CITY OF MERCER ISLAND

DEVELOPMENT SERVICES GROUP

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SECTION A: SMALL PROJECT STORMWATER SITE PLAN/REPORT

Narrative and Plan Submittal

Instructions: This is a template for a simplified Stormwater Report. This form or an equivalent must accompany your Building Permit Application if the answer is "Yes" to each statement below. If "No" is the answer to one or more of the statements below, a full Drainage Report is required and the project does not qualify for use of the Small Project Stormwater Site Plan/Report template.

Select "yes" or "no" for each statement below. Answer "yes" if the statement accurately describes your project.

Yes	No	Statement
✔		This project disturbs less than 1 acre and is not part of a larger common plan of development.
✔		This project converts less than 3/4 acre to lawn or landscape areas.
✔		This project will create, add, or replace (in any combination) 2,000 square feet or greater, but less than 5,000 square feet, of new plus replaced hard surface **OR** will have a land disturbing activity of 7,000 square feet or greater **OR** will result in a net increase of impervious surface of 500 square feet or greater.
✔		This project will not adversely impact a wetland, stream, water of the state, or change a natural drainage course.

Basic Project Information

Project Name: Hwang Lee Residence

Site Address: 9772 SE 41st Street, Mercer Island, WA

Total Lot Size: 0.2 ac

Total Proposed Area to be Disturbed (including stockpile area): 4,602 sq ft

Total Volume of Proposed Cut and Fill: n/a sq ft

Total Proposed New Hard Surface Area: 167 sq ft

Total Proposed Replaced Hard Surface Area: 3,264 sq ft

Total Proposed Converted Pervious Surface Area (Native vegetation to lawn or landscape): 0 sq ft

Net Increase in Impervious Surface: 167 sq ft

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Minimum Requirement #1 : Preparation of Stormwater Site Plan

Written Project Description:

This project includes the construction of a 2,428 square foot single family home, as well as replacement of the existing driveway. The project will include 3,431 square feet of new plus replaced hard surfaces. A StormTech SC-160LP on-site detention system which discharges to the adjacent Mercer Island municipal storm system will be utilized to meet Minimum Requirement #5.

Calculate new or replaced areas by surface type:

Lawn or Landscape Areas: 1,171 sq ft	Roof Area: 2,428 sq ft

Other Hard Surface Areas:

Driveway: 1,003 sq ft Patio: _____ sq ft Sidewalk: _____ sq ft

Parking Lot: _____ sq ft Other: _____ sq ft

☑ Attach Drainage Plan

Drainage Plan shall include the following:

- Scaled drawing with slopes, lot lines, any public-right-of-way and any easements, location of each on-site stormwater management BMP selected above and the areas served by them, buildings, roads, parking lots, driveways, landscape features, and areas of disturbed soils to be amended.
- The scaled drawing must be suitable to serve as a recordable document that will be attached to the property deed for each lot that includes on-site BMPs. Document submittal must follow the "Standard Formatting Requirements for Recording Documents" per King County: www.kingcounty.gov/depts/records-licensing/recorders-office/recording-documents.aspx
- Identify design details and maintenance instructions for each on-site BMP, and attach them to this Small Project Stormwater Site Plan/Report.

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SECTION A: SMALL PROJECT STORMWATER SITE PLAN/REPORT

Minimum Requirement #2 : Construction Stormwater Pollution Prevention

☑ Complete Section B of this submittal package: Construction Stormwater Pollution Prevention Plan Narrative (SWPPP)

☐ Attach construction SWPPP

Minimum Requirement #3 : Source Control of Pollution

This section contains practices and procedures to reduce the release of pollutants. Provide a description of all known, available and reasonable source control BMPs that will be, or are anticipated to be, used at this location to prevent stormwater from coming into contact with pollutants. Additional BMPs are found in Volume IV of the 2014 Stormwater Management Manual for Western Washington (SWMMWW).

Check the BMPs you will use:

☑ BMP S411 for Landscaping and Lawn/ Vegetation Management
Operational practices for sites with landscaping

☐ BMP S421 for Parking and Storage of Vehicles.
Public and commercial parking lots can be sources of suspended solids, metals, or toxic hydrocarbons such oils and greases.

☐ BMP S433 for Pools, Spas, Hot Tubs, Fountains
Discharge from pools, hot tubs, and fountains can degrade ambient water quality. Routine maintenance activities generate a variety of wastes. Direct disposal of these waters to drainage system and waters of the state are not permitted without prior treatment and approval.

☑ Other BMPs found in Volume IV of SWMMWW applicable to project:

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems
Provide maintenance and clearing of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

☐ No source control BMPs are applicable for this project.

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Minimum Requirement #4 : Preservation of Natural Drainage Systems

Natural drainage patterns shall be maintained and discharges from the project site shall occur at the natural location, to the maximum extent practicable. All outfalls require energy dissipation.

Choose the option below that best describes your project:

☑ This site has existing drainage systems or outfalls. These items are shown on the Drainage Plan. Include the following items on the Drainage Plan:

- Pipe invert elevations, slopes, cover, and material
- Locations, grades, and direction of flow in ditches and swales, culverts, and pipes

Describe how these systems will be preserved:

Existing lot perimeter trench drain will be preserved and replaced if impacted by construction. The existing trench drain is not surveyed but exists per the previous owner. The trench drains follow the property lines and connect to the existing type 1 CB in SE 40th Street near the northeast corner of the property. The drain connection point is marked by an upright, broken PVC pipe. The trench drain will connect to an on site CB in the northeast corner of the lot to combine discharge with the detention facility, which will then drain to the Type 1 CB in SE 40th Street.

☐ This site does not have any existing drainage systems or outfalls.

Additional Comments:

Proposed on-site detention system will discharge to the existing Mercer Island municipal storm system.

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SECTION A: SMALL PROJECT STORMWATER SITE PLAN/REPORT

Minimum Requirement #5 : On-site Stormwater Management

All projects meeting the thresholds for this Small Project Stormwater Report shall employ on-site stormwater management BMPs (See Small Project Stormwater Requirements Tip Sheet) to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts.

List #1

For each category select the *first* feasible item on the list below. Document your justification for each infeasible BMP in Section C of this submittal package.

Check one option for each category below:

Lawn and Landscape Areas

- ☐ My project does not have *Lawn or Landscape* areas
- ☑ Post-construction soil quality and depth
- ☐ Post-construction soil quality and depth is infeasible (see Section C of this submittal package)

Roofs

- ☐ My project does not have *Roof* areas
- ☐ 1. Full dispersion or downspout full infiltration
- ☐ 2. Rain garden or bioretention
- ☐ 3. Downspout dispersion system
- ☐ 4. Perforated stub-out connections
- ☑ 5. On-site detention system or fee-in-lieu of on-site detention authorized by the City Engineer (applicable if options #1-4 are infeasible and drainage from the site will be discharged to a storm or surface water system that includes a watercourse or there is a capacity constraint in the system)
- ☐ 6. No Roof BMP (applicable if options #1-4 are infeasible and on-site detention is not required)

Measured Infiltration Rate: _____ in/ hr

If #5 or #6 is selected, briefly describe why no Roof BMP is feasible (include detailed information in Section C of this submittal package):

Downspout full infiltration, perforated stub-outs, and bioretention are infeasible because the project site is located within "Areas Infeasible for Infiltration" on Mercer Island GIS Portal. Dispersion BMPs are infeasible because minimum flow paths cannot be met between the trench outlet and structures or property lines. Drainage from the on-site detention system will be discharged to the City of Mercer Island stormwater system. See attached detention design memo for details.

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SECTION A: SMALL PROJECT STORMWATER SITE PLAN/REPORT

Minimum Requirement #5 : On-site Stormwater Management (cont.)

Other Hard Surfaces (such as driveway, sidewalk, parking lot, patio, etc.)

- ☐ My project does not have *Other Hard Surface* areas
- ☐ 1. Full dispersion

Measured Infiltration Rate: _____ in/ hr

- ☐ 2. Permeable pavement, rain gardens, or bioretention
- ☐ 3. Sheet flow dispersion or concentrated flow dispersion
- ☑ 4. On-site detention system or fee-in-lieu of on-site detention authorized by the City Engineer (applicable if options #1-3 are infeasible and drainage from the site will be discharged to a storm or surface water system that includes a watercourse or there is a capacity constraint in the system)
- ☐ 5. No Other Hard Surface BMP (applicable if options #1-3 are infeasible and on-site detention is not required)

If #4 or #5 is selected, briefly describe why no Other Hard Surface BMP is feasible (include detailed information in Section C of this submittal package):

Downspout full infiltration, perforated stub-outs, and bioretention are infeasible because the project site is located within "Areas Infeasible for Infiltration" on Mercer Island GIS Portal. Dispersion BMPs are infeasible because minimum required flow paths cannot be met between the trench outlet and structures or property lines. Drainage from the on-site detention system will be discharged to the City of Mercer Island stormwater system. See attached detention sizing memo for details.

Flow Control Exempt List

Proceed with this list if your project discharges directly to Lake Washington or if findings from a downstream analysis confirm that the downstream system is free of capacity constraints for a minimum of ¼ mile and a maximum of 1 mile.

For flow control exempt discharges, the BMPs listed below for Roofs and Other Hard Surfaces do not need to be evaluated in priority order. You can select any BMP from the lists provided below and do not need to document infeasibility in Section C of this submittal package.

Check <u>one</u> option for <u>each category</u> below:

Lawn and Landscape Areas

- ☐ My project does not have *Lawn or Landscape* areas
- ☐ Post-construction soil quality and depth

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SECTION A: SMALL PROJECT STORMWATER SITE PLAN/REPORT

Minimum Requirement #5 : On-site Stormwater Management (cont.)

