
0.5000	0.010	0.002	0.010	0.000
0.5833	0.010	0.002	0.011	0.000
0.6667	0.010	0.002	0.012	0.000
0.7500	0.010	0.003	0.013	0.000
0.8333	0.010	0.003	0.013	0.000
0.9167	0.010	0.004	0.014	0.000
1.0000	0.010	0.005	0.015	0.000
1.0833	0.010	0.006	0.015	0.000
1.1667	0.010	0.006	0.016	0.000
1.2500	0.010	0.007	0.017	0.000
1.3333	0.010	0.008	0.017	0.000
1.4167	0.010	0.009	0.018	0.000
1.5000	0.010	0.009	0.018	0.000
1.5833	0.010	0.010	0.019	0.000
1.6667	0.010	0.011	0.019	0.000
1.7500	0.010	0.011	0.020	0.000
1.8333	0.010	0.012	0.020	0.000
1.9167	0.010	0.013	0.021	0.000
2.0000	0.010	0.014	0.021	0.000
2.0833	0.010	0.014	0.022	0.000
2.1667	0.010	0.015	0.022	0.000
2.2500	0.010	0.016	0.022	0.000
2.3333	0.010	0.017	0.023	0.000
2.4167	0.010	0.017	0.023	0.000
2.5000	0.010	0.018	0.024	0.000
2.5833	0.010	0.019	0.024	0.000
2.6667	0.010	0.019	0.024	0.000

2.7500	0.010	0.020	0.025	0.000
2.8333	0.010	0.021	0.025	0.000
2.9167	0.010	0.021	0.026	0.000
3.0000	0.010	0.022	0.026	0.000
3.0833	0.010	0.023	0.026	0.000
3.1667	0.010	0.023	0.027	0.000
3.2500	0.010	0.024	0.027	0.000
3.3333	0.010	0.025	0.027	0.000
3.4167	0.010	0.025	0.028	0.000
3.5000	0.010	0.026	0.028	0.000
3.5833	0.010	0.027	0.028	0.000
3.6667	0.010	0.027	0.029	0.000
3.7500	0.010	0.028	0.029	0.000
3.8333	0.010	0.029	0.029	0.000
3.9167	0.010	0.029	0.030	0.000
4.0000	0.010	0.030	0.031	0.000
4.0833	0.010	0.031	0.034	0.000
4.1667	0.010	0.031	0.037	0.000
4.2500	0.010	0.032	0.041	0.000
4.3333	0.010	0.032	0.046	0.000
4.4167	0.010	0.033	0.051	0.000
4.5000	0.010	0.034	0.056	0.000
4.5833	0.010	0.034	0.062	0.000
4.6667	0.010	0.035	0.067	0.000
4.7500	0.010	0.035	0.073	0.000
4.8333	0.010	0.036	0.079	0.000
4.9167	0.010	0.036	0.084	0.000
5.0000	0.010	0.037	0.091	0.000
5.0833	0.010	0.037	0.346	0.000
5.1667	0.010	0.038	0.795	0.000
5.2500	0.010	0.038	1.309	0.000
5.3333	0.010	0.039	1.776	0.000
5.4167	0.010	0.039	2.105	0.000
5.5000	0.010	0.039	2.296	0.000
5.5833	0.010	0.040	2.499	0.000
5.6667	0.010	0.040	2.665	0.000
5.7500	0.010	0.040	2.821	0.000
5.8333	0.010	0.041	2.969	0.000
5.9167	0.010	0.041	3.110	0.000
6.0000	0.010	0.041	3.244	0.000
6.0833	0.010	0.042	3.373	0.000
6.1667	0.010	0.042	3.497	0.000
6.2500	0.010	0.042	3.616	0.000
6.3333	0.010	0.043	3.732	0.000
6.4167	0.010	0.043	3.844	0.000
6.5000	0.010	0.043	3.953	0.000
6.5833	0.010	0.044	4.059	0.000
6.6667	0.010	0.044	4.162	0.000
6.7500	0.010	0.044	4.263	0.000

StormTech C

Chamber Model:	4500
Dimensions	
Max Row Length:	200
Number of Chambers:	24
Number of Endcaps:	2
Top Stone Depth:	12
Bottom Stone Depth:	9
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	12 in.
Notch Type:	Rectangular
Notch Width:	0.020 ft.
Notch Height:	1.050 ft.
Orifice 1 Diameter:	0.75 in. Elevation:0 ft.
Element Flows To:	
Outlet 1	Outlet 2
Outfall	

StormTech Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.020	0.000	0.000	0.000
0.0833	0.020	0.000	0.004	0.000
0.1667	0.020	0.001	0.006	0.000
0.2500	0.020	0.002	0.007	0.000
0.3333	0.020	0.002	0.008	0.000
0.4167	0.020	0.003	0.009	0.000
0.5000	0.020	0.004	0.010	0.000
0.5833	0.020	0.004	0.011	0.000
0.6667	0.020	0.005	0.012	0.000
0.7500	0.020	0.006	0.013	0.000
0.8333	0.020	0.007	0.013	0.000
0.9167	0.020	0.009	0.014	0.000
1.0000	0.020	0.010	0.015	0.000
1.0833	0.020	0.012	0.015	0.000
1.1667	0.020	0.013	0.016	0.000
1.2500	0.020	0.015	0.017	0.000
1.3333	0.020	0.016	0.017	0.000
1.4167	0.020	0.018	0.018	0.000
1.5000	0.020	0.019	0.018	0.000
1.5833	0.020	0.021	0.019	0.000
1.6667	0.020	0.022	0.019	0.000
1.7500	0.020	0.023	0.020	0.000
1.8333	0.020	0.025	0.020	0.000
1.9167	0.020	0.026	0.021	0.000
2.0000	0.020	0.028	0.021	0.000
2.0833	0.020	0.029	0.022	0.000
2.1667	0.020	0.031	0.022	0.000
2.2500	0.020	0.032	0.022	0.000
2.3333	0.020	0.034	0.023	0.000
2.4167	0.020	0.035	0.023	0.000
2.5000	0.020	0.036	0.024	0.000
2.5833	0.020	0.038	0.024	0.000
2.6667	0.020	0.039	0.024	0.000
2.7500	0.020	0.041	0.025	0.000
2.8333	0.020	0.042	0.025	0.000

2.9167	0.020	0.043	0.026	0.000
3.0000	0.020	0.045	0.026	0.000
3.0833	0.020	0.046	0.026	0.000
3.1667	0.020	0.047	0.027	0.000
3.2500	0.020	0.049	0.027	0.000
3.3333	0.020	0.050	0.027	0.000
3.4167	0.020	0.051	0.028	0.000
3.5000	0.020	0.053	0.028	0.000
3.5833	0.020	0.054	0.028	0.000
3.6667	0.020	0.055	0.029	0.000
3.7500	0.020	0.057	0.029	0.000
3.8333	0.020	0.058	0.029	0.000
3.9167	0.020	0.059	0.030	0.000
4.0000	0.020	0.060	0.031	0.000
4.0833	0.020	0.062	0.034	0.000
4.1667	0.020	0.063	0.037	0.000
4.2500	0.020	0.064	0.041	0.000
4.3333	0.020	0.065	0.046	0.000
4.4167	0.020	0.066	0.051	0.000
4.5000	0.020	0.067	0.056	0.000
4.5833	0.020	0.069	0.062	0.000
4.6667	0.020	0.070	0.067	0.000
4.7500	0.020	0.071	0.073	0.000
4.8333	0.020	0.072	0.079	0.000
4.9167	0.020	0.073	0.084	0.000
5.0000	0.020	0.074	0.091	0.000
5.0833	0.020	0.075	0.346	0.000
5.1667	0.020	0.076	0.795	0.000
5.2500	0.020	0.077	1.309	0.000
5.3333	0.020	0.077	1.776	0.000
5.4167	0.020	0.078	2.105	0.000
5.5000	0.020	0.079	2.296	0.000
5.5833	0.020	0.080	2.499	0.000
5.6667	0.020	0.080	2.665	0.000
5.7500	0.020	0.081	2.821	0.000
5.8333	0.020	0.082	2.969	0.000
5.9167	0.020	0.082	3.110	0.000
6.0000	0.020	0.083	3.244	0.000
6.0833	0.020	0.084	3.373	0.000
6.1667	0.020	0.084	3.497	0.000
6.2500	0.020	0.085	3.616	0.000
6.3333	0.020	0.086	3.732	0.000
6.4167	0.020	0.086	3.844	0.000
6.5000	0.020	0.087	3.953	0.000
6.5833	0.020	0.088	4.059	0.000
6.6667	0.020	0.088	4.162	0.000
6.7500	0.020	0.089	4.263	0.000

Outfall

Discharge Structure

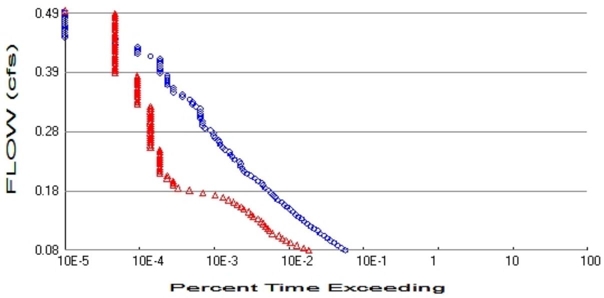
Riser Height:	0 ft.
Riser Diameter:	0 in.

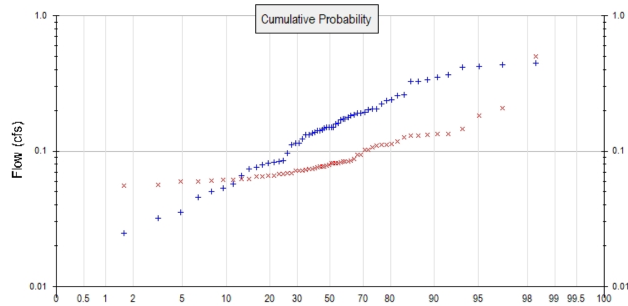
Element Flows To:

Outlet 1	Outlet 2

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.105
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.375
Total Impervious Area: 0.73

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.153322
5 year	0.280773
10 year	0.357949
25 year	0.441413
50 year	0.493181
100 year	0.536882

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.082684
5 year	0.116539
10 year	0.143695
25 year	0.183986
50 year	0.218753
100 year	0.25796

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.001	0.062
1950	0.173	0.084
1951	0.162	0.082
1952	0.032	0.065
1953	0.035	0.077
1954	0.436	0.146
1955	0.337	0.110
1956	0.185	0.084
1957	0.325	0.112
1958	0.240	0.126

1959	0.203	0.083
1960	0.149	0.077
1961	0.235	0.131
1962	0.097	0.085
1963	0.114	0.094
1964	0.206	0.082
1965	0.143	0.071
1966	0.082	0.060
1967	0.193	0.102
1968	0.079	0.079
1969	0.123	0.118
1970	0.132	0.065
1971	0.262	0.112
1972	0.182	0.082
1973	0.136	0.068
1974	0.190	0.094
1975	0.148	0.075
1976	0.178	0.076
1977	0.171	0.061
1978	0.151	0.059
1979	0.365	0.131
1980	0.053	0.065
1981	0.172	0.062
1982	0.160	0.072
1983	0.150	0.084
1984	0.138	0.074
1985	0.257	0.102
1986	0.446	0.209
1987	0.206	0.081
1988	0.057	0.078
1989	0.082	0.074
1990	0.050	0.068
1991	0.115	0.073
1992	0.084	0.062
1993	0.074	0.069
1994	0.085	0.055
1995	0.076	0.057
1996	0.328	0.132
1997	0.417	0.498
1998	0.143	0.087
1999	0.150	0.076
2000	0.222	0.113
2001	0.025	0.053
2002	0.133	0.066
2003	0.066	0.060
2004	0.046	0.106
2005	0.142	0.072
2006	0.420	0.133
2007	0.352	0.133
2008	0.191	0.182
2009	0.111	0.068

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.4460	0.4982
2	0.4359	0.2092
3	0.4198	0.1825

4	0.4169	0.1456
5	0.3651	0.1330
6	0.3519	0.1329
7	0.3374	0.1315
8	0.3281	0.1307
9	0.3254	0.1305
10	0.2624	0.1262
11	0.2565	0.1180
12	0.2400	0.1134
13	0.2352	0.1121
14	0.2223	0.1115
15	0.2061	0.1102
16	0.2059	0.1063
17	0.2033	0.1023
18	0.1926	0.1019
19	0.1909	0.0943
20	0.1905	0.0938
21	0.1853	0.0871
22	0.1821	0.0851
23	0.1784	0.0842
24	0.1733	0.0842
25	0.1717	0.0841
26	0.1710	0.0826
27	0.1620	0.0817
28	0.1597	0.0816
29	0.1510	0.0816
30	0.1503	0.0813
31	0.1497	0.0789
32	0.1493	0.0778
33	0.1480	0.0773
34	0.1433	0.0768
35	0.1425	0.0764
36	0.1420	0.0757
37	0.1380	0.0747
38	0.1358	0.0739
39	0.1327	0.0738
40	0.1318	0.0729
41	0.1231	0.0722
42	0.1147	0.0721
43	0.1139	0.0714
44	0.1108	0.0689
45	0.0966	0.0684
46	0.0847	0.0677
47	0.0839	0.0676
48	0.0823	0.0656
49	0.0819	0.0654
50	0.0793	0.0652
51	0.0761	0.0645
52	0.0736	0.0624
53	0.0658	0.0621
54	0.0575	0.0617
55	0.0532	0.0610
56	0.0503	0.0603
57	0.0458	0.0596
58	0.0355	0.0594
59	0.0319	0.0566
60	0.0248	0.0552
61	0.0015	0.0534

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0767	1216	392	32	Pass
0.0809	1067	334	31	Pass
0.0851	951	271	28	Pass
0.0893	861	223	25	Pass
0.0935	770	195	25	Pass
0.0977	701	173	24	Pass
0.1019	631	156	24	Pass
0.1061	561	129	22	Pass
0.1103	519	117	22	Pass
0.1145	463	111	23	Pass
0.1187	419	103	24	Pass
0.1229	377	97	25	Pass
0.1271	345	90	26	Pass
0.1314	318	82	25	Pass
0.1356	285	71	24	Pass
0.1398	260	67	25	Pass
0.1440	246	62	25	Pass
0.1482	221	53	23	Pass
0.1524	202	49	24	Pass
0.1566	184	43	23	Pass
0.1608	174	39	22	Pass
0.1650	152	33	21	Pass
0.1692	141	28	19	Pass
0.1734	130	22	16	Pass
0.1776	121	15	12	Pass
0.1818	115	10	8	Pass
0.1861	103	7	6	Pass
0.1903	97	6	6	Pass
0.1945	92	6	6	Pass
0.1987	82	6	7	Pass
0.2029	75	5	6	Pass
0.2071	66	5	7	Pass
0.2113	58	4	6	Pass
0.2155	54	4	7	Pass
0.2197	51	4	7	Pass
0.2239	48	4	8	Pass
0.2281	48	4	8	Pass
0.2323	47	4	8	Pass
0.2365	40	4	10	Pass
0.2407	37	4	10	Pass
0.2450	35	4	11	Pass
0.2492	34	4	11	Pass
0.2534	30	4	13	Pass
0.2576	28	3	10	Pass
0.2618	26	3	11	Pass
0.2660	25	3	12	Pass
0.2702	24	3	12	Pass
0.2744	22	3	13	Pass
0.2786	21	3	14	Pass
0.2828	21	3	14	Pass
0.2870	19	3	15	Pass
0.2912	16	3	18	Pass
0.2954	15	3	20	Pass

0.2996	15	3	20	Pass
0.3039	15	3	20	Pass
0.3081	14	3	21	Pass
0.3123	14	3	21	Pass
0.3165	14	3	21	Pass
0.3207	14	3	21	Pass
0.3249	14	3	21	Pass
0.3291	12	3	25	Pass
0.3333	11	2	18	Pass
0.3375	11	2	18	Pass
0.3417	10	2	20	Pass
0.3459	8	2	25	Pass
0.3501	8	2	25	Pass
0.3543	6	2	33	Pass
0.3585	6	2	33	Pass
0.3628	6	2	33	Pass
0.3670	5	2	40	Pass
0.3712	5	2	40	Pass
0.3754	5	2	40	Pass
0.3796	5	2	40	Pass
0.3838	5	2	40	Pass
0.3880	4	1	25	Pass
0.3922	4	1	25	Pass
0.3964	4	1	25	Pass
0.4006	4	1	25	Pass
0.4048	4	1	25	Pass
0.4090	4	1	25	Pass
0.4132	4	1	25	Pass
0.4175	3	1	33	Pass
0.4217	2	1	50	Pass
0.4259	2	1	50	Pass
0.4301	2	1	50	Pass
0.4343	2	1	50	Pass
0.4385	1	1	100	Pass
0.4427	1	1	100	Pass
0.4469	1	1	100	Pass
0.4511	0	1	n/a	Fail
0.4553	0	1	n/a	Fail
0.4595	0	1	n/a	Fail
0.4637	0	1	n/a	Fail
0.4679	0	1	n/a	Fail
0.4721	0	1	n/a	Fail
0.4764	0	1	n/a	Fail
0.4806	0	1	n/a	Fail
0.4848	0	1	n/a	Fail
0.4890	0	1	n/a	Fail
0.4932	0	1	n/a	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.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0612 acre-feet
On-line facility target flow:	0.04 cfs.
Adjusted for 15 min:	0.04 cfs.
Off-line facility target flow:	0.0259 cfs.
Adjusted for 15 min:	0.0259 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
Outfall POC	☐	121.03			☐	0.00			
StormTech B	☐	42.75			☐	0.00			
StormTech C	☐	65.11			☐	0.00			
Total Volume Infiltrated		228.88	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

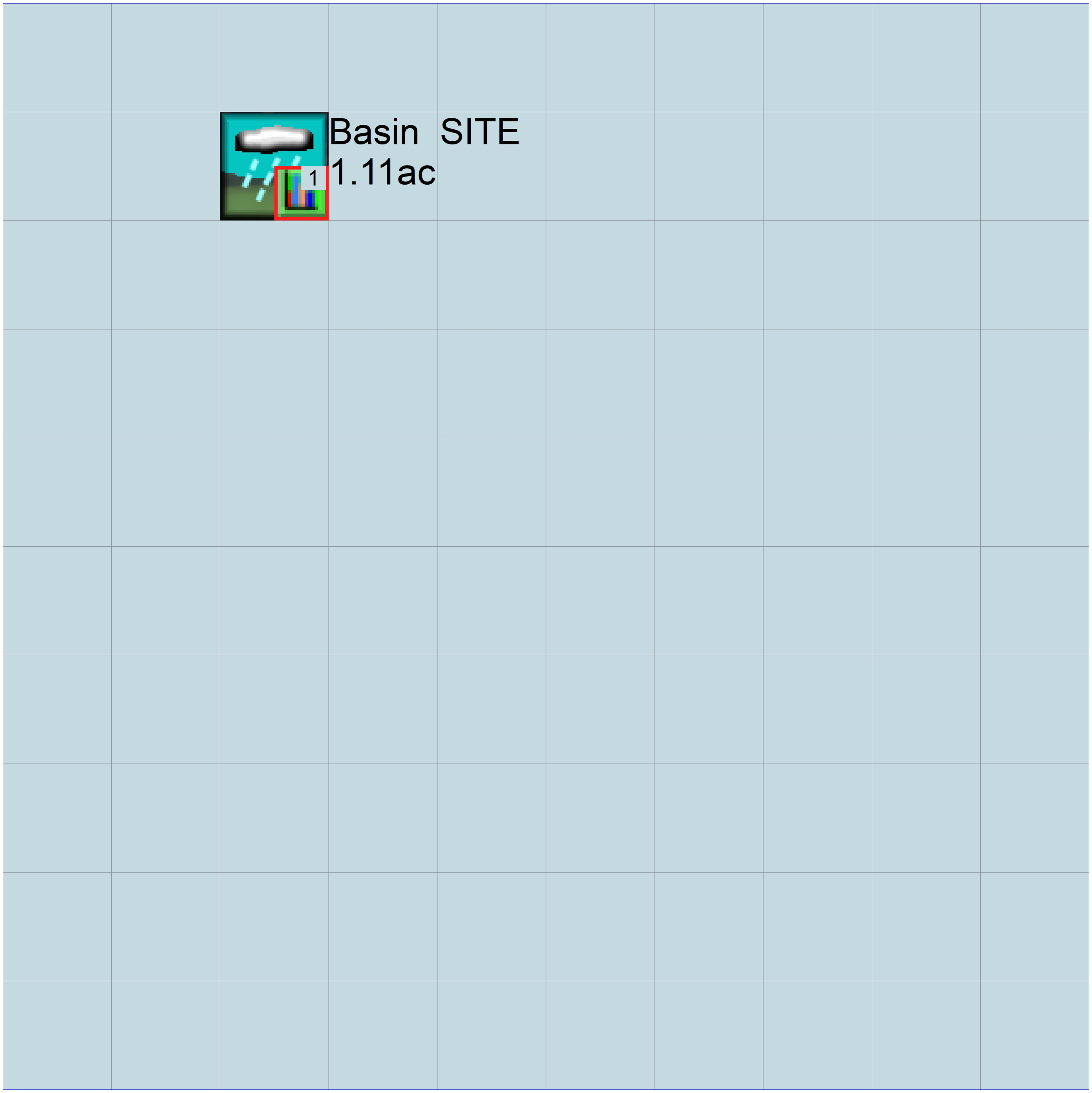
PERLND Changes

No PERLND changes have been made.

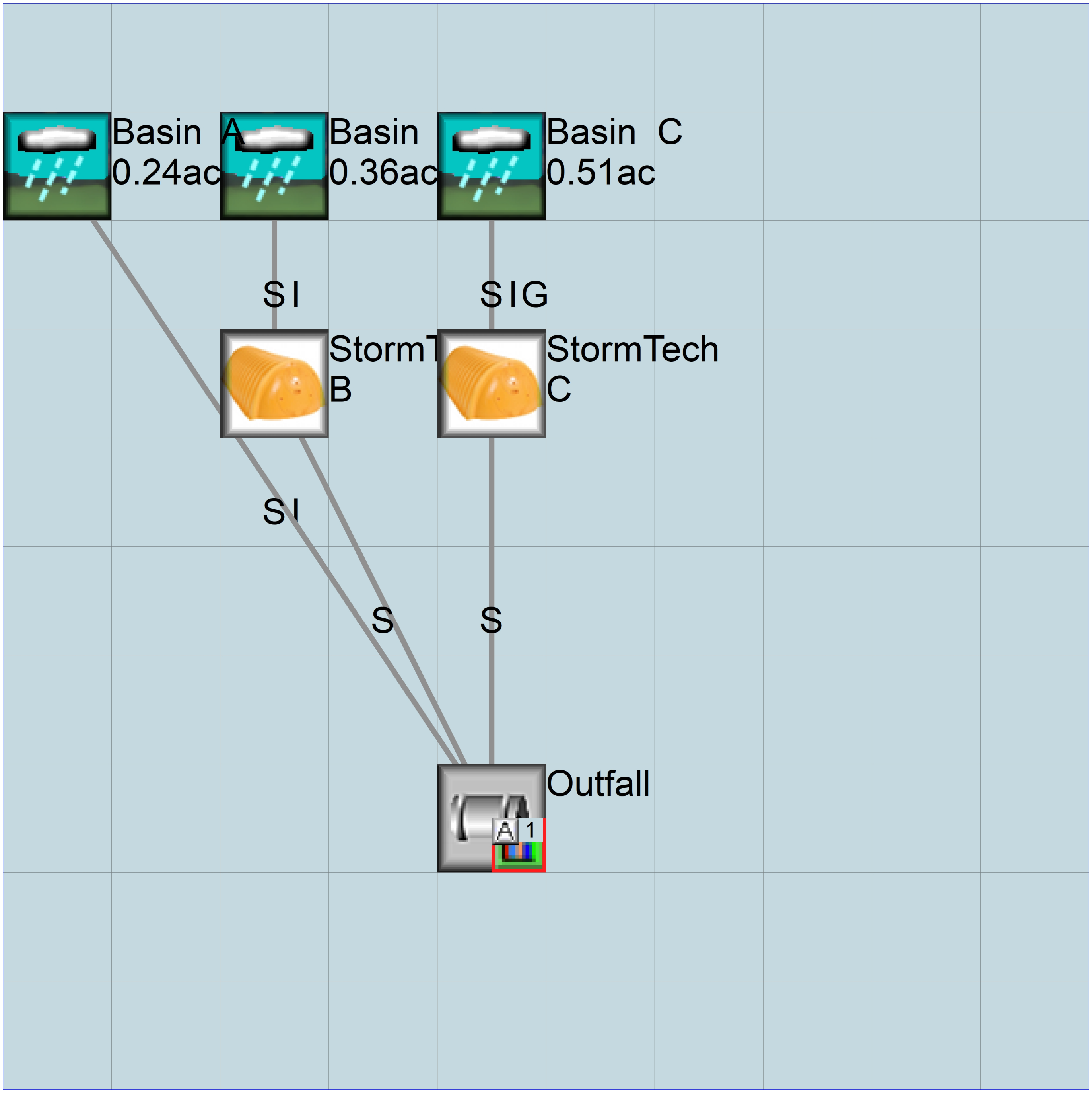
IMPLND Changes

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   7Cs WQ Model.wdm
MESSU      25   Pre7Cs WQ Model.MES
           27   Pre7Cs WQ Model.L61
           28   Pre7Cs WQ Model.L62
           30   POC7Cs WQ Model1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      21
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  SITE                 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           ***
   21     SAT, Forest, Steep      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 ***
   21         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  *********
   21         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 ***
   21         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
   21             0         4         2       100       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   21             0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   21           0.2         3       0.5         1       0.7       0.8
  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
   21             0         0         0         0       4.2         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  SITE***
PERLND  21                       1.105     COPY   501     12
PERLND  21                       1.105     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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   7Cs WQ Model.wdm
MESSU      25   Mit7Cs WQ Model.MES
           27   Mit7Cs WQ Model.L61
           28   Mit7Cs WQ Model.L62
           30   POC7Cs WQ Model1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      IMPLND       3
      PERLND      27
      IMPLND       4
      RCHRES       1
      RCHRES       2
      RCHRES       3
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Outfall                     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           ***
   26      SAT, Lawn, Mod          1    1    1    1   27    0
   27      SAT, Lawn, Steep        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 ***
   26         0    0    1    0    0    0    0    0    0    0    0    0
```

```
  27         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  *********
   26         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   27         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 ***
   26         0    0    0    0    0    0    0    0    0    0    0
   27         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
   26              0         4         1       100      0.01       0.5     0.996
   27              0         4         1       100       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26              0         0        10         2         0         0      0.35
   27              0         0        10         2         0         0      0.35
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26            0.1         3       0.5         1       0.7       0.4
   27            0.1         3       0.5         1       0.7       0.4
  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
   26              0         0         0         0       4.2         1         0
   27              0         0         0         0       4.2         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                    User  t-series Engl Metr ***
                                     in  out           ***
    3      ROADS/STEEP           1    1    1   27    0
    4      ROOF TOPS/FLAT        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    3         0    0    1    0    0    0
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    3         0    0    4    0    0    0    1    9
    4         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     ***
    3         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    3            400       0.1       0.1      0.05
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    3              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    3              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  B***
PERLND  26                        0.08     RCHRES   1      2
PERLND  26                        0.08     RCHRES   1      3
IMPLND   3                       0.277     RCHRES   1      5
Basin  C***
PERLND  27                        0.12     RCHRES   2      2
PERLND  27                        0.12     RCHRES   2      3
PERLND  27                        0.12     RCHRES   2      4
IMPLND   3                       0.162     RCHRES   2      5
IMPLND   4                       0.226     RCHRES   2      5
Basin  A***
PERLND  27                       0.175     RCHRES   3      2
PERLND  27                       0.175     RCHRES   3      3
IMPLND   3                       0.065     RCHRES   3      5

******Routing******
RCHRES   1                           1     RCHRES   3      6
RCHRES   1                                 COPY     1     16
PERLND  27                       0.175     COPY     1     12
IMPLND   3                       0.065     COPY     1     15
PERLND  27                       0.175     COPY     1     13
RCHRES   2                           1     RCHRES   3      6
RCHRES   2                                 COPY     1     16
RCHRES   3                           1     COPY   501     16
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                             ***
    1     StormTech  B           1    1    1    1   28    0    1
    2     StormTech  C           1    1    1    1   28    0    1
    3     Outfall                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
    3         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
    3         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  0  0  0  0       0  0  0  0  0      2  2  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0      2  2  2  2  2
    3        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      0.04       0.0       4.0       0.5       0.0
    2             2      0.04       0.0       4.0       0.5       0.0
    3             3      0.01       0.0       0.0       0.5       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  0.0  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
    3           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
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   81    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.011556  0.000000  0.000000
  0.083333  0.011556  0.000386  0.004406
  0.166667  0.011556  0.000771  0.006232
  0.250000  0.011556  0.001155  0.007632
  0.333333  0.011556  0.001541  0.008813
  0.416667  0.011556  0.001926  0.009853
  0.500000  0.011556  0.002311  0.010794
```

0.583333	0.011556	0.002696	0.011658
0.666667	0.011556	0.003082	0.012463
0.750000	0.011556	0.003467	0.013219
0.833333	0.011556	0.004298	0.013934
0.916667	0.011556	0.005127	0.014615
1.000000	0.011556	0.005955	0.015264
1.083333	0.011556	0.006780	0.015888
1.166667	0.011556	0.007604	0.016487
1.250000	0.011556	0.008426	0.017066
1.333333	0.011556	0.009246	0.017626
1.416667	0.011556	0.010064	0.018168
1.500000	0.011556	0.010880	0.018695
1.583333	0.011556	0.011693	0.019207
1.666667	0.011556	0.012504	0.019706
1.750000	0.011556	0.013312	0.020193
1.833333	0.011556	0.014118	0.020668
1.916667	0.011556	0.014920	0.021133
2.000000	0.011556	0.015720	0.021587
2.083333	0.011556	0.016517	0.022032
2.166667	0.011556	0.017310	0.022469
2.250000	0.011556	0.018100	0.022897
2.333333	0.011556	0.018886	0.023317
2.416667	0.011556	0.019669	0.023730
2.500000	0.011556	0.020448	0.024135
2.583333	0.011556	0.021223	0.024534
2.666667	0.011556	0.021994	0.024927
2.750000	0.011556	0.022761	0.025313
2.833333	0.011556	0.023524	0.025694
2.916667	0.011556	0.024281	0.026069
3.000000	0.011556	0.025035	0.026439
3.083333	0.011556	0.025783	0.026803
3.166667	0.011556	0.026526	0.027163
3.250000	0.011556	0.027264	0.027518
3.333333	0.011556	0.027997	0.027869
3.416667	0.011556	0.028723	0.028215
3.500000	0.011556	0.029445	0.028557
3.583333	0.011556	0.030160	0.028895
3.666667	0.011556	0.030868	0.029229
3.750000	0.011556	0.031571	0.029559
3.833333	0.011556	0.032266	0.029886
3.916667	0.011556	0.032954	0.030209
4.000000	0.011556	0.033635	0.031266
4.083333	0.011556	0.034309	0.034001
4.166667	0.011556	0.034974	0.037584
4.250000	0.011556	0.035631	0.041755
4.333333	0.011556	0.036279	0.046370
4.416667	0.011556	0.036918	0.051330
4.500000	0.011556	0.037547	0.056558
4.583333	0.011556	0.038166	0.061995
4.666667	0.011556	0.038775	0.067590
4.750000	0.011556	0.039371	0.073298
4.833333	0.011556	0.039955	0.079082
4.916667	0.011556	0.040526	0.084907
5.000000	0.011556	0.041082	0.091458
5.083333	0.011556	0.041622	0.346033
5.166667	0.011556	0.042143	0.795454
5.250000	0.011556	0.042642	1.309856
5.333333	0.011556	0.043104	1.776045
5.416667	0.011556	0.043536	2.105936
5.500000	0.011556	0.043957	2.296459
5.583333	0.011556	0.044370	2.498964
5.666667	0.011556	0.044774	2.665324
5.750000	0.011556	0.045166	2.821588
5.833333	0.011556	0.045601	2.969398
5.916667	0.011556	0.045987	3.109996
6.000000	0.011556	0.046371	3.244346
6.083333	0.011556	0.046757	3.373213
6.166667	0.011556	0.047142	3.497221
6.250000	0.011556	0.047527	3.616880
6.333333	0.011556	0.047912	3.732620