Roofs

- ☐ My project does not have *Roof* areas
- ☐ Downspout full infiltration
- ☐ Downspout dispersion system
- ☐ Perforated stub-out connections
- ☐ Each item above is infeasible

If "Each item above is infeasible" is selected, briefly describe why no Roof BMP is feasible:

Other Hard Surfaces (such as driveway, sidewalk, parking lot, patio, etc.)

- ☐ My project does not have *Other Hard Surface* areas
- ☐ Sheet flow dispersion
- ☐ Concentrated flow dispersion
- ☐ Each item above is infeasible

If "Each item above is infeasible" is selected, briefly describe why no Other Hard Surface BMP is feasible:

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Instructions

This is a template for a simplified Construction Stormwater Pollution Prevention Plan ("Construction SWPPP"). If "No" is the answer to one or more of the statements on the first page of Section A of this submittal package, then a full Construction SWPPP is required and the project does not quality for the use of the Small Project Construction SWPPP Narrative template. If the project is less than the thresholds on the first page of Section A of this submittal package, then Minimum Requirement #2 still applies, but this section (Section B) or a full construction SWPPP is not required. You should include your Construction SWPPP in your contract with your builder. A copy of the Construction SWPPP must be located at the construction site or within reasonable access to the site for construction and inspection personnel at all times.

General Information on the Existing Site and Project

Describe the following in the Project Narrative box below (attach additional pages if necessary):

- Nature and purpose of the construction project
- Existing topography, vegetation, and drainage, and building structures
- Adjacent areas, including streams, lakes, wetlands, residential areas, and roads that might be affected by the construction project
- How upstream drainage areas may affect the site
- Downstream drainage leading from the site to the receiving body of water
- Areas on or adjacent to the site that are classified as critical areas
- Critical areas that receive runoff from the site up to one-quarter mile away
- Special requirements and provisions for working near or within critical areas
- Areas on the site that have potential erosion problems

Project Narrative:

The existing site contains a multi-story residence including a gravel driveway, concrete landscape walls, and rockery. The existing 2261 square-foot house will be replaced with a 2428 square-foot house. The existing driveway and landscape features will remain.

The site slopes own from south to north. Runoff flows off the property into existing City of Mercer Island stormwater infrastructure in SE 40th Street. The site is located in Drainage Basin 1, and the receiving waterbody is Lake Washington.

A StormTech SC-160LP detention system with 495 cubic feet of volume will be installed to mitigate the new and replaced impervious surface area. Refer to the drainage and erosion control plan, and the detention sizing memo for detention system details.

The site is located within a Potential Landslide Area, Seismic Hazard Area, and is within the boundary of Areas Infeasible for Infiltration on the Mercer Island GIS Portal. Roughly 60% of the site is within an Erosion Hazard Area and 7% of the site contains a protected slope per the Mercer Island GIS Portal.

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Construction SWPPP Drawings

Refer to the general Drawing Requirements in Stormwater Management Manual for Western Washington (SWMMWW) Volume I, Chapter 3.

Vicinity Map

Provide a map with enough detail to identify the location of the construction site, adjacent roads, and receiving waters.

Site Map

Include the following (where applicable):

- [x] Legal description of the property boundaries or an illustration of property lines (including distances) on the drawings.
- [x] North arrow.
- [x] Existing structures and roads.
- [x] Boundaries and identification of different soil types.
- [x] Areas of potential erosion problems.
- [x] Any on-site and adjacent surface waters, critical areas, buffers, flood plain boundaries, and Shoreline Management boundaries.
- [x] Existing contours and drainage basins and the direction of flow for the different drainage areas.
- [x] Where feasible, contours extend a minimum of 25 feet beyond property lines and extend sufficiently to depict existing conditions.
- [x] Final and interim grade contours as appropriate, drainage basins, and the direction of stormwater flow during and upon completion of construction.
- [x] Areas of soil disturbance, including all areas affected by clearing, grading, and excavation.
- [ ] Locations where stormwater will discharge to surface waters during and upon completion of construction.
- [x] Existing unique or valuable vegetation and vegetation to be preserved.
- [ ] Cut-and-fill slopes indicating top and bottom of slope catch lines.
- [ ] Total cut-and-fill quantities and the method of disposal for excess material.
- [x] Stockpile; waste storage; and vehicle storage, maintenance, and washdown areas.

Temporary and Permanent BMPs

Include the following on site map (where applicable):

- [ ] Locations for temporary and permanent swales, interceptor trenches, or ditches.
- [x] Drainage pipes, ditches, or cut-off trenches associated with erosion and sediment control and stormwater management.
- [x] Temporary and permanent pipe inverts and minimum slopes and cover.
- [x] Grades, dimensions, and direction of flow in all ditches and swales, culverts, and pipes.
- [ ] Locations and outlets of any dewatering systems.
- [ ] Details for bypassing off-site runoff around disturbed areas.
- [x] Locations of temporary and permanent stormwater treatment and/or flow control best management practices (BMPs).
- [x] Details for all structural and nonstructural erosion and sediment control (ESC) BMPs (including, but not limited to, silt fences, construction entrances, sedimentation facilities, etc.)
- [x] Details for any construction-phase BMPs or techniques used for Low Impact Development (LID) BMP protection.

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 1: Preserve Vegetation / Mark Clearing Limits

The goal of this element is to preserve native vegetation and to clearly show the limits of disturbance.

This element **does not** *apply to my project because:*

☐ The site was cleared as part of clearing activity that is subject to an enforcement action and is re-vegetated. Restoration may be necessary to comply with Critical Area Regulations or NPDES requirements. Buffer Zones-BMP C102 may apply if Critical Areas exist on-site and buffer zones shall be protected.

☐ Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the best management practices (BMPs) you will use:*

☑ The perimeter of the area to be cleared shall be marked prior to clearing operation with visible flagging, orange plastic barrier fencing and/or orange silt fencing as shown on the SWPPP site map. The total disturbed area shall be less than 7,000 square feet. Vehicles will only be allowed in the areas to be graded, so no compaction of the undeveloped areas will occur.

Additional Comments:

High visibility silt fence will mark and protect the perimeter of the site.

Check the BMPs you will use:

☐ C101 Preserving Natural Vegetation ☐ C102 Buffer Zones ☐ C103 High Visibility Fence

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 2: Construction Access

The goal of this element is to provide a stabilized construction entrance/exit to prevent or reduce or sediment track out.

*This element **does not** apply to my project because:*

☑ The driveway to the construction area already exists and will be used for construction access. All equipment and vehicles will be restricted to staying on that existing impervious surface.

☐ Other Reason / Additional Comments:

*If it **does** apply, describe the steps you will take and select the BMPs you will use:*

☐ A stabilized construction entrance will be installed prior to any vehicles entering the site, at the location shown on the SWPPP site map.

Additional Comments:

Check the BMPs you will use:

☐ C105 Stabilized Construction Entrance / Exit

☐ C106 Wheel Wash

☐ C107 Construction Road / Parking Area Stabilization

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 3: Control Flow Rates

The goal of this element is to construct retention or detention facilities when necessary to protect properties and waterways downstream of development sites from erosion and turbid discharges.

This element **does not** *apply to my project because:*

☐ Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

☑ Flow rates will be controlled by using SWPPP Element 4 sediment controls and BMP T5.13 Post-Construction Soil Quality and Depth if necessary.

Additional Comments:

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 4: Sediment Control

The goal of this element is to construct sediment control BMPs that minimize sediment discharges from the site.

*This element **does not** apply to my project because:*

☐ The site has already been stabilized and re-vegetated.

☐ Other Reason / Additional Comments:

*If it **does** apply, describe the steps you will take and select the BMPs you will use:*

☑ Sediment control BMPs shall be placed at the locations shown on the SWPPP site map

Additional Comments:

Check the BMPs you will use:

☐ C231 Brush Barrier

☐ C232 Gravel Filter Berm

☑ C233 Silt Fence

☐ C234 Vegetated Strip

☐ C235 Wattles

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 5: Stabilize Soils

The goal of this element is to stabilize exposed and unworked soils by implementing erosion control BMPs.

*This element **does not** apply to my project because:*

☐ Other Reason / Additional Comments:

*If it **does** apply, describe the steps you will take and select the BMPs you will use:*

☑ Exposed soils shall be worked during the week until they have been stabilized. Soil stockpiles will be located within the disturbed area shown on the SWPPP site map. Soil excavated for the foundation will be backfilled against the foundation and graded to drain away from the building. No soils shall remain exposed and unworked for more than 7 days from May 1 to September 30 or more than 2 days from October 1 to April 30. Once the disturbed landscape areas are graded, the grass areas will be amended using BMP T5.13 Post-Construction Soil Quality and Depth. All stockpiles will be covered with plastic or burlap if left unworked.

Additional Comments:

Check the BMPs you will use:

☑ C120 Temporary & Permanent Seeding
☑ C122 Nets & Blankets
☐ C124 Sodding
☐ C131 Gradient Terraces
☐ C235 Wattles
☑ C121 Mulching
☑ C123 Plastic Covering
☐ C125 Topsoil / Composting
☑ C140 Dust Control

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 6: Protect Slopes

The goal of this element is to design and construct cut-and-fill slopes in a manner to minimize erosion.

This element **does not** *apply to my project because:*

☑ No cut slopes over 4 feet high or slopes steeper than 2 feet horizontal to 1 foot vertical, and no fill slopes over 4 feet high will exceed 3 feet horizontal to 1 foot vertical. Therefore, there is no requirement for additional engineered slope protection.