```
6.416667  0.011556  0.048297  3.844802
6.500000  0.011556  0.048683  3.953736
6.583333  0.011556  0.049068  4.059689
6.666667  0.011556  0.049453  4.162893
END FTABLE  1
FTABLE      2
 81    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
0.000000  0.021627  0.000000  0.000000
0.083333  0.021627  0.000722  0.004406
0.166667  0.021627  0.001443  0.006232
0.250000  0.021627  0.002162  0.007632
0.333333  0.021627  0.002884  0.008813
0.416667  0.021627  0.003605  0.009853
0.500000  0.021627  0.004326  0.010794
0.583333  0.021627  0.005047  0.011658
0.666667  0.021627  0.005767  0.012463
0.750000  0.021627  0.006488  0.013219
0.833333  0.021627  0.008073  0.013934
0.916667  0.021627  0.009654  0.014615
1.000000  0.021627  0.011231  0.015264
1.083333  0.021627  0.012805  0.015888
1.166667  0.021627  0.014376  0.016487
1.250000  0.021627  0.015944  0.017066
1.333333  0.021627  0.017507  0.017626
1.416667  0.021627  0.019067  0.018168
1.500000  0.021627  0.020623  0.018695
1.583333  0.021627  0.022174  0.019207
1.666667  0.021627  0.023720  0.019706
1.750000  0.021627  0.025262  0.020193
1.833333  0.021627  0.026798  0.020668
1.916667  0.021627  0.028329  0.021133
2.000000  0.021627  0.029854  0.021587
2.083333  0.021627  0.031374  0.022032
2.166667  0.021627  0.032887  0.022469
2.250000  0.021627  0.034395  0.022897
2.333333  0.021627  0.035895  0.023317
2.416667  0.021627  0.037389  0.023730
2.500000  0.021627  0.038876  0.024135
2.583333  0.021627  0.040355  0.024534
2.666667  0.021627  0.041826  0.024927
2.750000  0.021627  0.043289  0.025313
2.833333  0.021627  0.044744  0.025694
2.916667  0.021627  0.046190  0.026069
3.000000  0.021627  0.047627  0.026439
3.083333  0.021627  0.049056  0.026803
3.166667  0.021627  0.050474  0.027163
3.250000  0.021627  0.051882  0.027518
3.333333  0.021627  0.053280  0.027869
3.416667  0.021627  0.054668  0.028215
3.500000  0.021627  0.056044  0.028557
3.583333  0.021627  0.057408  0.028895
3.666667  0.021627  0.058761  0.029229
3.750000  0.021627  0.060101  0.029559
3.833333  0.021627  0.061428  0.029886
3.916667  0.021627  0.062741  0.030209
4.000000  0.021627  0.064040  0.031266
4.083333  0.021627  0.065325  0.034001
4.166667  0.021627  0.066594  0.037584
4.250000  0.021627  0.067847  0.041755
4.333333  0.021627  0.069083  0.046370
4.416667  0.021627  0.070301  0.051330
4.500000  0.021627  0.071500  0.056558
4.583333  0.021627  0.072680  0.061995
4.666667  0.021627  0.073839  0.067590
4.750000  0.021627  0.074975  0.073298
4.833333  0.021627  0.076087  0.079082
4.916667  0.021627  0.077174  0.084907
5.000000  0.021627  0.078231  0.091458
```

```
 5.083333  0.021627  0.079257  0.346033
 5.166667  0.021627  0.080246  0.795454
 5.250000  0.021627  0.081190  1.309856
 5.333333  0.021627  0.082063  1.776045
 5.416667  0.021627  0.082874  2.105936
 5.500000  0.021627  0.083666  2.296459
 5.583333  0.021627  0.084442  2.498964
 5.666667  0.021627  0.085201  2.665324
 5.750000  0.021627  0.085936  2.821588
 5.833333  0.021627  0.086707  2.969398
 5.916667  0.021627  0.087428  3.109996
 6.000000  0.021627  0.088147  3.244346
 6.083333  0.021627  0.088869  3.373213
 6.166667  0.021627  0.089590  3.497221
 6.250000  0.021627  0.090311  3.616880
 6.333333  0.021627  0.091032  3.732620
 6.416667  0.021627  0.091753  3.844802
 6.500000  0.021627  0.092474  3.953736
 6.583333  0.021627  0.093195  4.059689
 6.666667  0.021627  0.093915  4.162893
 END FTABLE  2
 FTABLE      3
  91    4
    Depth      Area    Volume  Outflow1 Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
 0.000000  0.000000  0.000000  0.000000
 0.033333  0.000014  0.000000  0.013700
 0.066667  0.000020  0.000001  0.061090
 0.100000  0.000025  0.000002  0.146048
 0.133333  0.000028  0.000003  0.270501
 0.166667  0.000032  0.000004  0.435601
 0.200000  0.000034  0.000005  0.642056
 0.233333  0.000037  0.000006  0.890275
 0.266667  0.000039  0.000007  1.180454
 0.300000  0.000041  0.000008  1.512621
 0.333333  0.000043  0.000010  1.886670
 0.366667  0.000045  0.000011  2.302391
 0.400000  0.000047  0.000013  2.759475
 0.433333  0.000048  0.000014  3.257540
 0.466667  0.000050  0.000016  3.796129
 0.500000  0.000051  0.000018  4.374729
 0.533333  0.000053  0.000020  4.992768
 0.566667  0.000054  0.000021  5.649626
 0.600000  0.000055  0.000023  6.344637
 0.633333  0.000056  0.000025  7.077093
 0.666667  0.000057  0.000027  7.846248
 0.700000  0.000058  0.000029  8.651319
 0.733333  0.000059  0.000031  9.491494
 0.766667  0.000060  0.000033  10.36592
 0.800000  0.000061  0.000035  11.27372
 0.833333  0.000062  0.000037  12.21400
 0.866667  0.000062  0.000039  13.18580
 0.900000  0.000063  0.000041  14.18818
 0.933333  0.000064  0.000043  15.22015
 0.966667  0.000064  0.000045  16.28070
 1.000000  0.000065  0.000047  17.36880
 1.033333  0.000065  0.000050  18.48339
 1.066667  0.000066  0.000052  19.62338
 1.100000  0.000066  0.000054  20.78769
 1.133333  0.000067  0.000056  21.97518
 1.166667  0.000067  0.000058  23.18472
 1.200000  0.000067  0.000061  24.41513
 1.233333  0.000068  0.000063  25.66523
 1.266667  0.000068  0.000065  26.93381
 1.300000  0.000068  0.000067  28.21966
 1.333333  0.000068  0.000070  29.52150
 1.366667  0.000069  0.000072  30.83807
 1.400000  0.000069  0.000074  32.16809
 1.433333  0.000069  0.000077  33.51024
 1.466667  0.000069  0.000079  34.86317
```

```
  1.500000  0.000069  0.000081  36.22555
  1.533333  0.000069  0.000083  37.59597
  1.566667  0.000069  0.000086  38.97305
  1.600000  0.000069  0.000088  40.35534
  1.633333  0.000069  0.000090  41.74141
  1.666667  0.000068  0.000093  43.12977
  1.700000  0.000068  0.000095  44.51891
  1.733333  0.000068  0.000097  45.90730
  1.766667  0.000068  0.000099  47.29338
  1.800000  0.000067  0.000102  48.67555
  1.833333  0.000067  0.000104  50.05220
  1.866667  0.000067  0.000106  51.42166
  1.900000  0.000066  0.000108  52.78223
  1.933333  0.000066  0.000111  54.13218
  1.966667  0.000065  0.000113  55.46973
  2.000000  0.000065  0.000115  56.79306
  2.033333  0.000064  0.000117  58.10030
  2.066667  0.000064  0.000119  59.38954
  2.100000  0.000063  0.000121  60.65878
  2.133333  0.000062  0.000123  61.90599
  2.166667  0.000062  0.000125  63.12906
  2.200000  0.000061  0.000128  64.32580
  2.233333  0.000060  0.000130  65.49393
  2.266667  0.000059  0.000132  66.63109
  2.300000  0.000058  0.000133  67.73480
  2.333333  0.000057  0.000135  68.80246
  2.366667  0.000056  0.000137  69.83135
  2.400000  0.000055  0.000139  70.81854
  2.433333  0.000054  0.000141  71.76096
  2.466667  0.000053  0.000143  72.65530
  2.500000  0.000051  0.000144  73.49798
  2.533333  0.000050  0.000146  74.28511
  2.566667  0.000048  0.000148  75.01243
  2.600000  0.000047  0.000149  75.67516
  2.633333  0.000045  0.000151  76.26796
  2.666667  0.000043  0.000152  76.78469
  2.700000  0.000041  0.000154  77.21818
  2.733333  0.000039  0.000155  77.55987
  2.766667  0.000037  0.000156  77.79922
  2.800000  0.000034  0.000158  77.92280
  2.833333  0.000032  0.000159  77.92280
  2.866667  0.000028  0.000160  77.92280
  2.900000  0.000025  0.000161  77.92280
  2.933333  0.000020  0.000161  77.92280
  2.966667  0.000014  0.000162  77.92280
  3.000000  0.001000  0.000162  77.92280
  END FTABLE  3
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   3 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1003 STAG     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        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        4
PERLND     PWATER AGWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    4

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  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

  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

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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Local (360)943-0304

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Appendix F

Sediment Trap Calculations

TerraVista NW LLC
Consulting Engineers
3204 Smokey Point Dr, Suite 207
Arlington, WA 98223

BMP C240: SEDIMENT TRAP

Tributary Area = 1.76 acres

Q_2 = 0.139 cfs

FS = 2

V_s = 0.00096

$$SA = FS\left(\frac{Q_2}{V_s}\right)$$

$$= 2\left(\frac{0.139}{0.00096}\right)$$

$$= 290 \text{ sf} \Rightarrow 18 \times 18$$

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	7Cs Sed Trap Basin
Site Name:	
Site Address:	
City:	
Report Date:	2/19/2020
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Sed Trap Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Mod	1.76
Pervious Total	1.76
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.76

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Sed Trap Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Lawn, Mod	1.76
Pervious Total	1.76
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.76

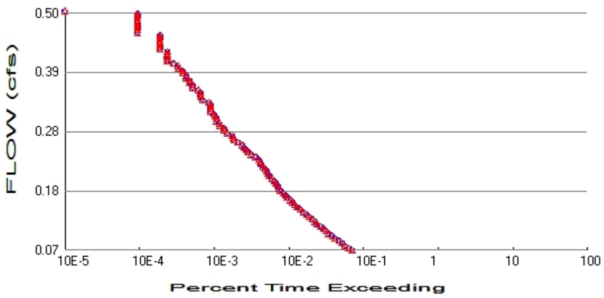
Element Flows To:

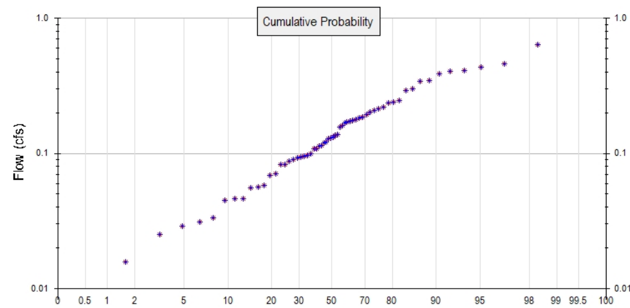
Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.76
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.76
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.139061
5 year	0.269575
10 year	0.351616
25 year	0.442241
50 year	0.499288
100 year	0.547891

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.139061
5 year	0.269575
10 year	0.351616
25 year	0.442241
50 year	0.499288
100 year	0.547891

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.002	0.002
1950	0.167	0.167
1951	0.179	0.179
1952	0.025	0.025
1953	0.033	0.033
1954	0.412	0.412
1955	0.345	0.345
1956	0.171	0.171
1957	0.342	0.342
1958	0.245	0.245

1959	0.203	0.203
1960	0.115	0.115
1961	0.136	0.136
1962	0.083	0.083
1963	0.097	0.097
1964	0.207	0.207
1965	0.128	0.128
1966	0.058	0.058
1967	0.194	0.194
1968	0.120	0.120
1969	0.092	0.092
1970	0.131	0.131
1971	0.236	0.236
1972	0.187	0.187
1973	0.046	0.046
1974	0.221	0.221
1975	0.108	0.108
1976	0.176	0.176
1977	0.096	0.096
1978	0.089	0.089
1979	0.433	0.433
1980	0.031	0.031
1981	0.099	0.099
1982	0.161	0.161
1983	0.113	0.113
1984	0.108	0.108
1985	0.292	0.292
1986	0.388	0.388
1987	0.184	0.184
1988	0.057	0.057
1989	0.068	0.068
1990	0.056	0.056
1991	0.157	0.157
1992	0.088	0.088
1993	0.045	0.045
1994	0.029	0.029
1995	0.083	0.083
1996	0.463	0.463
1997	0.639	0.639
1998	0.094	0.094
1999	0.172	0.172
2000	0.240	0.240
2001	0.016	0.016
2002	0.138	0.138
2003	0.046	0.046
2004	0.070	0.070
2005	0.133	0.133
2006	0.403	0.403
2007	0.299	0.299
2008	0.214	0.214
2009	0.120	0.120

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6391	0.6391
2	0.4627	0.4627
3	0.4330	0.4330

4	0.4116	0.4116
5	0.4030	0.4030
6	0.3883	0.3883
7	0.3449	0.3449
8	0.3424	0.3424
9	0.2992	0.2992
10	0.2924	0.2924
11	0.2450	0.2450
12	0.2395	0.2395
13	0.2360	0.2360
14	0.2210	0.2210
15	0.2137	0.2137
16	0.2071	0.2071
17	0.2026	0.2026
18	0.1936	0.1936
19	0.1867	0.1867
20	0.1841	0.1841
21	0.1786	0.1786
22	0.1764	0.1764
23	0.1724	0.1724
24	0.1708	0.1708
25	0.1668	0.1668
26	0.1609	0.1609
27	0.1567	0.1567
28	0.1376	0.1376
29	0.1355	0.1355
30	0.1327	0.1327
31	0.1305	0.1305
32	0.1282	0.1282
33	0.1204	0.1204
34	0.1199	0.1199
35	0.1148	0.1148
36	0.1126	0.1126
37	0.1084	0.1084
38	0.1081	0.1081
39	0.0989	0.0989
40	0.0967	0.0967
41	0.0957	0.0957
42	0.0940	0.0940
43	0.0924	0.0924
44	0.0895	0.0895
45	0.0875	0.0875
46	0.0828	0.0828
47	0.0828	0.0828
48	0.0703	0.0703
49	0.0683	0.0683
50	0.0582	0.0582
51	0.0567	0.0567
52	0.0557	0.0557
53	0.0465	0.0465
54	0.0459	0.0459
55	0.0450	0.0450
56	0.0331	0.0331
57	0.0310	0.0310
58	0.0291	0.0291
59	0.0250	0.0250
60	0.0158	0.0158
61	0.0015	0.0015

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0695	1495	1495	100	Pass
0.0739	1348	1348	100	Pass
0.0782	1195	1195	100	Pass
0.0826	1103	1103	100	Pass
0.0869	1005	1005	100	Pass
0.0912	878	878	100	Pass
0.0956	809	809	100	Pass
0.0999	725	725	100	Pass
0.1043	665	665	100	Pass
0.1086	616	616	100	Pass
0.1129	570	570	100	Pass
0.1173	509	509	100	Pass
0.1216	479	479	100	Pass
0.1260	437	437	100	Pass
0.1303	397	397	100	Pass
0.1346	368	368	100	Pass
0.1390	332	332	100	Pass
0.1433	301	301	100	Pass
0.1477	276	276	100	Pass
0.1520	255	255	100	Pass
0.1564	241	241	100	Pass
0.1607	224	224	100	Pass
0.1650	203	203	100	Pass
0.1694	190	190	100	Pass
0.1737	181	181	100	Pass
0.1781	165	165	100	Pass
0.1824	156	156	100	Pass
0.1867	150	150	100	Pass
0.1911	143	143	100	Pass
0.1954	135	135	100	Pass
0.1998	128	128	100	Pass
0.2041	116	116	100	Pass
0.2084	111	111	100	Pass
0.2128	108	108	100	Pass
0.2171	102	102	100	Pass
0.2215	95	95	100	Pass
0.2258	89	89	100	Pass
0.2301	87	87	100	Pass
0.2345	84	84	100	Pass
0.2388	77	77	100	Pass
0.2432	67	67	100	Pass
0.2475	60	60	100	Pass
0.2519	57	57	100	Pass
0.2562	53	53	100	Pass
0.2605	51	51	100	Pass
0.2649	44	44	100	Pass
0.2692	39	39	100	Pass
0.2736	38	38	100	Pass
0.2779	37	37	100	Pass
0.2822	32	32	100	Pass
0.2866	29	29	100	Pass
0.2909	29	29	100	Pass
0.2953	25	25	100	Pass

0.2996	25	25	100	Pass
0.3039	23	23	100	Pass
0.3083	23	23	100	Pass
0.3126	22	22	100	Pass
0.3170	21	21	100	Pass
0.3213	19	19	100	Pass
0.3256	19	19	100	Pass
0.3300	19	19	100	Pass
0.3343	19	19	100	Pass
0.3387	18	18	100	Pass
0.3430	15	15	100	Pass
0.3474	14	14	100	Pass
0.3517	14	14	100	Pass
0.3560	14	14	100	Pass
0.3604	13	13	100	Pass
0.3647	11	11	100	Pass
0.3691	11	11	100	Pass
0.3734	10	10	100	Pass
0.3777	10	10	100	Pass
0.3821	9	9	100	Pass
0.3864	9	9	100	Pass
0.3908	8	8	100	Pass
0.3951	8	8	100	Pass
0.3994	7	7	100	Pass
0.4038	7	7	100	Pass
0.4081	6	6	100	Pass
0.4125	5	5	100	Pass
0.4168	5	5	100	Pass
0.4212	5	5	100	Pass
0.4255	5	5	100	Pass
0.4298	5	5	100	Pass
0.4342	4	4	100	Pass
0.4385	4	4	100	Pass
0.4429	4	4	100	Pass
0.4472	4	4	100	Pass
0.4515	4	4	100	Pass
0.4559	4	4	100	Pass
0.4602	4	4	100	Pass
0.4646	2	2	100	Pass
0.4689	2	2	100	Pass
0.4732	2	2	100	Pass
0.4776	2	2	100	Pass
0.4819	2	2	100	Pass
0.4863	2	2	100	Pass
0.4906	2	2	100	Pass
0.4949	2	2	100	Pass
0.4993	2	2	100	Pass

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
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

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   7Cs Sed Trap Basin.wdm
MESSU      25   Pre7Cs Sed Trap Basin.MES
           27   Pre7Cs Sed Trap Basin.L61
           28   Pre7Cs Sed Trap Basin.L62
           30   POC7Cs Sed Trap Basin1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Sed Trap Basin             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           ***
   26     SAT, Lawn, Mod          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 ***
   26         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  *********
   26         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 ***
   26         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
   26              0         4         1       100      0.01       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26              0         0        10         2         0         0      0.35
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26            0.1         3       0.5         1       0.7       0.4
  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
   26              0         0         0         0       4.2         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#   ***
Sed Trap Basin***
PERLND  26                        1.76     COPY   501     12
PERLND  26                        1.76     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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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   7Cs Sed Trap Basin.wdm
MESSU      25   Mit7Cs Sed Trap Basin.MES
           27   Mit7Cs Sed Trap Basin.L61
           28   Mit7Cs Sed Trap Basin.L62
           30   POC7Cs Sed Trap Basin1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Sed Trap Basin              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           ***
   26     SAT, Lawn, Mod          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 ***
   26         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  *********
   26         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 ***
   26         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
   26             0         4         1       100      0.01       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26             0         0        10         2         0         0      0.35
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26           0.1         3       0.5         1       0.7       0.4
  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
   26             0         0         0         0       4.2         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#   ***
Sed Trap Basin***
PERLND  26                        1.76     COPY   501     12
PERLND  26                        1.76     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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              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

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     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       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
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

Appendix G

Backwater Analysis Calculations & Contributary Area Map

Culvert Report

Basin 1, CB-6 Backwater Analysis

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 19 2020

Circular Culvert

Invert Elev Dn (ft)	= 409.00
Pipe Length (ft)	= 2.00
Slope (%)	= 0.00
Invert Elev Up (ft)	= 409.00
Rise (in)	= 8.0
Shape	= Circular
Span (in)	= 8.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

Top Elevation (ft)	= 414.00
Top Width (ft)	= 0.00
Crest Width (ft)	= 0.00

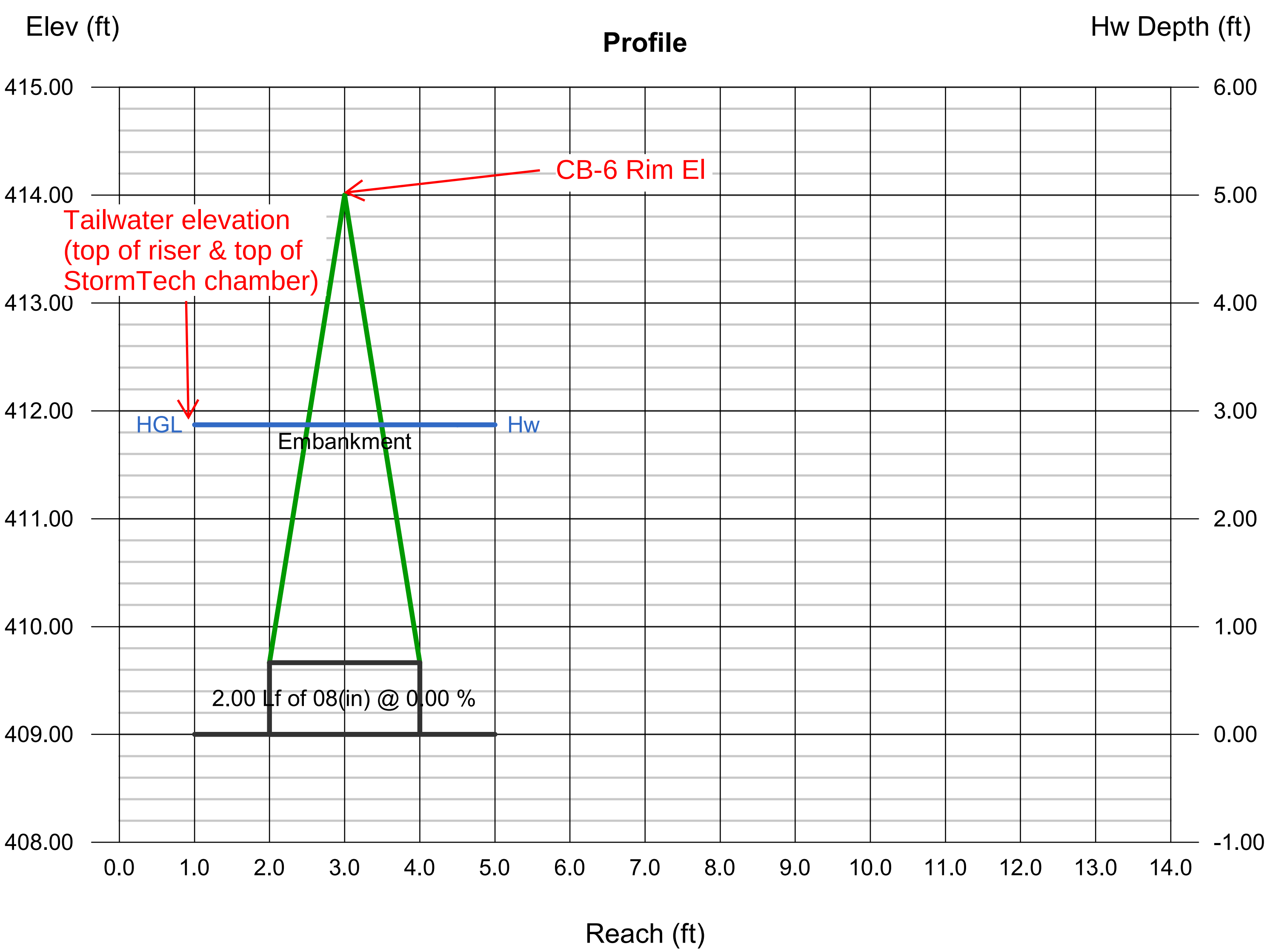
CB-6 Rim El

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 0.35
Tailwater Elev (ft)	= 411.87

Highlighted

Qtotal (cfs)	= 0.03
Qpipe (cfs)	= 0.03
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.09
Veloc Up (ft/s)	= 0.09
HGL Dn (ft)	= 411.87
HGL Up (ft)	= 411.87
Hw Elev (ft)	= 411.87
Hw/D (ft)	= 4.31
Flow Regime	= Outlet Control



Culvert Report

Basin 2, CB-8 Backwater Analysis

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 19 2020

Circular Culvert

Invert Elev Dn (ft)	= 420.00
Pipe Length (ft)	= 12.00
Slope (%)	= 7.08
Invert Elev Up (ft)	= 420.85
Rise (in)	= 8.0
Shape	= Circular
Span (in)	= 8.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

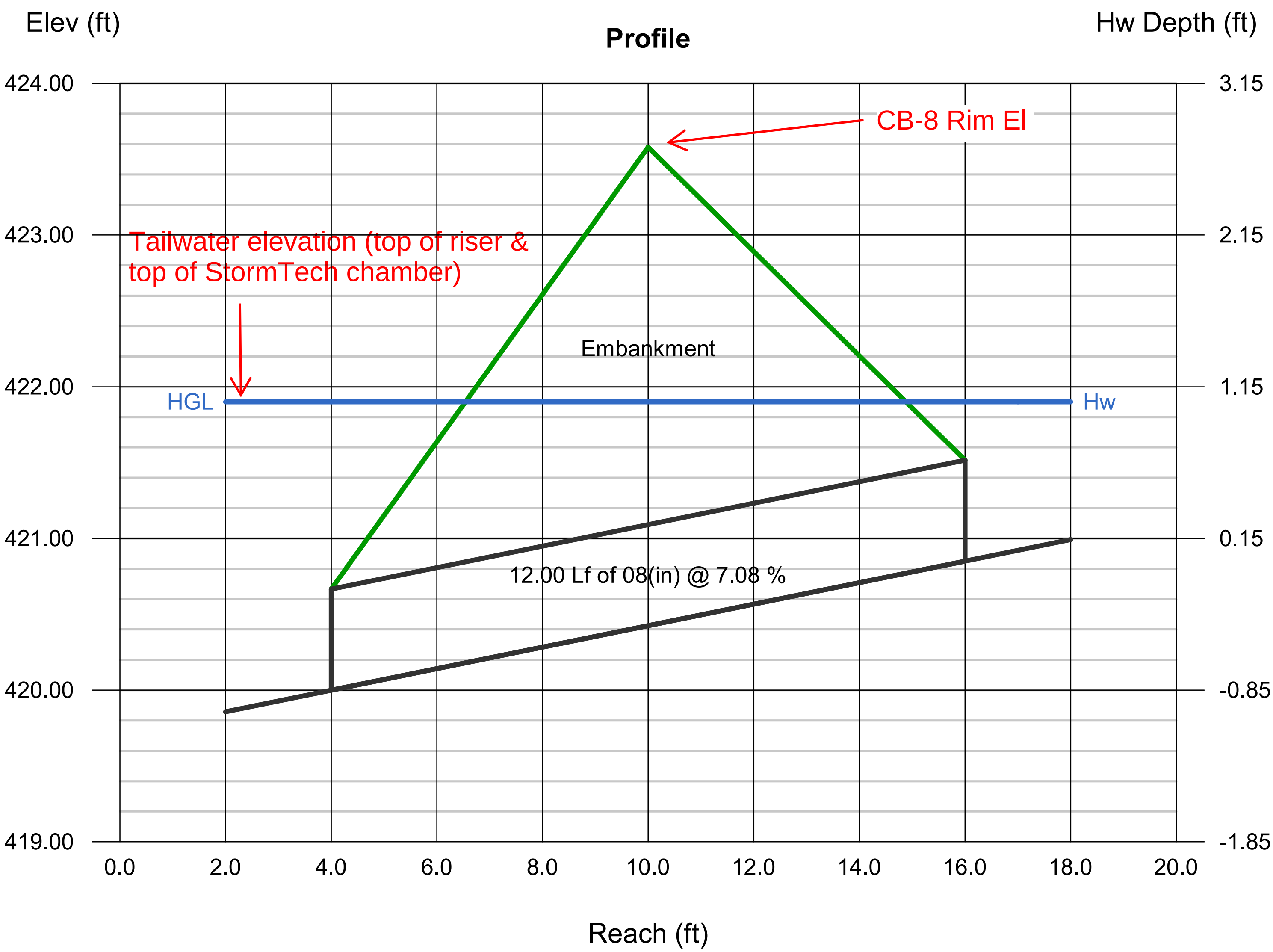
Top Elevation (ft)	= 423.58 CB-8 Rim El
Top Width (ft)	= 0.00
Crest Width (ft)	= 0.00

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 0.18
Tailwater Elev (ft)	= 421.9

Highlighted

Qtotal (cfs)	= 0.02
Qpipe (cfs)	= 0.02
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.06
Veloc Up (ft/s)	= 0.06
HGL Dn (ft)	= 421.90
HGL Up (ft)	= 421.90
Hw Elev (ft)	= 421.90
Hw/D (ft)	= 1.58
Flow Regime	= Outlet Control



Culvert Report

Basin 3, CB-9 Backwater Analysis

Circular Culvert

Invert Elev Dn (ft)	= 419.50
Pipe Length (ft)	= 10.00
Slope (%)	= 22.00
Invert Elev Up (ft)	= 421.70
Rise (in)	= 8.0
Shape	= Circular
Span (in)	= 8.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

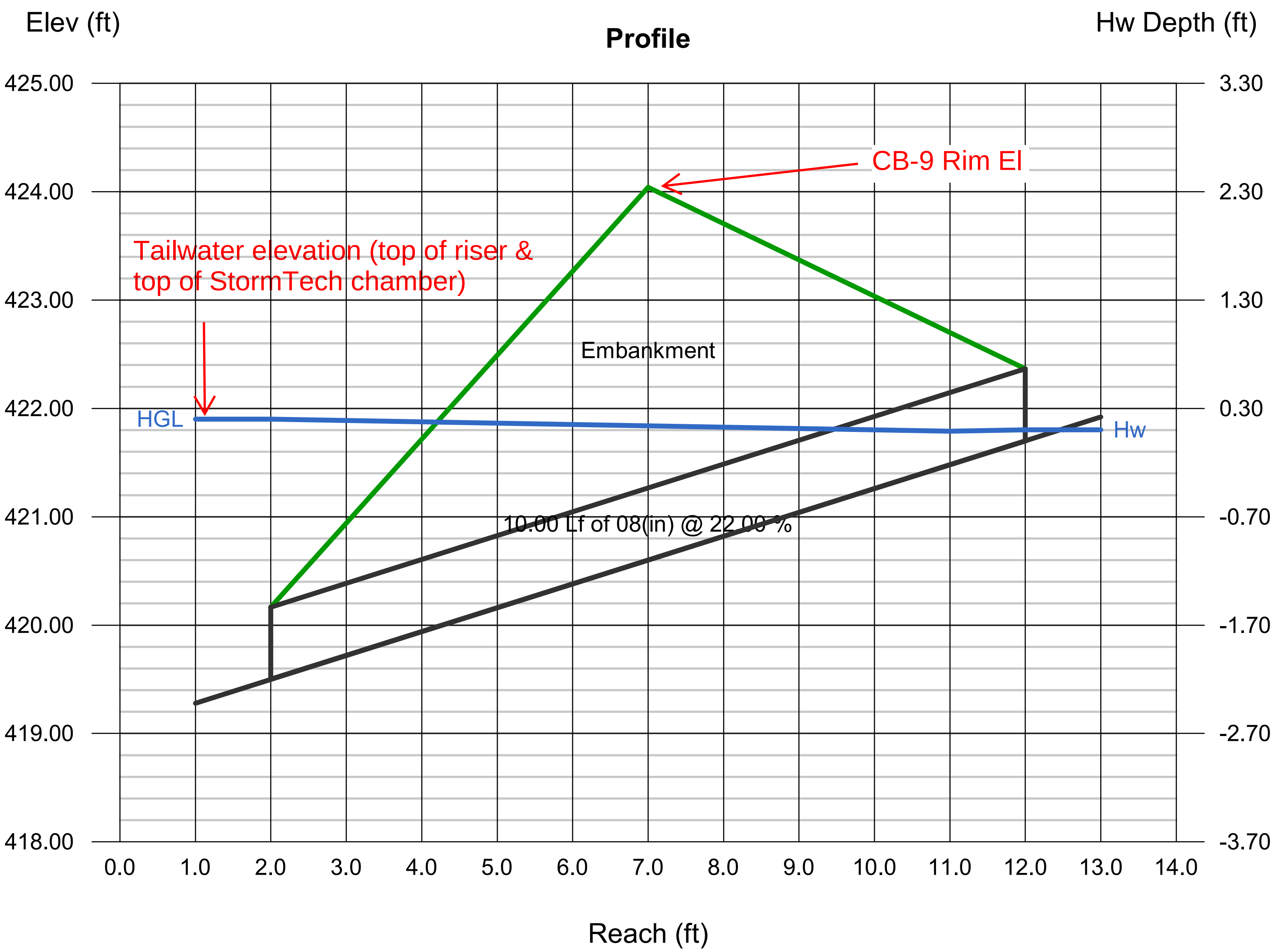
Top Elevation (ft)	= 424.04 CB-9 Rim El
Top Width (ft)	= 0.00
Crest Width (ft)	= 0.00

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 0.27
Tailwater Elev (ft)	= 421.9