☐ Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

Additional Comments:

Check the BMPs you will use:

☐ C120 Temporary & Permanent Seeding

☐ C205 Subsurface Drains

☐ C207 Check Dams

☐ C204 Pipe Slope Drains

☐ C206 Level Spreader

☐ C208 Triangular Silt Dike (Geotextile-Encased Check Dam)

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 7: Protect Permanent Drain Inlets

The goal of this element is to protect storm drain inlets during construction to prevent stormwater runoff from entering the conveyance system without being filtered or treated.

This element **does not** *apply to my project because:*

- ☐ The site has open ditches in the right-of-way or private road right-of-way.
- ☐ There are no catch basins on or near the site.
- ☐ Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

- ☑ Catch basins on the site or immediately off site in the right-of-way are shown on the SWPPP site map. Storm drain inlet protection shall be installed.

Additional Comments:

Check the BMPs you will use:

- ☑ C220 Storm Drain Inlet Protection

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Element 8: Stabilize Channels and Outlets

The goal of this element is to design, construct, and stabilize on-site conveyance channels to prevent erosion from entering existing stormwater outfalls and conveyance systems.

This element **does not** *apply to my project because:*

- [x] Construction will occur during the dry weather. No storm drainage channels or ditches shall be constructed either temporary or permanent. A small swale shall be graded to convey yard drainage around the structure using a shallow slope; it shall be seeded after grading and stabilized.

- [ ] Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

- [ ] A wattle shall be placed at the end of the swale to prevent erosion at the outlet of the swale.

Additional Comments:

Check the BMPs you will use:

- [ ] C202 Channel Lining
- [ ] C207 Check Dams
- [ ] C209 Outlet Protection
- [ ] C235 Wattles

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 9: Control Pollutants

The goal of this element is to design, install, implement and maintain BMPs to minimize the discharge of pollutants from material storage areas, fuel handling, equipment cleaning, management of waste materials, etc.

This element **does not** *apply to my project because:*

☐ Other Reason / Additional Comments:

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

☑ Any and all pollutants, chemicals, liquid products and other materials that have the potential to pose a threat to human health or the environment will be covered, contained, and protected from vandalism. All such products shall be kept under cover in a secure location on-site. Concrete handling shall follow BMP C151.

Additional Comments:

Check the BMPs you will use:

☑ C151 Concrete Handling

☐ C152 Sawcutting and Surfacing Pollution Prevention

☑ C153 Material Delivery, Storage, and Containment

☑ C154 Concrete Washout Area

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Element 10: Control De-watering

The goal of this element is to handle turbid or contaminated dewatering water separately from stormwater.

*This element **does not** apply to my project because:*

☑ No dewatering of the site is anticipated.

☐ Other Reason / Additional Comments:

*If it **does** apply, describe the steps you will take and select the BMPs you will use:*

Additional Comments:

Check the BMPs you will use:

☐ C203 Water Bars ☐ C236 Vegetated Filtration ☐ C206 Level Spreader

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Element 11: Maintain Best Management Practices

The goal of this element is to maintain and repair all temporary and permanent erosion and sediment control BMPs to assure continued performance.

Describe the steps you will take:

☑ Best Management Practices or BMPs shall be inspected and maintained during construction and removed within 30 days after the City Inspector or Engineer determines that the site is stabilized, provided that they may be removed when they are no longer needed.

Element 12: Manage the Project

The goal of this element is to ensure that the construction SWPPP is properly coordinated and that all BMPs are deployed at the proper time to achieve full compliance with City regulations throughout the project.

If it **does** *apply, describe the steps you will take and select the BMPs you will use:*

The Construction SWPPP will be implemented at all times. The applicable erosion control BMPs will be implemented in the following sequence:

☑ 1. Mark clearing limits

☐ 2. Install stabilized construction entrance

☑ 3. Install protection for existing drainage systems and permanent drain inlets

☑ 4. Establish staging areas for storage and handling polluted material and BMPs

☑ 5. Install sediment control BMPs

☑ 6. Grade and install stabilization measures for disturbed areas

☑ 7. Maintain BMPs until site stabilization, at which time they may be removed

Additional Comments:

Existing driveway to be used as construction entrance.

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SECTION B: SMALL PROJECT CONSTRUCTION SWPPP NARRATIVE

Element 13: Protect Low Impact Development BMPs

The goal of this element is to protect on-site stormwater management BMPs (also known as "Low Impact Development BMPs") from siltation and compaction during construction. On-site stormwater management BMPs used for runoff from roofs and other hard surfaces include: full dispersion, roof downspout full infiltration or dispersion systems, perforated stubout connections, rain gardens, bioretention systems, permeable pavement, sheetflow dispersion, and concentrated flow dispersion. Methods for protecting on-site stormwater management BMPs include sequencing the construction to install these BMPs at the latter part of the construction grading operations, excluding equipment from the BMPs and the associated areas, and using the erosion and sedimentation control BMPs listed below.

Describe the construction sequencing you will use:

Additional Comments:

N/A

Select the BMPs you will use:

- ☐ C102 Buffer Zone
- ☐ C103 High Visibility Fence
- ☐ C231 Brush Barrier
- ☐ C233 Silt Fence
- ☐ C234 Vegetated Strip

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SECTION C: INFEASIBILITY CRITERIA

Minimum Requirement #5 (On-Site Stormwater Management)

The following tables summarize infeasibility criteria that can be used to justify not using various on-site stormwater management best management practices (BMPs) for consideration for Minimum Requirement #5. This information is also included under the detailed descriptions of each BMP in the 2014 Stormwater Management Manual for Western Washington (Stormwater Manual), but is provided here in this worksheet for additional clarity and efficiency. Where any inconsistencies or lack of clarity exists, the requirements in the main text of the Stormwater Manual shall be applied. If a project is limited by one or more of the infeasibility criteria specified below, but an applicant is interested in implementing a specific BMP, a functionally equivalent design may be submitted to the City for review and approval. Evaluate the feasibility of the BMPs in priority order based on List #1 or #2 (Small Project Stormwater Requirements Tip Sheet and Stormwater Manual). Select the first BMP that is considered feasible for each surface type. Document the infeasibility (narrative description and rationale) for each BMP that was not selected. Only one infeasibility criterion needs to be selected for a BMP before evaluating the next BMP on the list. Attach additional pages for supporting information if necessary.

Note: If your project discharges directly to Lake Washington (flow control exempt) or a downstream analysis confirms that the downstream system is free of capacity constraints for a minimum of ¼ mile and a maximum of 1 mile, then you do not need to complete this worksheet, but should still refer to the infeasibility criteria when selecting BMPs.

Lawn and Landscaped Areas		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Post-construction Soil Quality and Depth List #1 and #2	☐ Siting and design criteria provided in BMP T5.13 (**Stormwater Manual** Volume V, Section 5.3) cannot be achieved. ☐ Lawn and landscape area is on till slopes greater than 33 percent.	