Highlighted

Qtotal (cfs)	= 0.03
Qpipe (cfs)	= 0.03
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.09
Veloc Up (ft/s)	= 1.31
HGL Dn (ft)	= 421.90
HGL Up (ft)	= 421.78
Hw Elev (ft)	= 421.80
Hw/D (ft)	= 0.15
Flow Regime	= Inlet Control



Culvert Report

Basin 4, CB-12 Backwater Analysis

Circular Culvert

Invert Elev Dn (ft)	= 413.00
Pipe Length (ft)	= 31.00
Slope (%)	= 6.52
Invert Elev Up (ft)	= 415.02
Rise (in)	= 8.0
Shape	= Circular
Span (in)	= 8.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

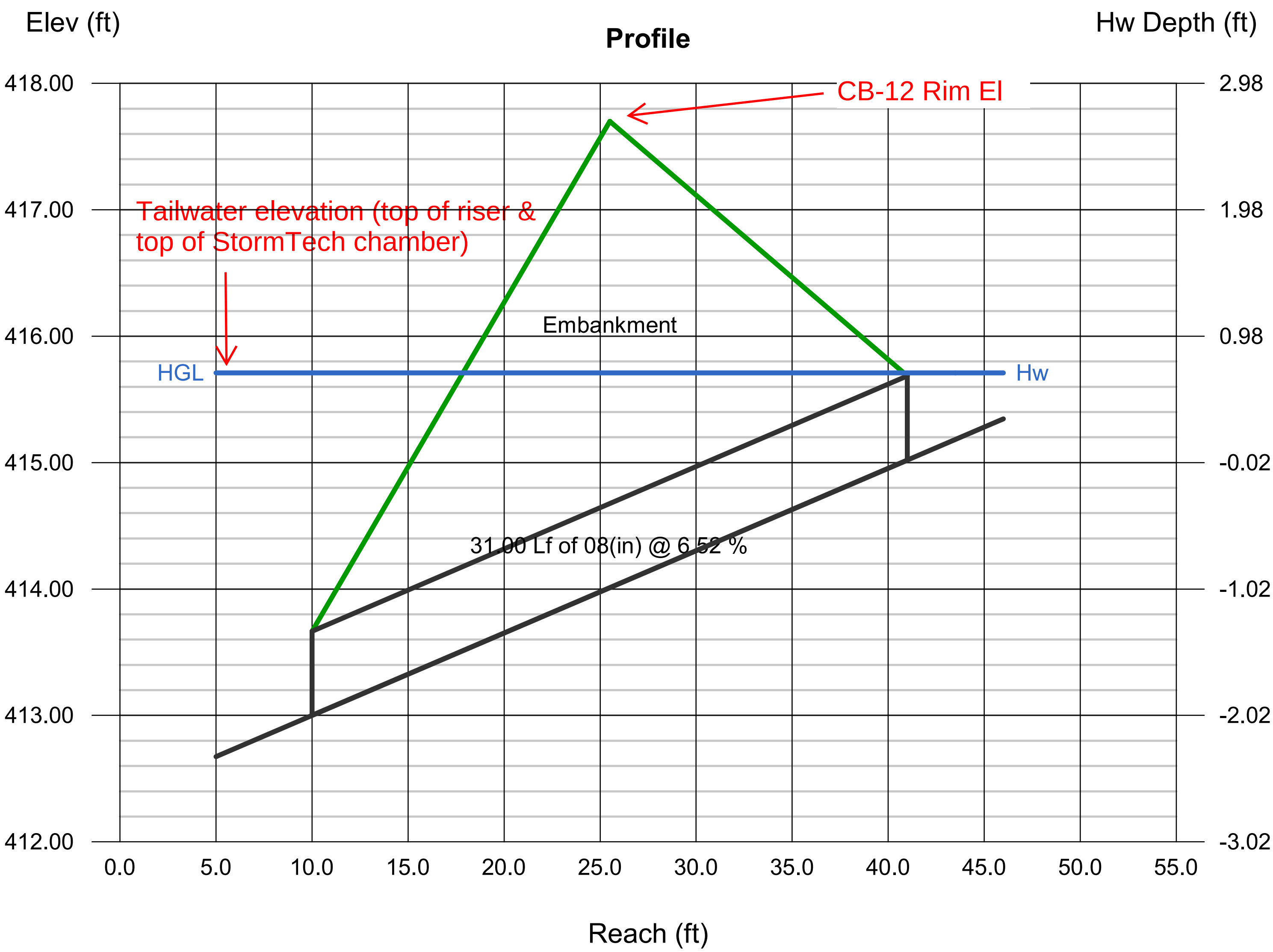
Top Elevation (ft)	= 417.70 CB-12 Rim El
Top Width (ft)	= 0.00
Crest Width (ft)	= 0.00

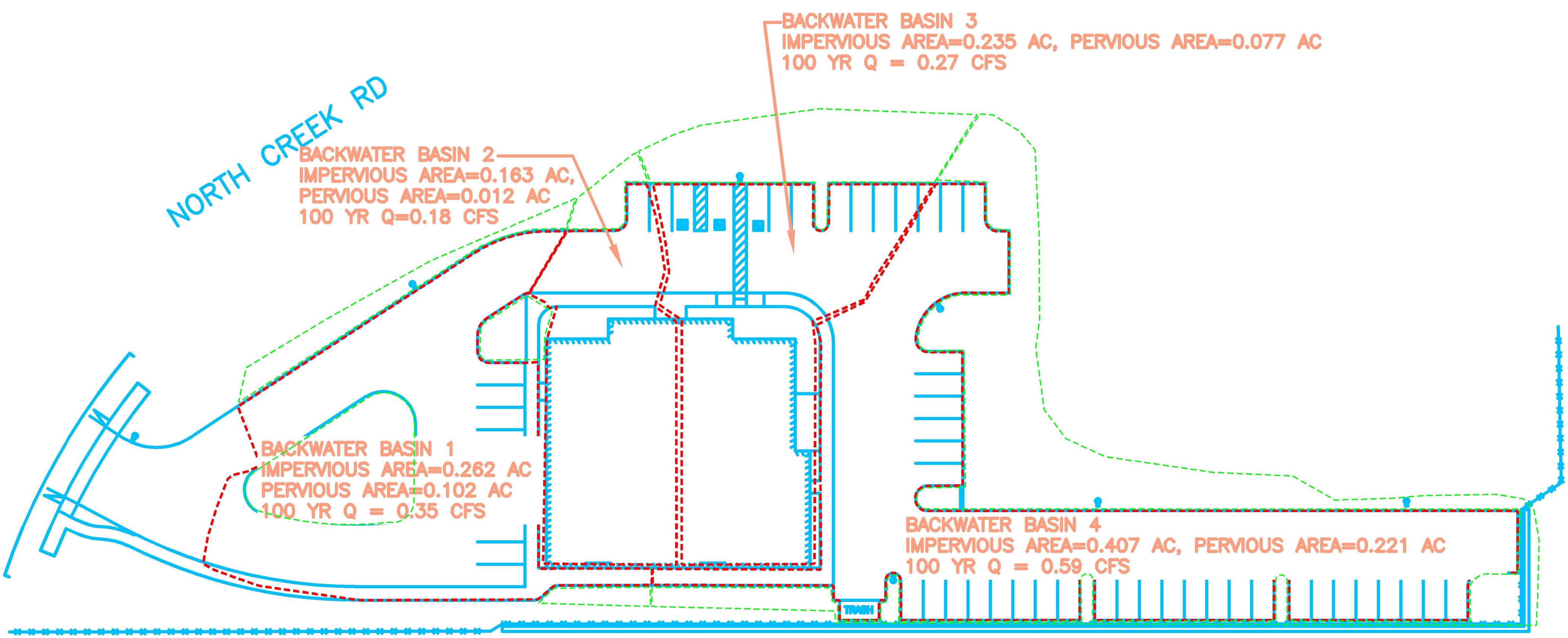
Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 0.59
Tailwater Elev (ft)	= 415.71

Highlighted

Qtotal (cfs)	= 0.04
Qpipe (cfs)	= 0.04
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.11
Veloc Up (ft/s)	= 0.11
HGL Dn (ft)	= 415.71
HGL Up (ft)	= 415.71
Hw Elev (ft)	= 415.71
Hw/D (ft)	= 1.04
Flow Regime	= Outlet Control




NORTH CREEK RD
BACKWATER BASIN 1
IMPERVIOUS AREA=0.262 AC
PERVIOUS AREA=0.102 AC
100 YR Q = 0.35 CFS
BACKWATER BASIN 2
IMPERVIOUS AREA=0.163 AC,
PERVIOUS AREA=0.012 AC
100 YR Q=0.18 CFS
BACKWATER BASIN 3
IMPERVIOUS AREA=0.235 AC, PERVIOUS AREA=0.077 AC
100 YR Q = 0.27 CFS
BACKWATER BASIN 4
IMPERVIOUS AREA=0.407 AC, PERVIOUS AREA=0.221 AC
100 YR Q = 0.59 CFS
TRASH

Appendix H

Off-Site Basin Map (Fig. 3) & Mill Creek Basin Map

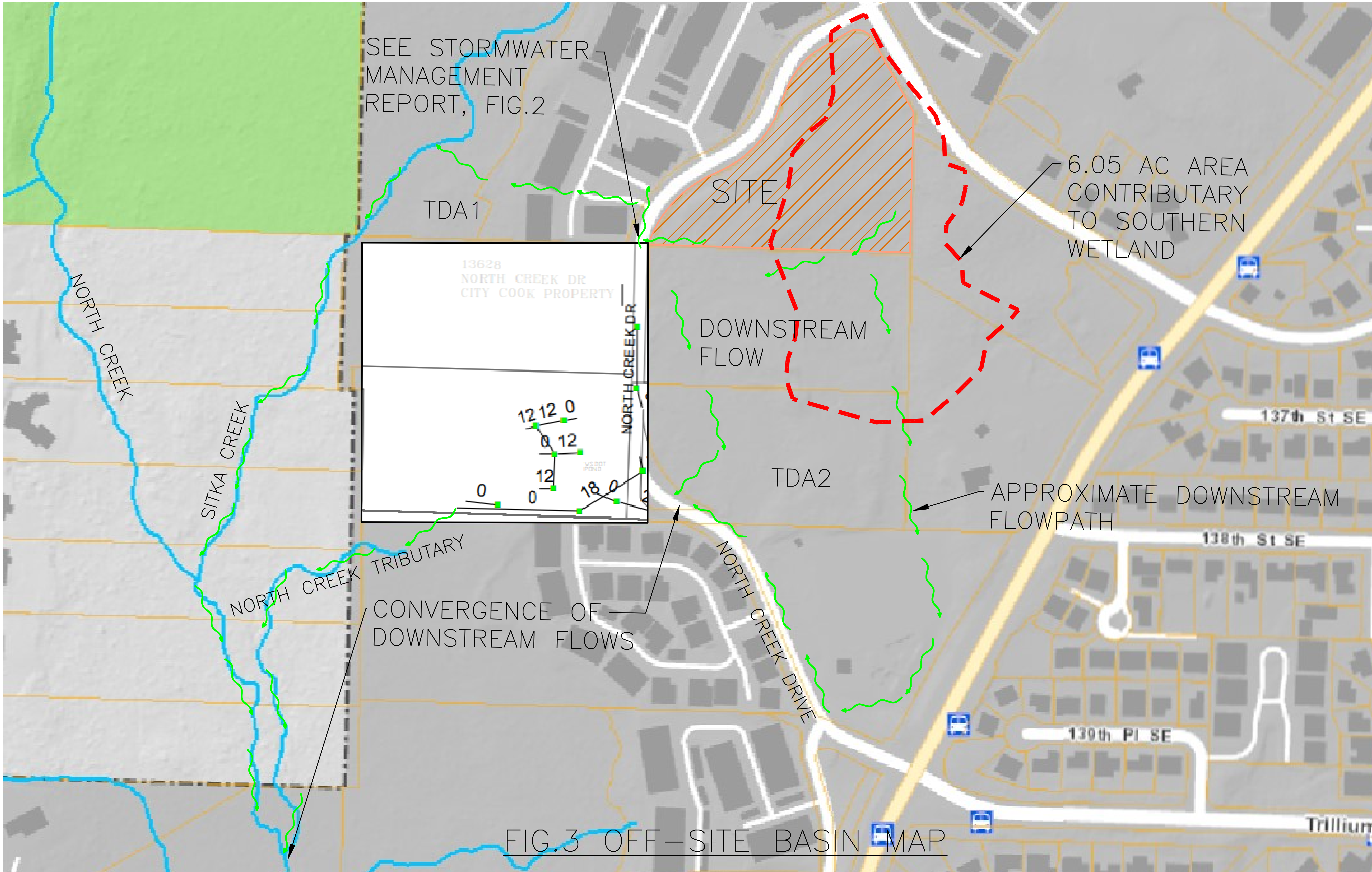
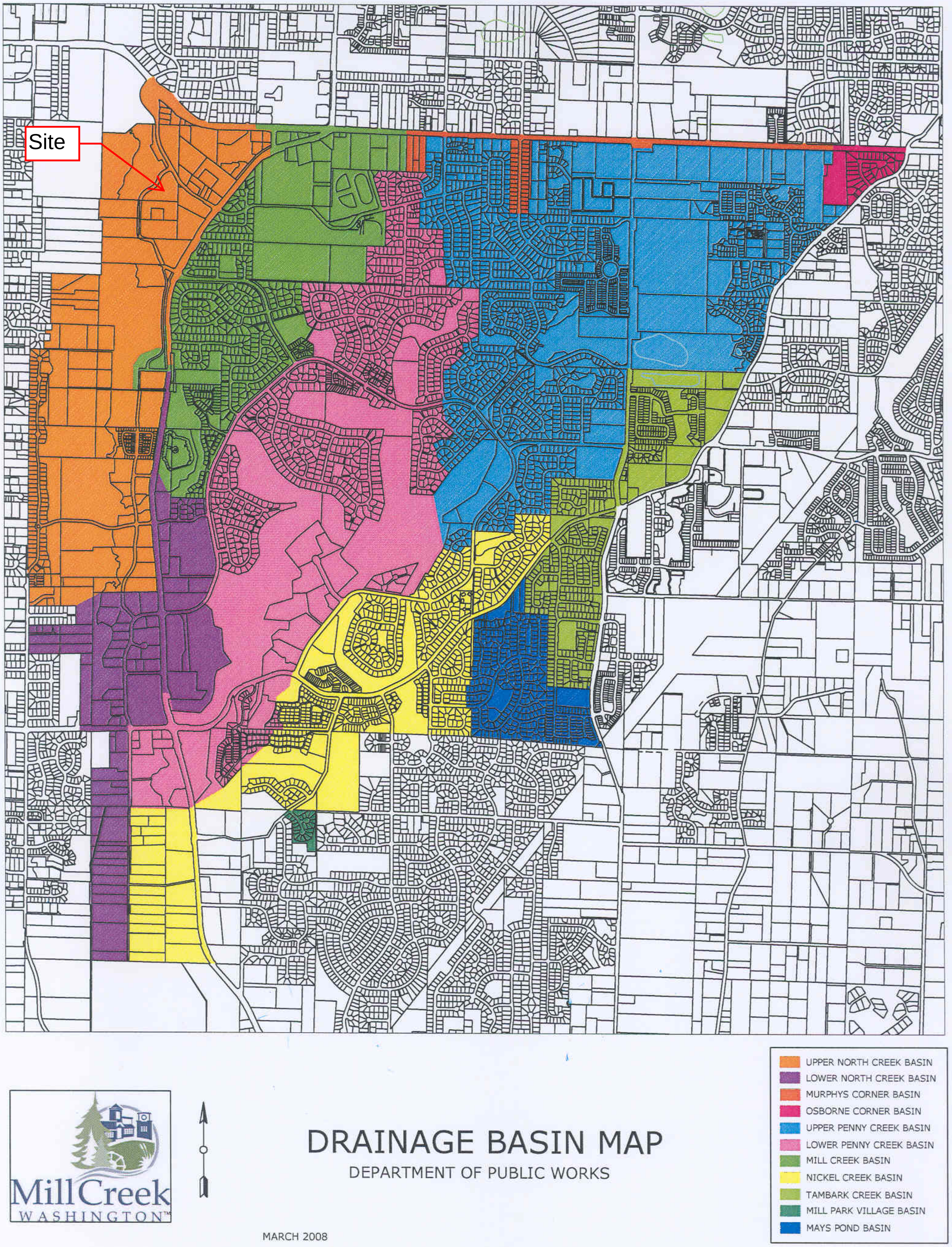


FIG.3 OFF-SITE BASIN MAP



DRAINAGE BASIN MAP

DEPARTMENT OF PUBLIC WORKS

MARCH 2008

Appendix I

Lift Station Wet Well Calculations, Total Dynamic Head (TDH) Calculations, & Pump Specifications