Roofs		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Full Dispersion List #1 and #2	☐ Site setbacks and design criteria provided in BMP T5.30 (**Stormwater Manual** Volume V, Section 5.3) cannot be achieved. ☑ A 65 to 10 ratio of forested or native vegetation area to impervious area cannot be achieved. ☑ A minimum forested or native vegetation flowpath length of 100 feet (25 feet for sheet flow from a non-native pervious surface) cannot be achieved.	
Downspout Full Infiltration List #1 and #2	☑ Evaluation of infiltration is not required per the Infiltration Infeasibility Map due to steep slopes, erosion hazards, or landslide hazards. ☐ Site setbacks and design criteria provided in BMP T5.10A (**Stormwater Manual** Volume III, Section 3.1.1) cannot be achieved. ☐ The lot(s) or site does not have out-wash or loam soils. ☐ There is not at least 3 feet or more of permeable soil from the proposed final grade to the seasonal high groundwater table or other impermeable layer. ☐ There is not at least 1 foot or more of permeable soil from the proposed bottom of the infiltration system to the seasonal high groundwater table or other impermeable layer.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Roofs (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Bioretention or Rain Gardens List #1 (both) and List #2 (bioretention only)	*Note: Criteria with setback distances are as measured from the bottom edge of the bioretention soil mix.* Citation of any of the following infeasibility criteria must be based on an evaluation of site-specific conditions and a written recommendation from an appropriate licensed professional (e.g., engineer, geologist, hydrogeologist): ☐ Where professional geotechnical evaluation recommends infiltration not be used due to reasonable concerns about erosion, slope failure, or down-gradient flooding. ☐ Within an area whose ground water drains into an erosion hazard, or landslide hazard area. ☐ Where the only area available for siting would threaten the safety or reliability of pre-existing underground utilities, pre-existing underground storage tanks, pre-existing structures, or pre-existing road or parking lot surfaces. ☐ Where the only area available for siting does not allow for a safe overflow pathway to stormwater drainage system or private storm sewer system. ☐ Where there is a lack of usable space for bioretention areas at re-development sites, or where there is insufficient space within the existing public right-of-way on public road projects. ☐ Where infiltrating water would threaten existing below grade basements. ☐ Where infiltrating water would threaten shoreline structures such as bulkheads. The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☑ Evaluation of infiltration is not required per the Infiltration Infeasibility Map due to steep slopes, erosion hazards, or landslide hazards ☐ Within setback provided for BMP T7.30 (**Stormwater Manual** Volume V, Section 7.4) ☐ Where they are not compatible with surrounding drainage system as determined by the city (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning bioretention area).	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Roofs (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Bioretention or Rain Gardens (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☑ Where land for bioretention is within an erosion hazard, or landslide hazard area (as defined by MICC 19.07.060). ☐ Where the site cannot be reasonably designed to locate bioretention areas on slopes less than 8 percent. ☐ Within 50 feet from the top of slopes that are greater than 20 percent and over 10 feet of vertical relief. ☐ For properties with known soil or groundwater contamination (typically federal Superfund sites or state cleanup sites under the Model Toxics Control Act [MTCA]): • Within 100 feet of an area known to have deep soil contamination. • Where groundwater modeling indicates infiltration will likely increase or change the direction of the migration of pollutants in the groundwater. • Wherever surface soils have been found to be contaminated unless those soils are removed within 10 horizontal feet from the infiltration area. • Any area where these facilities are prohibited by an approved cleanup plan under the state MTCA or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW. ☐ Within 100 feet of a closed or active landfill. ☐ Within 10 feet of an underground storage tank and connecting underground pipes when the capacity of the tank and pipe system is 1,100 gallons or less. As used in these criteria, an underground storage tank means any tank used to store petroleum products, chemicals, or liquid hazardous wastes of which 10 percent or more of the storage volume (including volume in the connecting piping system) is beneath the ground surface. ☐ Within 100 feet of an underground storage tank and connecting underground pipes when the capacity of the tank and pipe system is greater than 1,100 gallons.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Roofs (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Bioretention or Rain Gardens (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☐ Where field testing indicates potential bioretention/rain garden sites have a measured (a.k.a., initial) native soil saturated hydraulic conductivity less than 0.30 inches per hour. A small-scale or large-scale PIT in accordance with **Stormwater Manual** Volume III, Section 3.3.6 (or an alternative small scale test specified by the City) shall be used to demonstrate infeasibility of bioretention areas. If the measured native soil infiltration rate is less than 0.30 in/hour, bioretention/rain garden BMPs are not required to be evaluated as an option in List #1 or List #2. In these slow draining soils, a bioretention area with an underdrain may be used to treat pollution-generating surfaces to help meet Minimum Requirement #6, Runoff Treatment. If the underdrain is elevated within a base course of gravel, it will also provide some modest flow reduction benefit that will help achieve Minimum Requirement #7. ☐ Where the minimum vertical separation of 3 feet to the seasonal high groundwater elevation or other impermeable layer would not be achieved below bioretention that would serve a drainage area that exceeds the following thresholds (and cannot reasonably be broken down into amounts smaller than indicated): o 5,000 square feet of pollution-generating impervious surface (PGIS) o 10,000 square feet of impervious area o 0.75 acres of lawn and landscape. ☐ Where the minimum vertical separation of 1 foot to the seasonal high groundwater or other impermeable layer would not be achieved below bioretention that would serve a drainage area less than the above thresholds. ☐ Within 100 feet of a drinking water well, or a spring used for drinking water supply. ☐ Within 10 feet of small on-site sewage disposal drainfield, including reserve areas, and grey water reuse systems. For setbacks from a "large on-site sewage disposal system," see Chapter 246-272B WAC.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Roofs (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Downspout Dispersion Systems List #1 and #2	☐ Site setbacks and design criteria provided in BMP T5.10B (**Stormwater Manual** Volume III, Section 3.1.2) cannot be achieved. ☑ For splash blocks, a vegetated flowpath at least 50 feet in length from the downspout to the downstream property line, structure, stream, wetland, slope over 15 percent, or other impervious surface is not feasible. ☑ For trenches, a vegetated flowpath of at least 25 feet in between the outlet of the trench and any property line, structure, stream, wetland, or impervious surface is not feasible. A vegetated flowpath of at least 50 feet between the outlet of the trench and any slope steeper than 15 percent is not feasible.	
Perforated Stub-Out Connections List #1 and #2	☑ Evaluation of infiltration is not required per the Infiltration Infeasibility Map due to steep slopes, erosion hazards, or landslide hazards ☐ For sites with septic systems, the only location available for the perforated portion of the pipe is located up-gradient of the drainfield primary and reserve areas. This requirement can be waived if site topography will clearly prohibit flows from intersecting the drainfield or where site conditions (soil permeability, distance between systems, etc.) indicate that this is unnecessary. ☐ Site setbacks and design criteria provided in BMP T5.10C (**Stormwater Manual** Volume III, Section 3.1.3) cannot be achieved. ☐ There is not at least 1 foot of permeable soil from the proposed bottom (final grade) of the perforated stub-out connection trench to the highest estimated groundwater table or other impermeable layer. ☐ The only location available for the perforated stub-out connection is under impervious or heavily compacted soils.	
On-site Detention List #1 and #2	☐ Project discharges directly to Lake Washington. ☐ Findings from a 1/4 mile downstream analysis confirm that the downstream system is free of capacity constraints. ☐ Site setbacks and design criteria provided in the **Stormwater Manual** (Volume III, Section 3.2.2) cannot be achieved.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Full Dispersion List #1 and #2	☐ Site setbacks and design criteria provided in BMP T5.30 (**Stormwater Manual** Volume V, Section 5.3) cannot be achieved. ☐ A 65 to 10 ratio of forested or native vegetation area to impervious area cannot be achieved. ☑ A minimum forested or native vegetation flowpath length of 100 feet (25 feet for sheet flow from a non-native pervious surface) cannot be achieved.	
Permeable Pavement List #1 and #2	Citation of any of the following infeasibility criteria must be based on an evaluation of site-specific conditions and a written recommendation from an appropriate licensed professional (e.g., engineer, geologist, hydrogeologist): ☐ Where professional geotechnical evaluation recommends infiltration not be used due to reasonable concerns about erosion, slope failure, or downgradient flooding. ☐ Within an area whose ground water drains into an erosion hazard, or landslide hazard area. ☐ Where infiltrating and ponded water below the new permeable pavement area would compromise adjacent impervious pavements. ☐ Where infiltrating water below a new permeable pavement area would threaten existing below grade basements. ☐ Where infiltrating water would threaten shoreline structures such as bulkheads. ☐ Down slope of steep, erosion prone areas that are likely to deliver sediment. ☐ Where fill soils are used that can become unstable when saturated. ☐ Excessively steep slopes where water within the aggregate base layer or at the subgrade surface cannot be controlled by detention structures and may cause erosion and structural failure, or where surface runoff velocities may preclude adequate infiltration at the pavement surface. ☐ Where permeable pavements cannot provide sufficient strength to support heavy loads at industrial facilities such as ports. ☐ Where installation of permeable pavement would threaten the safety or reliability of pre-existing underground utilities, pre-existing underground storage tanks, or pre-existing road subgrades.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Permeable Pavement (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☑ Evaluation of infiltration is not required per the Infiltration Infeasibility Map due to steep slopes, erosion hazards, or landslide hazards ☑ Within an area designated as an erosion hazard, or landslide hazard. ☐ Within 50 feet from the top of slopes that are greater than 20 percent. ☐ For properties with known soil or groundwater contamination (typically federal Superfund sites or state cleanup sites under MTCA): • Within 100 feet of an area known to have deep soil contamination. • Where groundwater modeling indicates infiltration will likely increase or change the direction of the migration of pollutants in the groundwater. • Wherever surface soils have been found to be contaminated unless those soils are removed within 10 horizontal feet from the infiltration area. • Any area where these facilities are prohibited by an approved cleanup plan under the state MTCA or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW. ☐ Within 100 feet of a closed or active landfill. ☐ Within 100 feet of a drinking water well, or a spring used for drinking water supply, if the pavement is a pollution-generating surface. ☐ Within 10 feet of a small on-site sewage disposal drainfield, including reserve areas, and grey water reuse systems. For setbacks from a "large on-site sewage disposal system," see Chapter 246-272B WAC. ☐ Within 10 feet of any underground storage tank and connecting underground pipes, regardless of tank size. As used in these criteria, an underground storage tank means any tank used to store petroleum products, chemicals, or liquid hazardous wastes of which 10 percent or more of the storage volume (including volume in the connecting piping system) is beneath the ground surface. ☐ At multi-level parking garages, and over culverts and bridges. ☐ Where the site design cannot avoid putting pavement in areas likely to have long-term excessive sediment deposition after construction (e.g., construction and landscaping material yards).	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Permeable Pavement (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☐ Where the site cannot reasonably be designed to have: • Porous asphalt surface < 5% slope • Pervious concrete surface < 10% slope • Permeable interlocking concrete pavement surface < 12% slope • Grid systems < 6-12% slope (check with manufacturer and local supplier to confirm maximum slope) ☐ Where the subgrade soils below a pollution-generating permeable pavement (e.g., road or parking lot) do not meet the soil suitability criteria for providing treatment. See soil suitability criteria for treatment in the **Stormwater Manual** Volume III, Section 3.3.7. Note: In these instances, the city may approve installation of a 6 inch sand filter layer meeting city specifications for treatment as a condition of construction. ☐ Where underlying soils are unsuitable for supporting traffic loads when saturated. Soils meeting a California Bearing Ratio of 5 percent are considered suitable for residential access roads. ☐ Where replacing existing impervious surfaces unless the existing surface is a non-pollution generating surface over an outwash soil with a saturated hydraulic conductivity of 4 inches per hour or greater. ☐ Where appropriate field testing indicates soils have a measured (a.k.a., initial) subgrade soil saturated hydraulic conductivity less than 0.3 inches per hour. Only small-scale PIT or large-scale PIT methods in accordance with **Stormwater Manual** Volume III, Section 3.3.6 (or an alternative small scale test specified by the City) shall be used to evaluate infeasibility of permeable pavement areas. (Note: In these instances, unless other infeasibility restrictions apply, roads and parking lots may be built with an underdrain, preferably elevated within the base course, if flow control benefits are desired.) ☐ Roads that receive more than very low traffic volumes, and areas having more than very low truck traffic. Roads with a projected average daily traffic volume of 400 vehicles or less are very low volume roads (AASHTO 2001) (U.S. Department of Transportation, 2013). Areas with very low truck traffic volumes are roads and other areas not subject to through truck traffic but may receive up to weekly use by utility trucks (e.g., garbage, recycling), daily school bus use, and multiple daily use by pick-up trucks, mail/parcel delivery trucks, and maintenance vehicles. (Note: This infeasibility criterion does not extend to sidewalks and other non-traffic bearing surfaces associated with the collector or arterial).	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Permeable Pavement (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☐ At sites defined as "high-use sites" (refer to the Glossary in the **Stormwater Manual** Volume I). ☐ In areas with "industrial activity" as identified in 40 CFR 122.26(b)(14). ☐ Where the risk of concentrated pollutant spills is more likely such as gas stations, truck stops, and industrial chemical storage sites. ☐ Where routine, heavy applications of sand occur in frequent snow zones to maintain traction during weeks of snow and ice accumulation. ☐ Where the seasonal high groundwater or an underlying impermeable/ low permeable layer would create saturated conditions within 1 foot of the bottom of the lowest gravel base course.	
Bioretention or Rain Gardens List #1 (both) and List #2 (bioretention only)	*Note: Criteria with setback distances are as measured from the bottom edge of the bioretention soil mix.* Citation of any of the following infeasibility criteria must be based on an evaluation of site-specific conditions and a written recommendation from an appropriate licensed professional (e.g., engineer, geologist, hydrogeologist): ☐ Where professional geotechnical evaluation recommends infiltration not be used due to reasonable concerns about erosion, slope failure, or down-gradient flooding. ☐ Within an area whose ground water drains into an erosion hazard, or landslide hazard area. ☐ Where the only area available for siting would threaten the safety or reliability of pre-existing underground utilities, pre-existing underground storage tanks, pre-existing structures, or pre-existing road or parking lot surfaces. ☐ Where the only area available for siting does not allow for a safe overflow pathway to stormwater drainage system or private storm sewer system. ☐ Where there is a lack of usable space for bioretention areas at re-development sites, or where there is insufficient space within the existing public right-of-way on public road projects. ☐ Where infiltrating water would threaten existing below grade basements. ☐ Where infiltrating water would threaten shoreline structures such as bulkheads.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Bioretention or Rain Gardens (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☑ Where evaluation of infiltration is not required per the Infiltration Infeasibility Map due to steep slopes, erosion hazards, or landslide hazards. ☐ Within setback provided for BMP T7.30 (**Stormwater Manual** Volume V, Section 7.4) ☐ Where they are not compatible with surrounding drainage system as determined by the city (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning bioretention area). ☑ Where land for bioretention is within an erosion hazard, or landslide hazard area (as defined by MICC 19.07.060). ☐ Where the site cannot be reasonably designed to locate bioretention areas on slopes less than 8 percent. ☐ Within 50 feet from the top of slopes that are greater than 20 percent and over 10 feet of vertical relief. ☐ For properties with known soil or groundwater contamination (typically federal Superfund sites or state cleanup sites under the Model Toxics Control Act [MTCA]): • Within 100 feet of an area known to have deep soil contamination. • Where groundwater modeling indicates infiltration will likely increase or change the direction of the migration of pollutants in the groundwater. • Wherever surface soils have been found to be contaminated unless those soils are removed within 10 horizontal feet from the infiltration area. • Any area where these facilities are prohibited by an approved cleanup plan under the state MTCA or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW. ☐ Within 100 feet of a closed or active landfill. ☐ Within 10 feet of an underground storage tank and connecting underground pipes when the capacity of the tank and pipe system is 1,100 gallons or less. As used in these criteria, an underground storage tank means any tank used to store petroleum products, chemicals, or liquid hazardous wastes of which 10 percent or more of the storage volume (including volume in the connecting piping system) is beneath the ground surface.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Bioretention or Rain Gardens (cont.)	The following criteria can be cited as reasons for infeasibility without further justification (though some require professional services to make the observation): ☐ Within 100 feet of an underground storage tank and connecting underground pipes when the capacity of the tank and pipe system is greater than 1,100 gallons. ☐ Where field testing indicates potential bioretention/rain garden sites have a measured (a.k.a., initial) native soil saturated hydraulic conductivity less than 0.30 inches per hour. A small-scale or large-scale PIT in accordance with **Stormwater Manual** Volume III, Section 3.3.6 (or an alternative small scale test specified by the City) shall be used to demonstrate infeasibility of bioretention areas. If the measured native soil infiltration rate is less than 0.30 in/hour, bioretention/rain garden BMPs are not required to be evaluated as an option in List #1 or List #2. In these slow draining soils, a bioretention area with an underdrain may be used to treat pollution-generating surfaces to help meet Minimum Requirement #6, Runoff Treatment. If the underdrain is elevated within a base course of gravel, it will also provide some modest flow reduction benefit that will help achieve Minimum Requirement #7. ☐ Where the minimum vertical separation of 3 feet to the seasonal high groundwater elevation or other impermeable layer would not be achieved below bioretention that would serve a drainage area that exceeds the following thresholds (and cannot reasonably be broken down into amounts smaller than indicated): o 5,000 square feet of pollution-generating impervious surface (PGIS) o 10,000 square feet of impervious area o 0.75 acres of lawn and landscape. ☐ Where the minimum vertical separation of 1 foot to the seasonal high groundwater or other impermeable layer would not be achieved below bioretention that would serve a drainage area less than the above thresholds ☐ Within 100 feet of a drinking water well, or a spring used for drinking water supply. ☐ Within 10 feet of small on-site sewage disposal drainfield, including reserve areas, and grey water reuse systems. For setbacks from a "large on-site sewage disposal system," see Chapter 246-272B WAC.	