TC'S WET WELL CALCULATIONS

TerraVista NW LLC
Consulting Engineers
3204 Smokey Point Dr, Suite 207
Arlington, WA 98223

Q_{IN} = 40.8 GPM

V_{MIN} = MINIMUM STORAGE OF WET WELL

T_{MIN} = MINIMUM CYCLE TIME BETWEEN PUMP STARTS

* ACCORDING TO HD FOWLER, MINIMUM CYCLE TIME OF 60 SECONDS AND MAXIMUM 8 STARTS PER HOUR

$\underline{T_{MIN}}$: $1\ HR - (8)(60\ SEC) = 52\ MIN \rightarrow \frac{52}{8} = \underline{6.5\ MIN}$

$\underline{V_{MIN}} = T_{MIN}\, Q_{IN} = (6.5)(40.8) = \underline{265.5\ GAL}\ (35.5\ CF)$

H_{MIN} = DISTANCE BETWEEN PUMPS "OFF" AND LEAD PUMP "ON" ELEVATION

$H_{MIN} = V_{MIN} / A$ $\qquad$ V_{MIN} (CF)
$\qquad\qquad\qquad\qquad\qquad$ A (SF)

A = CROSS SECTIONAL AREA OF WET WELL (SF)

* 72" TYPE 2, A = 28.3 SF

$\underline{H_{MIN}} = 35.5 / 28.3 = 1.25 \rightarrow$ USE $\underline{2\ FEET}$

7C'S WET WELL CALCULATIONS

TerraVista NW LLC
Consulting Engineers
3204 Smokey Point Dr, Suite 207
Arlington, WA 98223

H_{LAG} = DIFFERENCE IN ELEVATION BETWEEN LAG PUMP "ON" AND LEAD PUMP "ON"

H_{LAG} = 0.5 FEET IS RECOMMENDED

H_{RES} = DIFFERENCE IN ELEVATION BETWEEN INLET INVERT AND LAG PUMP "ON"

H_{RES} = 1.0 FEET IS RECOMMENDED

STATIC HEAD (ΔH)

ΔH = DISCHARGE INVERT − (INLET INVERT − H_{RES} − H_{LAG} − H_{MIN})

$\Delta H = 418.00 - (410.51 - 1.0 - 0.5 - 2.0) = 10.99$ FEET → **11 FEET**

1. Static Head 11 Feet

2. Friction Head: 0.03352960000000

Calculate Friction Head

a. Discharge Pipe Length 30 Feet

b. Friction Factors of Fitting and Valves *See Table A

Fitting	Size	Equivalent Length	Qty	Total
90's	2	9	5	45
45's	Select	0	0	0
Tees	Select	0	0	0
Check Valve	2	17	1	17
Gate Valve	2	2	1	2
Union	2	2	5	10
		Total Equivalent Length: (Feet)		74

Pipe Length 30 **Ft. + Equivalent Length** 74 **Ft./100=** 1.04 **100-foot Increments**

c. Friction Head per 100' 1.04 Pipe at GPM (from Table B) 3.224 Feet

Friction Head [Feet] 0.033529600000

3. Static Head 11 **ft. + Friction Head** 0.033529600000 **ft. = Total Dynamic Head** 11.0335296

Enter in TDH box on Design Guide

NOTE:
The frictional losses in the discharge pipe are fairly negligible compared to the static head.

SOURCE:
https://sthinc.com/engineering/sump-sewage-pump-design-guide/calculate-total-dynamic-head/

STORM PUMPS
GOULDS PUMP
5 PAGES

xylem
Let's Solve Water

TECHNICAL BROCHURE
B3886 R3

WS_B Series

Model 3886

BUILT IN THE USA
ENGINEERED, ASSEMBLED & TESTED

SUBMERSIBLE SEWAGE PUMP

GOULDS WATER TECHNOLOGY
a xylem brand

FEATURES

Impeller: Cast iron, semi-open, dynamically balanced, non-clog with pump out vanes for mechanical seal protection. Optional Silicon bronze impeller available.

Casing: Cast iron volute type for maximum efficiency. Designed for easy installation on A10-20 guide rail or base elbow rail systems.

Mechanical Seal: SILICON CARBIDE VS. SILICON CARBIDE sealing faces for superior abrasive resistance, stainless steel metal parts, BUNA-N elastomers.

Shaft: Corrosion-resistant stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.

Fasteners: 300 series stainless steel.

Capable of running dry without damage to components.

Designed for continuous operation when fully submerged.

EXTENDED WARRANTY AVAILABLE FOR RESIDENTIAL APPLICATIONS.

AGENCY LISTINGS

C US

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association
File #LR38549

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Sewage systems
- Dewatering/Effluent
- Water transfer

SPECIFICATIONS

Pump

- Solids handling capabilities: 2" maximum
- Discharge size: 2" NPT
- Capacities: up to 185 GPM
- Total heads: up to 38 feet TDH
- Temperature: 104°F (40°C) continuous, 140°F (60°C) intermittent

MOTORS

- Fully submerged in high grade turbine oil for lubrication and efficient heat transfer. All ratings are within the working limits of the motor.
- Class B insulation

Single phase (60 Hz):

- All single phase models feature capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ – 1 HP models have NEMA three prong grounding plugs.

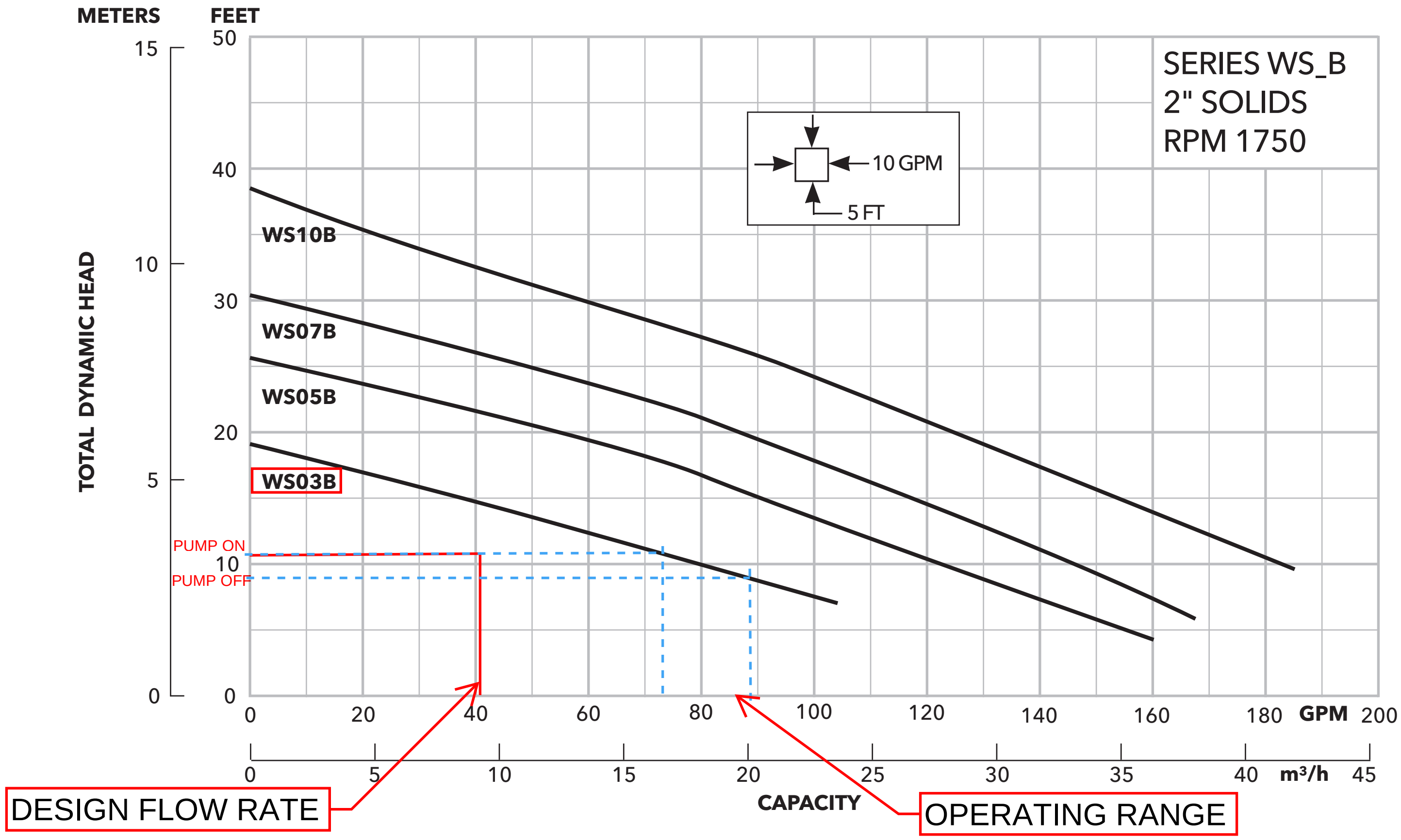
Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.

- **Bearings:** Upper and lower heavy duty ball bearing construction.
- **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- **Motor Cover O-ring:** Assures positive sealing against contaminants and oil leakage.

MODELS

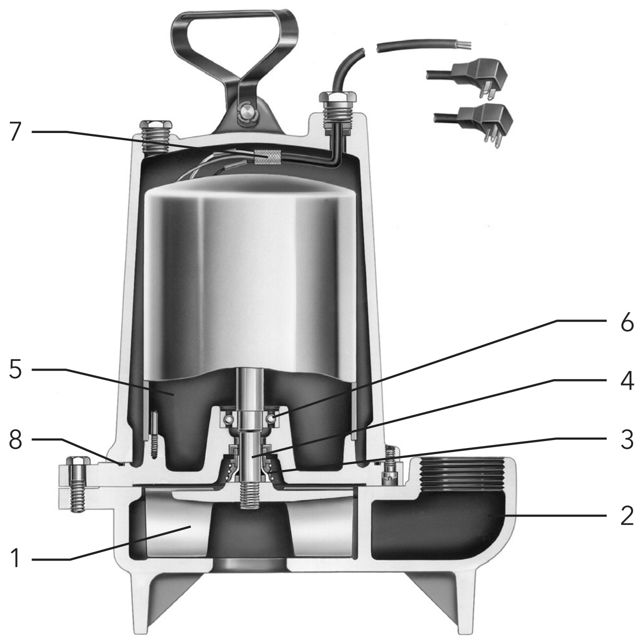
Order Number	HP	Phase	Volts	RPM	Impeller Diameter (in.)	Maximum Amps	Locked Rotor Amps	KVA Code	Full Load Efficiency	Resistance		Weight (lbs.)
										Start	Line-Line	
WS0311B	0.33	1	115	1750	4.69	10.7	30.0	M	54	11.9	1.7	63
WS0318B			208			6.8	19.5	K	51	9.1	4.2	
WS0312B			230			4.9	14.1	L	53	14.5	8.0	
WS0511B	0.5		115		5.00	14.5	31.1	J	55	9.3	1.4	65
WS0518B			208			8.0	19.5	K	51	9.1	4.2	
WS0512B			230			7.3	16.5	J	54	11.7	5.6	
WS0538B		3	200			3.8	12.3	K	75	NA	6.7	
WS0532B			230			3.3	9.7	K	75	NA	9.9	
WS0534B			460			1.7	4.9	K	75	NA	39.4	
WS0537B			575			1.4	4.3	K	68	NA	47.8	
WS0718B	0.75	1	208		5.38	11.0	39.0	K	65	2.6	1.4	85
WS0712B			230			9.4	24.8	J	57	4.8	2.3	
WS0738B		3	200			4.1	21.2	H	74	NA	4.3	
WS0732B			230			3.6	17.3	J	76	NA	5.6	
WS0734B			460			1.8	8.9	J	76	NA	22.4	
WS0737B			575			1.5	7.3	J	71	NA	29.2	
WS1018B	1	1	208		5.75	14.0	39.0	K	65	2.6	1.4	
WS1012B			230			12.3	30.5	H	60	4.3	1.8	
WS1038B		3	200			6.0	21.2	H	74	NA	4.3	
WS1032B			230			5.8	17.3	J	76	NA	5.6	
WS1034B			460			2.9	8.9	J	76	NA	22.4	
WS1037B			575			2.4	7.3	J	71	NA	29.2	



COMPONENTS *(for reference only)*

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring

NOTE: *For specific parts breakdown, see repair parts.*

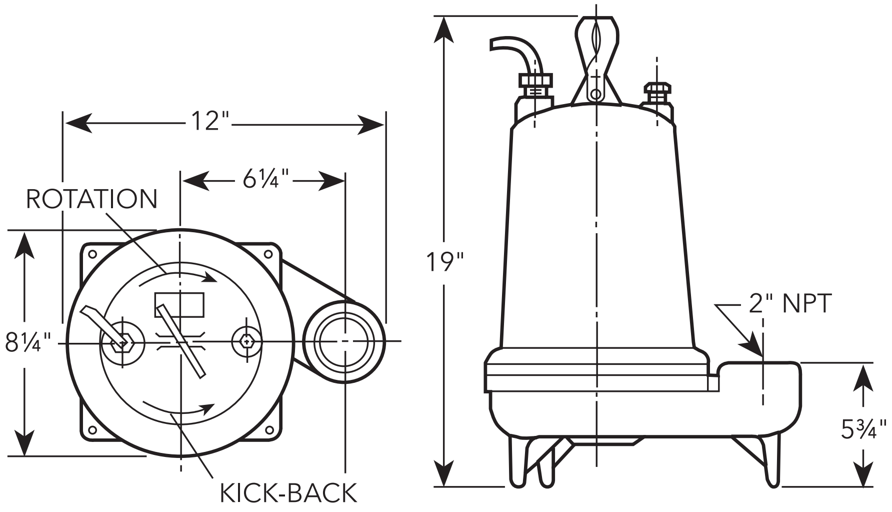


PERFORMANCE RATINGS (gallons per minute)

Order No.		WS03B	WS05B	WS07B	WS10B
	HP	⅓	½	¾	1
	RPM	1750	1750	1750	1750
Total Head Feet of Water	10	80	122	145	183
	15	36	90	116	152
	20	–	50	86	123
	25	–	–	48	95
	30	–	–	–	58
	35	–	–	–	20

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



NOTE: ALL DIMENSIONS ARE IN INCHES.