CITY OF MERCER ISLAND

SECTION C: INFEASIBILITY CRITERIA

Other Hard Surfaces (cont.)		
BMP and Applicable Lists	**Infeasibility Criteria**	**Infeasibility Description and Rationale for Each BMP Not Selected**
Sheet Flow Dispersion List #1 and #2	☐ Site setbacks and design criteria provided in BMP T5.12 (**Stormwater Manual** Volume V, Section 5.3) cannot be achieved. ☐ Positive drainage for sheet flow runoff cannot be achieved. ☐ Area to be dispersed (e.g., driveway, patio) cannot be graded to have less than a 15 percent slope. ☑ For flat to moderately sloped areas, at least a 10 foot-wide vegetation buffer for dispersion of the adjacent 20 feet of contributing surface cannot be achieved. For variably sloped areas, at least a 25 foot vegetated flowpath between berms cannot be achieved.	
Concentrated Flow Dispersion List #1 and #2	☐ Site setbacks and design criteria provided in BMP T5.11 (**Stormwater Manual** Volume V, Section 5.3) cannot be achieved. ☑ A minimum 3 foot length of rock pad and 50 foot flowpath OR a dispersion trench and 25 foot flowpath for every 700 square feet of drainage area followed with applicable setbacks cannot be achieved. ☐ More than 700 square feet drainage area drains to any dispersion device.	
On-site Detention List #1 and #2	☐ Project discharges directly to Lake Washington. ☐ Findings from a 1/4 mile downstream analysis confirm that the downstream system is free of capacity constraints. ☐ Site setbacks and design criteria provided in the **Stormwater Manual** (Volume III, Section 3.2.2) cannot be achieved.	

CITY OF MERCER ISLAND

SECTION D: POST-CONSTRUCTION SOIL MANAGEMENT

Attachments Required *(Check off required items that are attached)*

- [x] Site Plan showing, to scale:
  - [x] Areas of undisturbed native vegetation (no amendment required)
  - [ ] New planting beds (amendment required)
  - [x] New turf areas (amendment required)
  - [x] Type of soil improvement proposed for each area
- [ ] Soil test results (required if proposing custom amendment rates)
- [x] Product test results for proposed amendments

Total Amendment / Topsoil / Mulch for All Areas

Calculate the quantities needed for the entire site based on all of the areas identified on the Site Plan and the calculations on the following page(s):

Product	Total Quantity (CY)	Test Results
Product #1: CEDAR GROVE COMPOST	7.12 CY	53.1 % organic matter 18:1 C:N ratio "Stable"? yes ☑ no ☐
Product #2: _____	_____ CY	_____ % organic matter _____ C:N ratio "Stable"? yes ☐ no ☐
Product #3: _____	_____ CY	_____ % organic matter _____ C:N ratio "Stable"? yes ☐ no ☐

CY = cubic yards, C:N = Carbon:Nitrogen

CITY OF MERCER ISLAND

SECTION D: POST-CONSTRUCTION SOIL MANAGEMENT

Amendment / Topsoil / Mulch by Area

For each identified area on your Site Plan, provide the following information: (Use additional sheets if necessary)

Area # 1 (should match identified Area # on Site Plan)

Planting type: ☑ Turf ☐ Undisturbed native vegetation
☑ Planting Beds ☐ Other: _____