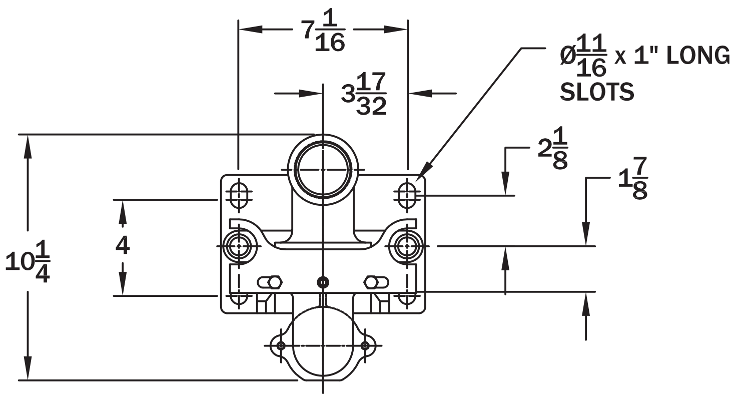
MATERIALS OF CONSTRUCTION:

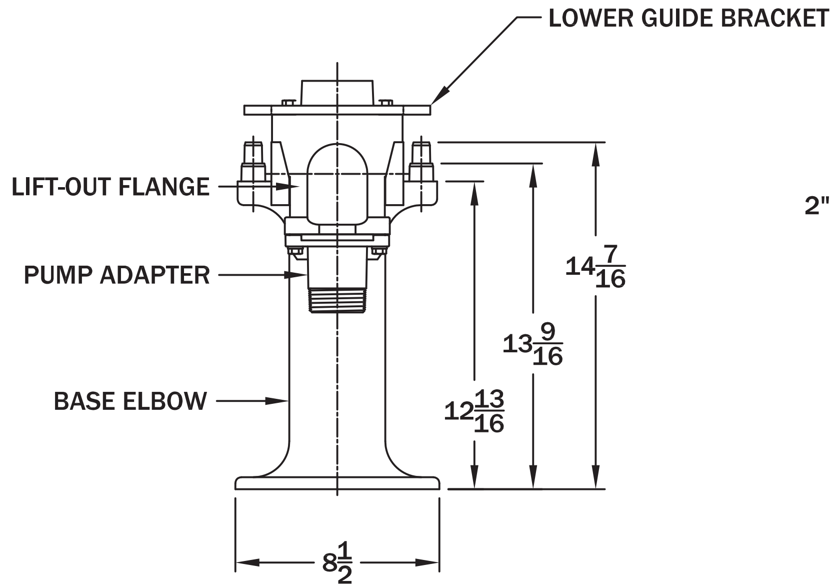
- PUMP ADAPTER: 304 SST
- BASE ELBOW: CAST DUCTILE IRON
- LIFT-OUT FLANGE: CAST DUCTILE IRON
- LOWER GUIDE BRACKET: 304 SST
- ALL FASTENERS ARE 304 SERIES SST
- USABLE RAIL SIZES: $\frac{3}{4}$" & 1"
- MAXIMUM WEIGHT ALLOWANCE: 250 lbs

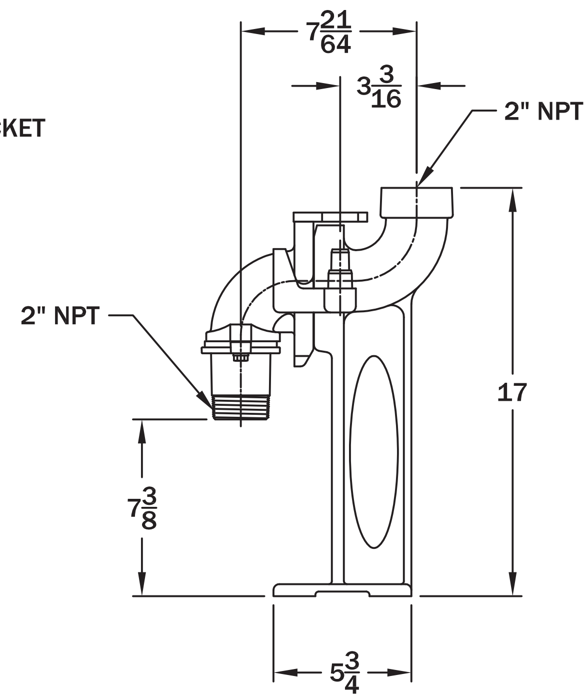
BERS-0200

PAGE 1

GUIDE RAIL ASSEMBLY
CONERY
MANUFACTURING
2 PAGES







CONERY MFG INC

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	03/05/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

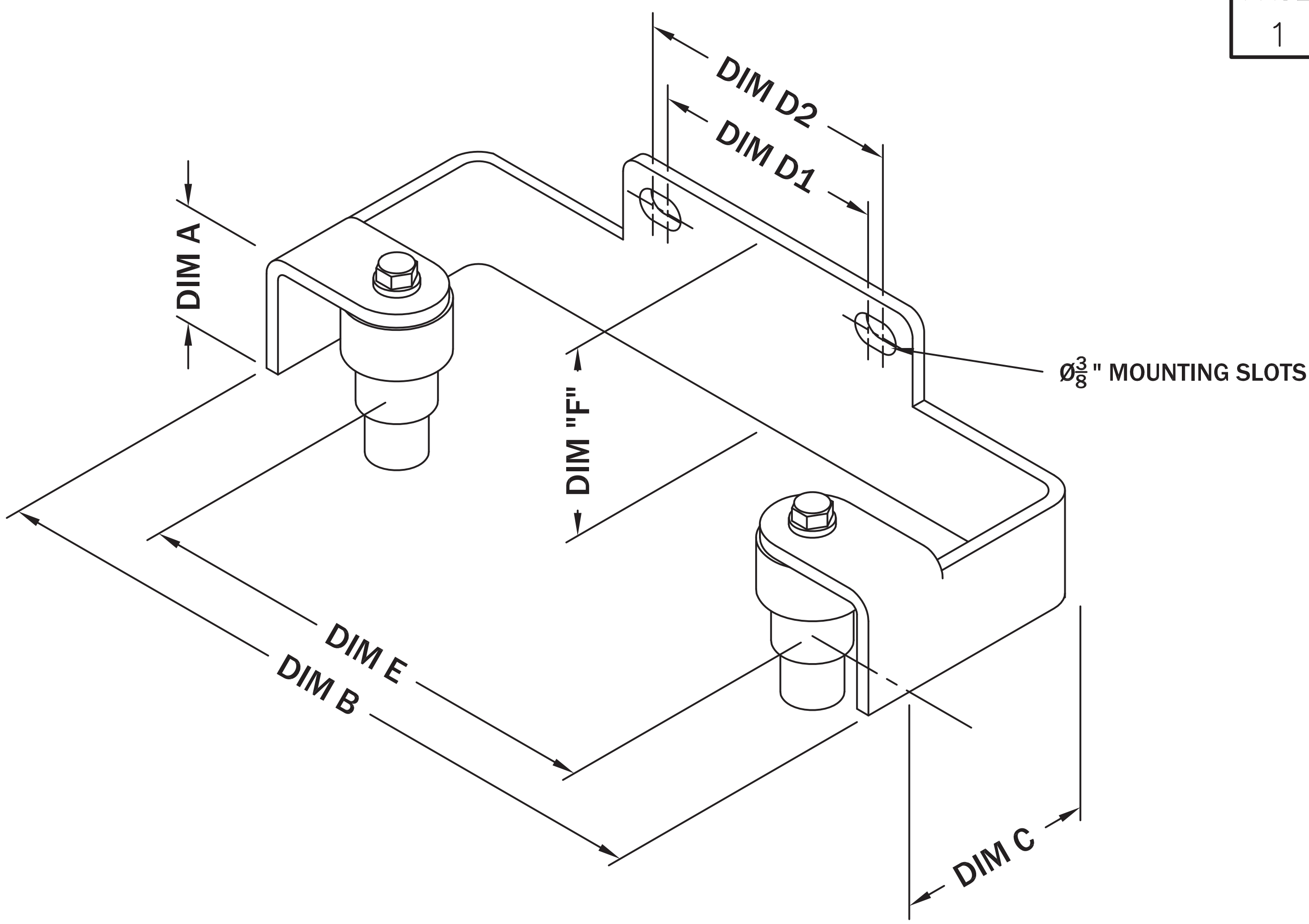
SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE:	PART NO.
1/8	2" LIFT OUT DIM

NOTE: BRACKET CAN BE USED FOR ~~$\frac{3}{4}$~~", $\boxed{1"}$, ~~$1\frac{1}{4}$~~" GUIDE RAILS.

GUIDE BRACKET

PAGE
1



MODEL NO.	DIA. "A"	DIM "B"	DIM "C"	DIM "D1 + D2"	DIM "E"	DIM "F"
UGB–STNLS	1 3/4"	10 1/8"	2 11/16"	2 7/8"–3 7/8"	7"	2 3/4"

CONERY MFG INC

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	03/22/04
E			MATERIAL SPECIFICATION: 300 SERIES SST	
D				
C				
B				
A				

SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE:	PART NO.
NONE	GUIDE BRACKET

MODEL 122 Control Panel

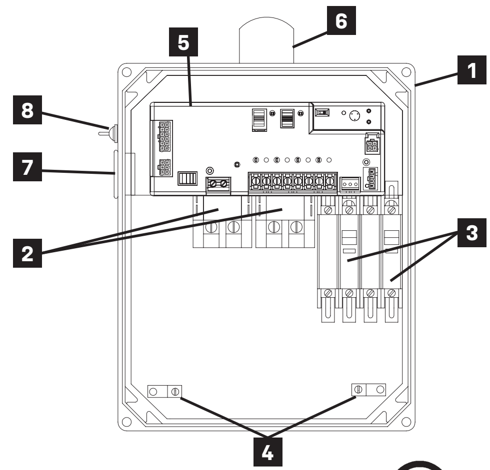
Single phase, duplex alternating pump control with override.

The Model 122 control panel is designed to alternately control two 120, 208, or 240 VAC single phase pumps in water and sewage installations. The controller is provided with a pump selector switch that can be set to alternate the pumps to equalize wear or to call either pump to activate first with the other pump to activate in lag condition. If an alarm occurs, the alarm activates the audible-visual system. The alarm conditions include: high water, float out-of-sequence, pump fail-to-run, seal failure (optional). Common applications include: lift stations, pump chambers, and irrigation systems.

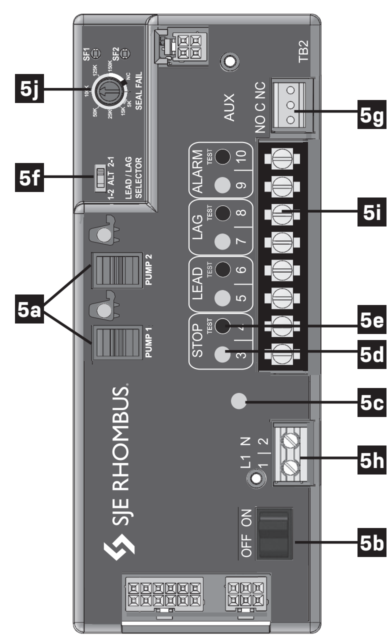
PANEL COMPONENTS

1. **Enclosure** measures 12x10x6 inches (30.48x24.4x15.24). Choice of NEMA 1 (steel for indoor use) or NEMA 4X (ultraviolet stabilized thermoplastic, padlockable with integral mounting flanges, drip shield, (2) heavy duty cover latches, and stainless steel ¼ turn set screw; for outdoor or indoor use). Note: added options may change enclosure size and enclosure features.
2. **Magnetic Motor Contactors** control pumps by switching electrical lines.
3. **Circuit Breakers** (optional) provide pump disconnect and branch circuit protection.
4. **Ground Lugs**
5. **Duplex Controller** provides pump control, alternation and alarm; elevated in the enclosure for easy access and field wiring
   a. HOA switches for manual control Hand/Off/Automatic
   b. Control Power ON/OFF switch
   c. Power ON green LED indicator
   d. Float status red LED indicators
   e. Float push-to-test buttons
   f. Pump selector switch: Alt, 1-lead 2-lag, 2-lead 1 lag
   g. Auxiliary alarm contacts Form-C
   h. Terminal block: incoming power
   i. Terminal block: float switches
   j. **Option:** adjustable seal failure circuits and red LED indicators (must select option 5E when ordering)

NOTE: Schematic Diagram is located inside the panel on enclosure cover.



Model Shown
1221W114X6A10E19B



STANDARD ALARM PACKAGE

6. **Red Alarm Beacon** provides 360° visual check of alarm condition.
7. **Alarm Horn** provides audible alarm warning (83 to 85 decibel rating).
8. **Exterior Alarm Test/Normal/Silence Switch** allows horn and light to be tested and horn to be silenced in an alarm condition. Alarm automatically resets once alarm condition is cleared unless the controller is programmed to manual alarm reset.

NOTE: other options available.

FEATURES

- Touch safe circuit board housing and low voltage 12 VDC float circuits
- Alarm (field programmable to flash)
- Alarm automatic reset (field programmable to manual alarm reset)
- Float out-of-sequence detection
- Pump fail-to-run detection (field programmable to deactivate)
- Controller protected by four auto resettable fuses (control, alarm, pump 1, and pump 2), no fuse replacement
- Three second lag pump delay time, prevents simultaneous pump start-up
- Standard package includes three 20' control switches or EZconnex® float system
- Five-year limited warranty

1221W114E3A6A8AC10AEF14B19B35H

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122							6A19B

MODEL 122

ALARM PACKAGE
- ☐ 0 = select options or no alarm package
- ☐ 1 = alarm package (includes test/normal/silence switch, fuse, red light, & horn)

ENCLOSURE RATING
- ☐ I = Indoor, NEMA 1 (metal)
- ☐ W = Weatherproof, NEMA 4X (engineered thermoplastic)

STARTING DEVICE
- ☐ 1 = magnetic motor contactor 120/208/240V
- ☐ ~~9 = magnetic motor contactor 120V only~~

PUMP FULL LOAD AMPS
- ☐ 0 = 0-7 FLA
- ☐ 1 = 7-15 FLA
- ☐ 2 = 15-20 FLA
- ☐ 3 = 20-30 FLA

PUMP DISCONNECTS
- ☐ 0 = no pump disconnect
- ☐ 4 = circuit breaker ~~120V (select STARTING DEVICE option 9 above)~~
  120/208/240V (select STARTING DEVICE option 1 above)

FLOAT SWITCH APPLICATION
- ☐ H or L = pump down or pump up (select 17 option)
- ☐ E = EZconnex® float switch system (select 34 or 35 option)
- X = no floats

OPTION (10A) IS NOT A CATALOG LISTED ITEM

OPTIONS *Listed below*

★ ENCLOSURE UPSIZE
If you selected one or more of the ★ options →

	CODE	DESCRIPTION
☐	1A	Red beacon only / no audio *(must select "0" for alarm package)*
☐	1C	Horn only / no visual *(must select "0" for alarm package)*
☐	3A	Alarm flasher *(factory programmed)*
☐	3B	Manual alarm reset *(factory programmed)*
☐	4A	Redundant off *(select Option 4D if floats included)*
☐	4B	Red redundant off indicator & alarm *(must select Option 4A also)*
☐	4D	Redundant off float *(must select 4A option) (select 17 option)*
☐	5A	Thermal cutout/heat sensor auto reset (for pumps w/thermal switch leads)
☐	5E	Seal failure circuit & red indicator (2 wire)
✔	6A	Auxiliary alarm contact, Form C *(included as standard)*
☐	8A	Elapsed time meter
☐	8C	Event (cycle) counter
☐	9_A	Pump overload specify amperage after number 9 followed by letter "A". Example: 912A = 12 amp pump. ☐ 0-25 FLA ☐ 25-30 FLA
✔	10E	Lockable latch - NEMA 4X *(included as standard)*
☐	10E	Lockable latch - NEMA 1
☐	10F	Lightning arrestor *(select pump circuit breaker)*
☐	10K	Anti-condensation heater
☐	11C	NEMA 1 alarm panel
☐	11D	NEMA 4X alarm panel
☐ ★	14B	Main disconnect *(rotary style, mounted through door, non-fused,* padlockable in the OFF-position, door interlock in the ON-position) *(must select circuit breaker)* ★☐ ~~0-20 FLA (total of both pumps)~~ ★☐ 20-60 FLA (total of both pumps)

	CODE	DESCRIPTION
☐	16A	10' cord in lieu of 20' *(per float)*
☐	16B	15' cord in lieu of 20' *(per float)*
☐	16C	30' cord in lieu of 20' *(per float)*
☐	16D	40' cord in lieu of 20' *(per float)*
☐	17C	Sensor Float® / internally weighted ▲ *(per float)*
☐	17D	Sensor Float® / externally weighted ▲ *(per float)*
☐	17E	Sensor Float® Mini / pipe clamp ▲ *(per float)*
☐	17F	Sensor Float® Mini / externally weighted ▲ *(per float)*
☐	17G	SJE MilliAmpMaster™/ pipe clamp ● *(per float)*
☐	17H	SJE MilliAmpMaster™/ externally weighted ● *(per float)*
☐	17J	Sensor Float® / pipe clamp ▲ *(per float)*
✔	19B	Lead lag selector switch *(included as standard)*
☐	19F	Fourth float to separate alarm function from lag
☐	19T	TOA (Test/Off/Automatic) switches and pump run lights through door mounted
☐	19U	HOA (Hand/Off/Automatic) switches and pump run lights through door mounted
☐	19X	Door mounted pump run indicator
☐	34D	EZconnex® 4-Port, 25', w/10' floats (3) /pipe clamp, sealing plug ✱
☐	34E	EZconnex® 4-Port, 50', w/10' floats (3) /pipe clamp, sealing plug ✱
☐	34G	EZconnex® 4-Port, 25', w/20' floats (3) /pipe clamp, sealing plug ✱
☐	34H	EZconnex® 4-Port, 50', w/20' floats (3) /pipe clamp, sealing plug ✱
☐	35D	EZconnex® 4-Port, 25', w/10' floats (4) /pipe clamp ✱
☐	35E	EZconnex® 4-Port, 50', w/10' floats (4) /pipe clamp ✱
☐	35G	EZconnex® 4-Port, 25', w/20' floats (4) /pipe clamp ✱
☐	35H	EZconnex® 4-Port, 50', w/20' floats (4) /pipe clamp ✱

● Mechanically-activated ▲ Mercury-activated
✱ EZconnex® mechanically-activated, narrow angle float switches with quick release connections.

9500066J-SPEC 10/19

EZconnex® 4-Port Float Connection System

Manifold/float switch connection system designed for easy installation of float switches in a wet well for level control applications.

The EZconnex® Float Switch Connection System includes an electrical wiring manifold with mounting bracket. The manifold features four quick release float switch connection ports. A single 8 conductor direct burial cable has Red-Blue-Yellow-White wire pairs that match the R-B-Y-W colored caps on the manifold housing for easy field wiring. The system is rated for short term water submersion. The mounting bracket is designed to allow quick access to the manifold and float switches for easy maintenance.