Pre-Approved Amendment Method		
☑ Amend with compost	Turf: 967 SF x 5.4 CY ÷ 1,000 SF = 5.22 CY Planting beds: 204 SF x 9.3 CY ÷ 1,000 SF= 1.90 CY Total Quantity = 7.12 CY Scarification depth: 8 inches	Product: CEDAR GROVE COMPOST
☐ Stockpile and amend	Turf: _____ SF x 5.4 CY ÷ 1,000 SF = _____ CY Planting beds: _____ SF x 9.3 CY ÷ 1,000 SF= _____ CY Total Quantity = _____ CY Scarification depth: 8 inches	Product: _____
☐ Topsoil import	Turf: _____ SF x 18.6 CY÷1,000 SF = _____ CY Planting beds: _____ SF x 18.6 CY ÷ 1,000 SF= _____ CY Total Quantity = _____ CY Scarification depth: 6 inches	Product: _____
Custom Amendment		
☐ Amend with compost	Attach information on bulk density, percent organic matter, moisture content, C:N ratio, and heavy metals analysis to support custom amendment rate and scarification depth. Total Quantity = _____ CY Scarification depth: _____ inches	Product: _____
☐ Stockpile and amend	Attach information on bulk density, percent organic matter, moisture content, C:N ratio, and heavy metals analysis to support custom amendment rate and scarification depth. Total Quantity = _____ CY Scarification depth: _____ inches	Product: _____
Mulch		
☐ Amend with compost	Planting beds: _____ SF x 12.4 CY ÷ 1,000 SF= _____ CY Total Quantity = _____ CY	Product: _____
☐ Stockpile and amend	Planting beds: _____ SF x 12.4 CY ÷ 1,000 SF= _____ CY Total Quantity = _____ CY	Product: _____
☐ Topsoil import	Planting beds: _____ SF x 12.4 CY ÷ 1,000 SF= _____ CY Total Quantity = _____ CY	Product: _____

CY = cubic yards, C:N = Carbon:Nitrogen

CITY OF MERCER ISLAND

SECTION E: SIGNATURE PAGE

Project Engineer's Certification for Section B

For Stormwater Site Plans with engineered elements, the Construction SWPPP is stamped by a professional engineer licensed in the State of Washington in civil engineering.

If required, attach a page with the project engineer's seal with the following statement:

"I hereby state that this Construction Stormwater Pollution Prevention Plan for Hwang Lee Residence *(name of project)* *has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Mercer Island does not and will not assume liability for the sufficiency, suitability, or performance of Construction SWPPP BMPs prepared by me."*

Applicant Signature for Full Stormwater Package (Sections A through D)

I have read and completed the Stormwater Submittal Package and know the information provided to be true and correct.

Print Applicant Name: Justin Goroch, P.E.

Applicant Signature: _____ Date 2/10/2022

2/10/2022

CEDAR GROVE®

Why is Our Product ORGANIC?

Cedar Grove makes a high quality, consistent compost through a patented process using controlled aeration, temperature monitoring, curing, and screening.

Compost supplies a natural feeding system with microbes, increasing activity in the soil. Our product is 100% soil!

US Composting Council Seal of Testing Assurance®

CLOSE THE LOOP 100% RECYCLED SUPPORT LOCAL MADE BY YOU

HOW IT WORKS:

1 Cedar Grove compost is made from locally recycled garden prunings, food products and vegetable trimmings from residential curbside and commercial collection programs across the Puget Sound region. At our facilities, we double-screen the material to remove any non-compostable items.

2 We use a state-of-the-art computer controlled system to ensure that the compost is heated to 150 - 170 degrees to remove pathogens, pesticides and weed seeds. The naturally occurring microbes and heat break down toxic chemicals into safe compounds.

3 Our finished compost is sent to certified third party laboratories to guarantee that our product meets all standards. Cedar Grove, in compliance with the US Composting Council Seal of Testing, tests our compost prior to sale to ensure compliance with regulations.

Cedar Grove Compost Quality Assurance Program

Cedar Grove Compost facilities are in compliance with Washington Department of Ecology (WDOE) requirements for compost process and product quality (WAC 173-350-220). Cedar Grove also voluntarily meets the US Composting Council's Seal of Testing Assurance (STA) and Washington Department of Transportation (WDOT) standards. Results of tests for horticultural values and applicable WDOT standards are shown in Chart 1. WDOE compost quality requirements and Cedar Grove Compost results are in Chart 2.

Chart 1. Cedar Grove Fine Grade Compost Horticultural Values

		WDOT Standard	Cedar Grove
Organic Matter		>40%	**53.1%**
Carbon to Nitrogen Ratio			**18**
Conductivity		<4 mmhos/cm	**3.1 mmhos/cm**
Seedling Emergence		>80% of purified water	**100%**
Seedling Vigor		>80% of purified water	**88%**
Weed Seeds			**No weed germination**
Compost Stability		<7 mg CO_2/gr. OM/day	**3.2 "Stable"**
Dry weight			**21 lbs / cu. ft.**
Major Nutrients	Total Nitrogen		**1.6%**
	Phosphorous (P_2O_5)		**.55%**
	Potassium (K_2O)		**.89%**
	Sulfate		**40 mg/kg**
	Calcium		**1.6%**
	Magnesium		**0.34%**

Chart 2. Compost Quality Requirements - Washington Administrative Code *173-350 Sect. 220*

	WAC 173-350-220 Standard	Cedar Grove
Metals	***Parts per million (mg/kg), dry wt.***	
Arsenic	<=20	**7.8**
Cadmium	<=10	**<1.0**
Copper	<=750	**42**
Lead	<=150	**29**
Mercury	<=8	**<1.0**
Molybdenum	<=9	**2.3**
Nickel	<=210	**18**
Selenium	<=18	**<1**
Zinc	<=1400	**160**
pH	5-10 (range)	**8.06**
Salmonella (Pathogen indicator)	< 3 MPN / 4 grams of total solids	**Pass**
Sharps	0 percent	**None Detected**
Manufactured Inerts	< 0.5 percent	**< 0.5 percent**

Chart 3. WDOT Particle Size Specifications by Compost Grade

Sieve size	WDOT "Fine" Compost	Cedar Grove
1"	95-100%	**100%**
5/8"	90-100%	**97.7%**
¼"	75-100%	**93%**

All tests performed by Soil Control Laboratories, Watsonville, CA; using TMECC/STA specified methods.

bcra
2106 Pacific Avenue, Suite 300
Tacoma, WA 98402

DETENTION SYSTEM WWHM ANALYSIS

PROJECT:
Hwang Lee Residence
9772 SE 41st Street
Mercer Island, WA 98040

PRPARED FOR:
NW Lifestyle Homes
11747 NE 1st Street Suite 210
Bellevue, WA 98005

PREPARED BY: Kayla Schunzel, EIT
REVIEWED BY: Justin Goroch, PE

DATE: February 10, 2022

The new Hwang Lee Residence on Mercer Island, WA will include 3,431 square feet of new plus replaced hard surfaces, consisting of a single-family home and driveway. The project is eligible to use the Mercer Island Standard On-site Detention System Worksheet to meet Minimum Requirement #5: Low Impact Development standards. Initial design iterations using the Standard On-site Detention System Worksheet have proven the project site does not have sufficient elevation drop between finished floor elevation of the new home and the municipal storm system to utilize the recommended detention tanks. A 495 CF storage StormTech SC-160LP detention chamber system will be used to meet the Minimum Requirement 5 standard while fitting within the elevation constraint.

The designed SC-160LP chamber system contains approximately 11 cubic feet more than equivalent volume to a detention pipe sized via Table 1 in the Standard On-Site Detention System Worksheet. See Figure 1 below for the detention pipe chosen for comparison. The detention pipe chosen from Figure 1 has a cross sectional storage area of 18.61 square feet after subtracting six inches of dead storage and is 26 feet long. The pipe can store 483.94 cubic feet of runoff on top of 26.57 cubic feet of dead storage.

Figure 1. Mercer Island Standard On-site Detention System Worksheet Table 1

Table 1

ON-SITE DETENTION DESIGN FOR PROJECTS BETWEEN 500 SF AND 9,500 SF NEW PLUS REPLACED IMPERVIOUS SURFACE AREA

New and Replaced Impervious Surface Area (sf)	Detention Pipe Diameter (in)	Detention Pipe Length (ft)		Lowest Orifice Diameter (in)[3]		Distance from Outlet Invert to Second Orifice (ft)		Second Orifice Diameter (in)	
		B soils	C soils	B soils	C soils	B soils	C soils	B soils	C soils
500 to 1,000 sf	36"	30	22	0.5	0.5	2.2	2.0	0.5	0.8
	48"	18	11	0.5	0.5	3.3	3.2	0.9	0.8
	60"	11	7	0.5	0.5	4.2	3.4	0.5	0.6
1,001 to 2,000 sf	36"	66	43	0.5	0.5	2.2	2.3	0.9	1.4
	48"	34	23	0.5	0.5	3.2	3.3	0.9	1.2
	60"	22	14	0.5	0.5	4.3	3.6	0.9	0.9
2,001 to 3,000 sf	36"	90	66	0.5	0.5	2.2	2.4	0.9	1.9
	48"	48	36	0.5	0.5	3.1	2.8	0.9	1.5
	60"	30	20	0.5	0.5	4.2	3.7	0.9	1.1
3,001 to 4,000 sf	36"	120	78	0.5	0.5	2.4	2.2	1.4	1.6
	48"	62	42	0.5	0.5	2.8	2.9	0.8	1.3
	60"	42	26	0.5	0.5	3.8	3.9	0.9	1.3

The prescribed detention pipe and StormTech system were compared via WWHM LID duration exceeding occasions. Both model predeveloped scenarios contained 0.078765 acres of flat forested land. The prescribed pipe mitigated condition contained 0.078765 acres of hard surface and the detention pipe as shown in Figure 2. The StormTech predeveloped condition contained the 0.078765 acres of hard surface and the StormTech system SSD table as shown in Figure 3 and the attached ADS StormTech SSD table.

The StormTech facility was sized to match volume and durations of the prescribed detention pipe, which failed the WWHM LID duration analysis. The StormTech Mitigated Occasions Exceeding LID column data from the LID Duration Analysis tab was compared to the prescribed detention pipe Mitigated Occasions Exceeding LID data. The StormTech system failed WWHM LID duration standards less than the prescribed pipe as shown in Table 1. Therefore, the StormTech system meets the Mercer Island standard for Low Impact Development determined from the Standard On-site Detention System Worksheet. Figures 4 and 5 show the LID Duration Analysis results. See attached WWHM reports and StormTech SSD table for reference.

Figure 2. WWHM Predeveloped Basin

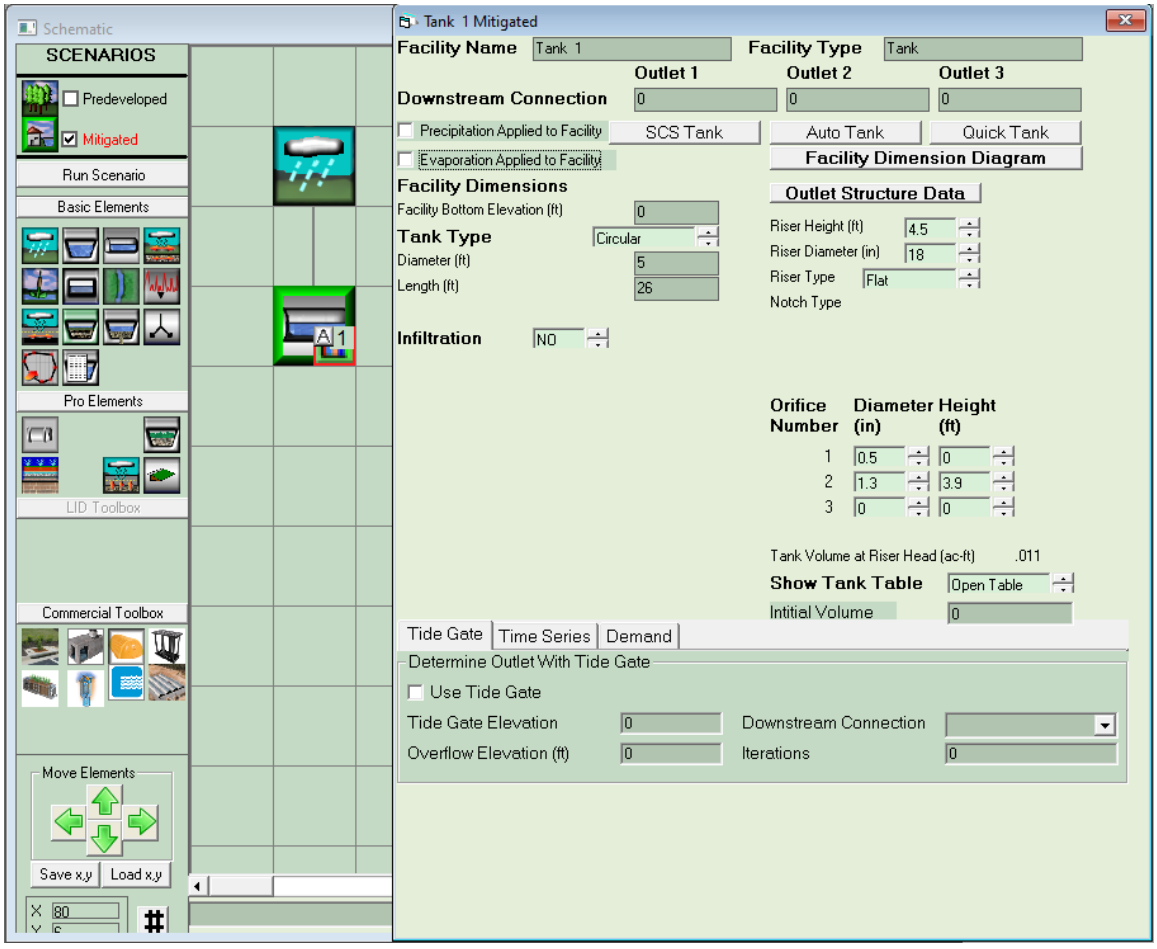


Figure 3. StormTech WWHM Mitigated Basin

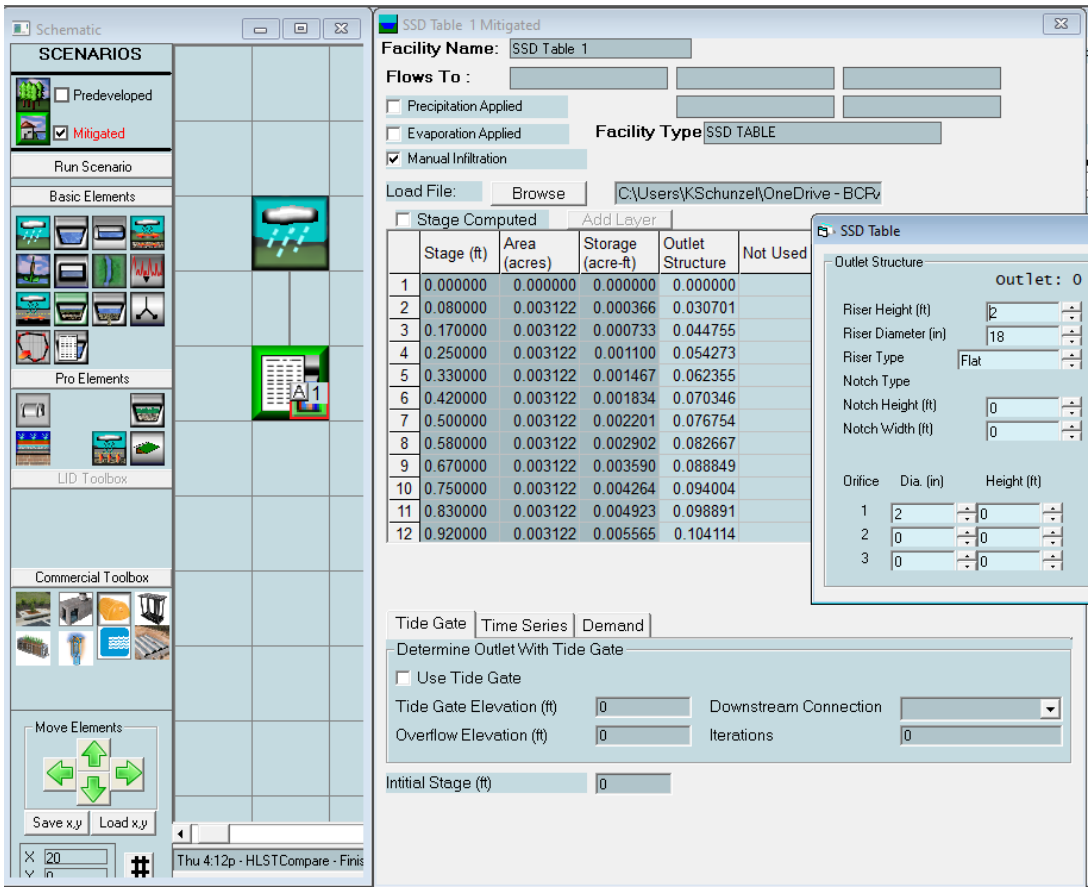


Figure 4. Prescribed Pipe WWHM LID Analysis Results

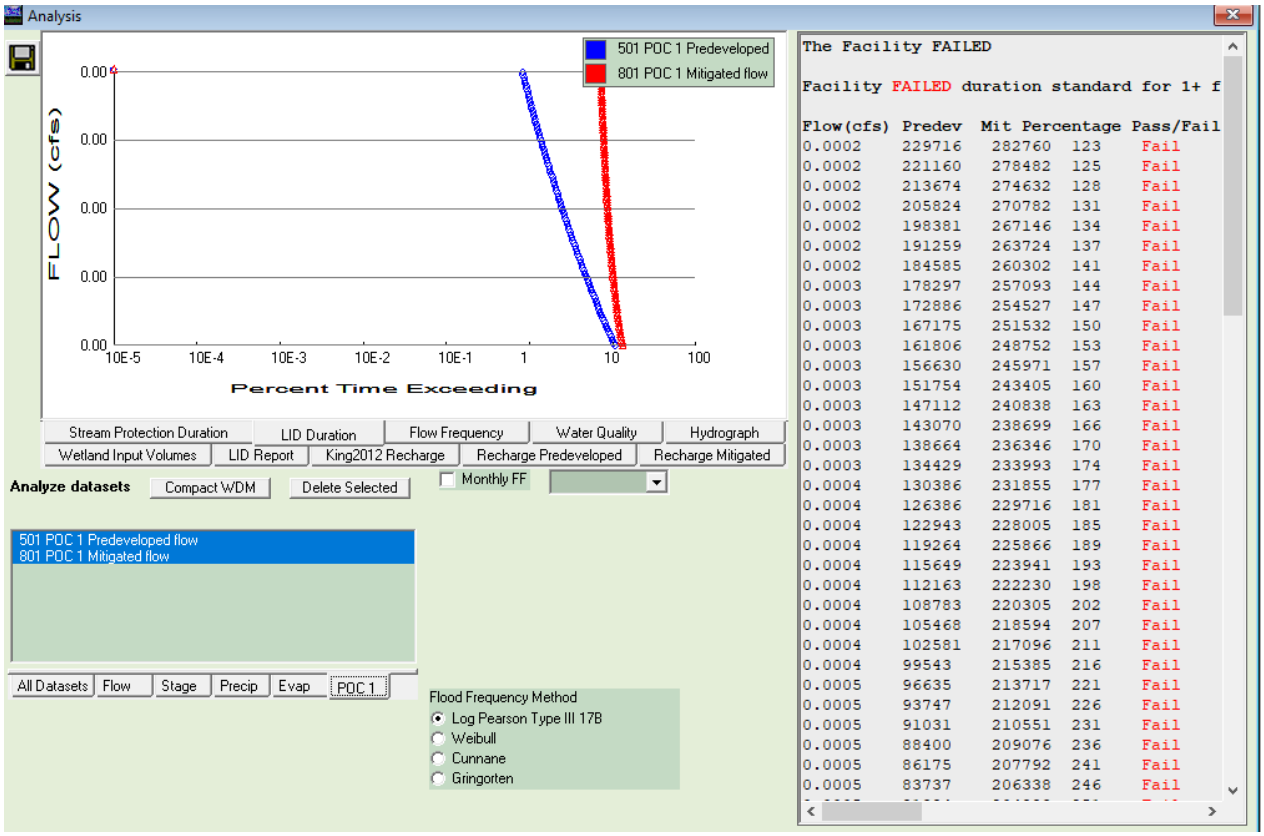


Figure 5. StormTech WWHM LID Analysis Results

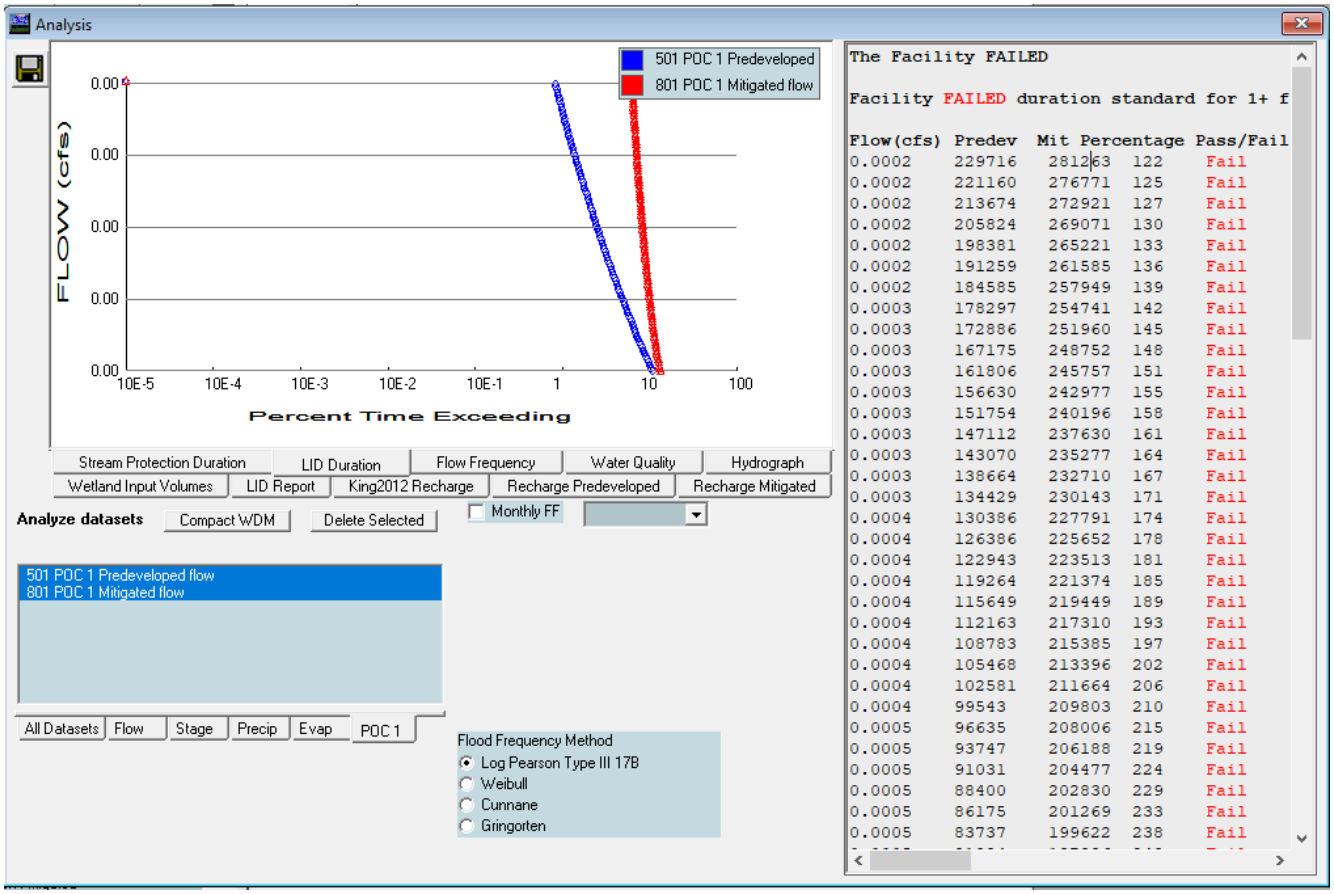


Table 1. LID Analysis Comparison

Prescribed Mitigated Exceeding LID Occasions	Stormtech Mitigated Exceeding LID Occasions	Stormtech < Prescribed?
282760	281263	TRUE
278482	276771	TRUE
274632	272921	TRUE
270782	269071	TRUE
267146	265221	TRUE
263724	261585	TRUE
260302	257949	TRUE
257093	254741	TRUE
254527	251960	TRUE
251532	248752	TRUE
248752	245757	TRUE
245971	242977	TRUE
243405	240196	TRUE
240838	237630	TRUE
238699	235277	TRUE
236346	232710	TRUE
233993	230143	TRUE
231855	227791	TRUE
229716	225652	TRUE
228005	223513	TRUE
225866	221374	TRUE
223941	219449	TRUE
222230	217310	TRUE
220305	215385	TRUE
218594	213396	TRUE
217096	211664	TRUE
215385	209803	TRUE
213717	208006	TRUE
212091	206188	TRUE
210551	204477	TRUE
209076	202830	TRUE
207792	201269	TRUE
206338	199622	TRUE
204883	197996	TRUE
203450	196413	TRUE
202124	194895	TRUE
200969	193547	TRUE
199707	192093	TRUE

198445	190574	TRUE
197226	189141	TRUE
196028	187708	TRUE
194831	186339	TRUE
193804	185120	TRUE
192649	183794	TRUE
191579	182489	TRUE
190531	181227	TRUE
189462	179965	TRUE
188435	178682	TRUE
187580	177570	TRUE