EZconnex® float switches feature an internal switching mechanism with sealed gold cross-point contacts for reliable low current operation. A range of wide-angle or narrow-angle float switches feature a quick release connection that simply plugs into the manifold port(s) for easy installation.

The EZconnex® system can be used with 1, 2, 3, or 4 float switches. Each float switch includes a protective rubber boot that provides a dual seal design for an extra layer of protection to keep connections clean and dry. Sealing plugs are available for unused manifold port(s).

US Pat. 9,559,455 and 9,583,867. Foreign Patents Pending.

NOTE: Do not install manifold with open port(s).

FEATURES

- (4) Quick release float connection ports.
- A single 8 conductor direct burial cable with shield.
- Housing colored caps match Red-Blue-Yellow-White cable wire pairs for easy float identification.
- Rated for short term water submersion.
- Includes mounting bracket.
- Designed for use with **EZconnex®** float switches (not included with manifold; float switches must be ordered separately):
  - Low current applications down to 0.160 mA at 125V.
  - Mechanically-activated, snap action contacts.
  - Quick release float connection simply plugs into manifold port(s).
  - Colored caps for easy identification of Normally Open (blue cap) or Normally Closed (red cap) models.
  - Activation angle above/below horizontal: 4" (10.16 cm) wide-angle; 1.5" (3.81 cm) narrow-angle
  - Each float switch includes a protective rubber boot that provides a dual seal design for an extra layer of protection to keep connections clean and dry.
- CSA Certified.
- Five-year limited warranty.

LR54245

OPTIONS

Manifold Options:

- Standard cable lengths of 25, $\boxed{50,}$ or 100 ft (7.62, 15.24, or 30.48 m).
- Sealing plug (includes rubber boot) required for unused port(s).

Float Switch Options:

- Standard cable lengths of 5, 10, or $\boxed{\text{20 ft}}$ (1.52, 3.05, or 6.10 m).
- Blue cap for normally open (high level) applications or red cap for normally closed (low level) applications. Narrow or wide-angle pumping ranges available.
- SJE MegaMaster™ float for high turbulence applications.
- Two float mounting configurations available:

  Mounting Clamp: for applications where the switch can be attached to a float tree or similar mounting device.

  Cable Weight: includes clip-on cable weight; floats should be hung from a hanger bracket (ordered separately)

  NOTE: do not suspend floats directly from manifold.

SPECIFICATIONS

MANIFOLD SPECIFICATIONS:

CABLE: direct burial shielded PVC Type TC-ER TFFN (UL) 600V 18 gauge, 8 conductor, shielded

HOUSING: ABS plastic

ELECTRICAL:

125 VAC

Maximum Electrical Load: 1 amp per connection port

MOUNTING BRACKET SPECIFICATIONS:

BRACKET: 304 stainless steel

FLOAT SPECIFICATIONS:

CABLE: flexible 18 gauge, 2 conductor (UL, CSA) SJOW, water-resistant (CPE)

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high-impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140° F (60° C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 PSI (90kPa)

ELECTRICAL:

125 VAC

Maximum Electrical Load: 1 amp

Minimum Electrical Load: 0.160 milliamps

30 VDC

Maximum Electrical Load: 1 amp

Minimum Electrical Load: 0.160 milliamps

5 VDC

Minimum Electrical Load: 1 milliamp

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California Prop 65 requires the following: ⚠ WARNING Cancer and Reproductive Harm - www.P65Warnings.ca.gov

SEE REVERSE SIDE FOR ORDERING INFORMATION.
SEE PRICE BOOK FOR LIST PRICE.

EZconnex® 4-Port Float Connection System

Manifold/float switch connection system designed for easy installation of float switches in a wet well for level control applications.

ORDERING INFORMATION

EZconnex® 4-Port Manifold

Part #	Description	Shipping Weight
1053987	EZconnex®, 4-Port, 25FT, with mounting bracket	4.57 lbs.
1053988	EZconnex®, 4-Port, 50FT, with mounting bracket	7.04 lbs.
1053989	EZconnex®, 4-Port, 100FT, with mounting bracket	11.98 lbs.

EZconnex® Float Switch Narrow-Angled Versions

Normally Open		Normally Closed		Shipping Weight
Part #	Description	Part #	Description	
1046922	5MAPNPCNOEZ	**1046923**	5MAPNPCNCEZ	0.86 lbs.
1046924	10MAPNPCNOEZ	**1046925**	10MAPNPCNCEZ	1.14 lbs.
1050721	20MAPNPCNOEZ	**1050840**	20MAPNPCNCEZ	1.79 lbs.
1054141	5MAPNCWNOEZ	**1054142**	5MAPNCWNCEZ	2.16 lbs.
1054145	10MAPNCWNOEZ	**1054146**	10MAPNCWNCEZ	2.44 lbs.
1054150	20MAPNCWNOEZ	**1054151**	20MAPNCWNCEZ	3.09 lbs.

EZconnex® Float Switch Wide-Angled Versions

Normally Open		Normally Closed		Shipping Weight
Part #	Description	Part #	Description	
1046918	5MAPWPCNOEZ	**1046919**	5MAPWPCNCEZ	0.86 lbs.
1046920	10MAPWPCNOEZ	**1046921**	10MAPWPCNCEZ	1.14 lbs.
1050841	20MAPWPCNOEZ	**1050842**	20MAPWPCNCEZ	1.79 lbs.
1054143	5MAPWCWNOEZ	**1054144**	5MAPWCWNCEZ	2.16 lbs.
1054147	10MAPWCWNOEZ	**1054148**	10MAPWCWNCEZ	2.44 lbs.
1054152	20MAPWCWNOEZ	**1054153**	20MAPWCWNCEZ	3.09 lbs.

EZconnex® SJE MegaMaster™ Float Switch

Normally Open		Normally Closed		Shipping Weight
Part #	Description	Part #	Description	
1059056	10MEGANOEZ	**1059057**	10MEGANCEZ	2.6 lbs.
1059058	25MEGANOEZ	**1059059**	25MEGANCEZ	3.6 lbs.
1059060	50MEGANOEZ	**1059061**	50MEGANCEZ	5.1 lbs.

OPTIONS

Part #	Description	Shipping Weight
1047611	Sealing plug (includes rubber boot)	0.16 lbs.
1052814	6 hook bracket	2.0 lbs.

**One sealing plug must be ordered for each unused port. Do not install manifold with open port(s).*
NOTE: Descriptions are by cable length measured in feet.

OPTIONS

PACKAGING
Manifold:
Boxed - standard

Float Switches:
Bagged - standard

LR54245

OTHER INFORMATION

NORMALLY OPEN (HIGH LEVEL) OPERATION
Blue colored cap, the control switch turns on (closes) when the switch tips above horizontal signaling a high level, and turns off (opens) when the switch drops below horizontal.

NORMALLY CLOSED (LOW LEVEL) OPERATION
Red colored cap, the control switch turns on (closes) when the switch drops below horizontal signaling a low level, and turns off (opens) when the switch tips above horizontal.

N = **N**arrow Angle
W = **W**ide Angle
PC = **P**ipe **C**lamp
CW = **C**able **W**eight
NO = **N**ormally **O**pen
NC = **N**ormally **C**losed
EZ = **EZ**connex®

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9500251G 10/19

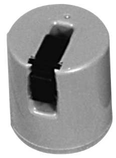
FLOAT ACCESSORIES

Cable Clamp Assembly, Float Brackets, Pipe Mounting Bracket, Cable Weights, ETM w/ Piggy-Back Plug, Vertical Reed Switch, Anchor and Chain

CABLE WEIGHT

Provides an accurate pivot point for suspended float switches.

- Gripper teeth on clip and weight channel securely lock float cable into place
- Cable Weight can be adjusted without the use of tools



U.S. Patent 5,306,885

HOUSING: 1 pound, 5 ounce (0.6 kgs.), 2.8 inch diameter x 3.3 inch long (7.1 cm diameter x 8.4 cm), impact resistant, non-corrosive, PVC housing for use in liquids up to 140°F (60°C).

CLIP: injection molded acetal plastic
WIRE/CABLE ACCOMMODATED: SJOW, SJTW, 18/2, 18/3, 16/2, 16/3, 14/2 and 14/3
SHIP WEIGHT: 1.6 lbs. (.726 kgs)

Part Number	Description
1002230	Cable Weight

CABLE WEIGHT MINI

Provides an accurate pivot point for suspended float switches.

- One piece cable weight
- Turn and Lock for easy installation.

HOUSING: 9.6 ounces (0.27 kgs.), 2.5 inch diameter x 2.5 inch long (6.35 cm diameter x 6.35 cm), impact resistant, non-corrosive, PVC housing for use in liquids up to 140°F (60°C)
WIRE/CABLE ACCOMMODATED:
SJOW, SJTW, 18/2, 18/3

Part Number	Description
1030356	Cable Weight Mini

ELAPSED TIME METER WITH PIGGY-BACK PLUG

Plugs into switched outlet or piggy-back switch of plugger control panel. Unit must be placed inside an enclosure.

- Screws and mounting adhesive included.

Part Number	Description
1022846	ETM w/120V piggy-back plug
1032834	ETM w/230V piggy-back plug

VERTICAL REED SWITCH

- Control differential: .375 inch (1 cm)
- Maximum angle from vertical: 5°
- Electrical: 250 mAmps, 12-125 VAC, 50/60 Hz
  500 mAmps, 6-12 VDC, 50/60 Hz
- Housing and Float: 1.60 inch diameter x 6.7 inch long (4.06 cm X 17.01 cm), high impact, corrosion resistant PVC for use in sewage and non-potable water up to 120°F (50°C)

Part Number	Description
1011027	10ft VRS 120V Bulk
1016561	15ft VRS 120V Bulk

ANCHOR

- 10 lb. weight
- Yellow, vinyl coated, mushroom style

Part Number	Description
1018687	10 lb. Mushroom Anchor

CHAIN

- 1/8" thickness
- 316 grade stainless steel
- Available in one foot increments

Part Number	Description
1018823	1/8 inch Chain

California Prop 65 requires the following: ⚠ WARNING Cancer and Reproductive Harm - www.P65Warnings.ca.gov

PRODUCTS CONTINUED ON NEXT PAGE.
SEE PRICE BOOK FOR LIST PRICES.

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www.sjerhombus.com

FLOAT ACCESSORIES

Cable Clamp Assembly, Float Brackets, Pipe Mounting Bracket, Cable Weights, ETM w/ Piggy-Back Plug, Vertical Reed Switch, Anchor and Chain

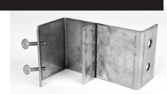
CABLE CLAMP ASSEMBLY

Provides cable anchor point and strain relief. Secures cable in vertical direction.

- For use with 18/16 gauge, 14 gauge, & 12 gauge cable
- Mounting clamp: ABS Nylon blend
- Hose clamp: highly corrosion resistant stainless steel

Part Number	Description
1008569	18 & 16 Gauge Cable Clamp Assembly
1008574	14 Gauge Cable Clamp Assembly
1008575	12 Gauge Cable Clamp Assembly

PIPE MOUNTING BRACKET



- Secures discharge pipe to basin wall.
- Clamps directly to 2" PVC discharge pipe.

Part Number	Description
1027771	Pipe Mounting Bracket

FLOAT BRACKET

Provides convenient installation of float switches.

- Six Float Bracket supports 1-6 floats
- Four Float Bracket supports 1-4 floats
- Can be directly mounted to wall or used with wall mounting device
- Provides convenient location to stow excess float cord
- Supplied with UL Recognized cord strain relief connectors

METAL COMPONENTS: all metal components are made of 300 series stainless steel

STRAIN RELIEF CONNECTORS: which accommodate 18/2, 18/3, 16/2, 16/3 SJOW and SJTW cords

Part Number	Description
1009432	4 Float Bracket With Mounting Device
1009433	4 Float Bracket Without Mounting Device
1009434	6 Float Bracket With Mounting Device
1009435	6 Float Bracket Without Mounting Device
1009436	Float Bracket Mounting Device

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*Product offering and pricing are subject to change without notice. Please visit **www.sjerhombus.com** for the most current information.*

Appendix J

Level Spreader Calculations

TC'S LEVEL SPREADER CALCULATIONS

TerraVista NW LLC
Consulting Engineers
3204 Smokey Point Dr, Suite 207
Arlington, WA 98223

ASSUMPTIONS

- 8" PVC PERF PIPE, 2 ROWS HOLES, 0.5" DIAMETER, 5" OC
- PIPE HALF FULL
- COEFFICIENT OF DISCHARGE (C_d) = 0.54
- 15 LF OF PIPE, 14 LF EXPOSED AFTER CAPPED
- NUMBER OF HOLES = $\frac{14'}{(5''/12'')}$ [2 ROWS] = 66 HOLES @ ϕ 1/2"

ORIFICE EQUATION

$$Q = C_d A_o \sqrt{\frac{2g(P_1 - P_2)}{\gamma}}$$ (FOR ONE HOLE)

$$A_o = \frac{\pi}{4}\left(\frac{0.5}{12}\right)^2 = 0.00136 \text{ SF}$$

P_1 = 4" HEAD → 0.144 PSI → 20.78 PSF

$P_2 = 0$

γ = 62.4 PCF

g = 32.2 Ft/s²

$$Q = (0.54)(0.00136)\sqrt{\frac{(2)(32.2)(20.78)}{62.4}} = 0.0034 \text{ CFS}$$

$$Q_{66} = (66)(0.0034) = 0.2244 \text{ CFS}$$

EXPECTED MAX Q_{OUT} = 0.2 CFS < 0.2244 CFS

$\therefore$ OK

Appendix K

Oldcastle Infrastructure Biopod Sizing Summaries

BioPod™
Downstream of Detention
Sizing Summary

Site Information

Project Name	7C's System 1	
Project Location	Mill Creek	
Design Engineer	Terra Vista	
OI Engineer		
Drainage Area	1.11	ac
Impervious Drainage Area (PGIS)	0.73	ac
Impervious Drainage Area (NPGIS)	0.00	ac
Pervious Area	0.95	ac
% Impervious	66%	
Runoff Coefficient	0.64	

Flow-Based Calculations

Treatment Release Rate	0.0826	cfs
Peak Release Rate (Q_p)	0.257	cfs
Minimum Surface Area Required	23.17	square fee

Mass Loading Calculations

Mean Annual Rainfall (P)	38	in
Required % Removal	80%	
Required % Runoff Capture	91%	
Mean Annual Runoff (V_t)	89,405	cf
Assumed Pollutant EMC	80	mg/L
Annual Mass Load	445.50	lb
Detention Pretreatment Credit	50%	

Cartridge Quantity Based on Mass Loading

Mass Removed by Pretreatment	222.75	lb
Mass Load to Filter after Pretreatment	222.75	lb
Required Filter Efficiency	60%	
Mass Removal Required	133.65	lb
Mass Load per Square Foot of Media	11	lb/sf
Minimum Surface Area Required	12.15	square fee

Determine Limiting Sizing Approach

Method to Use (Flow-Based, Mass Load)	Flow-Based	
Bypass Method	Internal	

Summary

BioPod Model	BPU-48	
BioPod Model	BPU-48IB	
Bypass Method	Internal	
Treatment Flow Capacity	0.086	cfs

Oldcastle Infrastructure A CRH COMPANY

BioPod™
Downstream of Detention
Sizing Summary

Site Information

Project Name	7C's System 2	
Project Location	Mill Creek	
Design Engineer	Terra Vista	
OI Engineer		
Drainage Area	0.63	ac
Impervious Drainage Area (PGIS)	0.41	ac
Impervious Drainage Area (NPGIS)	0.00	ac
Pervious Area	0.95	ac
% Impervious	65%	
Runoff Coefficient	0.63	

Flow-Based Calculations

Treatment Release Rate	0.0225	cfs
Peak Release Rate (Q_p)	0.257	cfs
Minimum Surface Area Required	6.31	square fee

Mass Loading Calculations

Mean Annual Rainfall (P)	38	in
Required % Removal	80%	
Required % Runoff Capture	91%	
Mean Annual Runoff (V_t)	49,683	cf
Assumed Pollutant EMC	80	mg/L
Annual Mass Load	247.56	lb
Detention Pretreatment Credit	50%	

Cartridge Quantity Based on Mass Loading

Mass Removed by Pretreatment	123.78	lb
Mass Load to Filter after Pretreatment	123.78	lb
Required Filter Efficiency	60%	
Mass Removal Required	74.27	lb
Mass Load per Square Foot of Media	11	lb/sf
Minimum Surface Area Required	6.75	square fee

Determine Limiting Sizing Approach

Method to Use (Flow-Based, Mass Load)	Mass Loading
Bypass Method	Internal

Summary

BioPod Model	BPU-46	
BioPod Model	BPU-46IB	
Bypass Method	Internal	
Treatment Flow Capacity	0.057	cfs