186575	176351	TRUE
185569	175174	TRUE
184607	173998	TRUE
183687	172779	TRUE
182789	171645	TRUE
181976	170597	TRUE
181099	169506	TRUE
180179	168480	TRUE
179345	167367	TRUE
178511	166341	TRUE
177805	165357	TRUE
176992	164330	TRUE
176180	163282	TRUE
175388	162277	TRUE
174597	161250	TRUE
173827	160288	TRUE
173142	159368	TRUE
172437	158427	TRUE
171731	157464	TRUE
171046	156523	TRUE
170383	155625	TRUE
169677	154748	TRUE
169078	153935	TRUE
168415	153080	TRUE
167774	152203	TRUE
167153	151304	TRUE
166512	150492	TRUE
165892	149636	TRUE
165335	148845	TRUE
164758	148032	TRUE
164159	147240	TRUE
163560	146492	TRUE
162940	145615	TRUE

162427	144866	TRUE
161828	144096	TRUE
161293	143262	TRUE
160737	142449	TRUE
160224	141701	TRUE
159646	140931	TRUE
159175	140289	TRUE
158662	139498	TRUE
158149	138771	TRUE
157635	138043	TRUE
157122	137359	TRUE
156609	136610	TRUE
156160	135969	TRUE
155646	135241	TRUE
155112	134536	TRUE
154620	133851	TRUE
154128	133188	TRUE
153657	132546	TRUE

Project: **Hwang Lee Residence**

StormTech® Detention • Retention • Water Quality
A division of ADS

Chamber Model -	SC-160	
Units -	**Imperial**	Click Here for Metric
Number of chambers -	25	
Voids in the stone (porosity) -	35	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	7	in
Amount of Stone Below Chambers -	6	in
Area of system -	548	sf Min. Area - 371 sf min. area

☑ Include Perimeter Stone in Calculations

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*	
25	0.00	0.00	15.98	15.98	510.95	2.08	
24	0.00	0.00	15.98	15.98	494.97	2.00	Top of Facility Riser
23	0.00	0.00	15.98	15.98	478.99	1.92	
22	0.00	0.00	15.98	15.98	463.00	1.83	
21	0.00	0.00	15.98	15.98	447.02	1.75	
20	0.00	0.00	15.98	15.98	431.04	1.67	
19	0.00	0.00	15.98	15.98	415.05	1.58	
18	0.05	1.28	15.54	16.82	399.07	1.50	
17	0.13	3.36	14.81	18.17	382.26	1.42	
16	0.29	7.26	13.44	20.71	364.09	1.33	
15	0.44	11.05	12.12	23.16	343.38	1.25	
14	0.54	13.48	11.27	24.74	320.22	1.17	
13	0.62	15.41	10.59	26.00	295.47	1.08	
12	0.68	17.02	10.03	27.05	269.47	1.00	
11	0.74	18.40	9.54	27.94	242.43	0.92	
10	0.78	19.59	9.13	28.71	214.49	0.83	
9	0.82	20.62	8.77	29.39	185.77	0.75	
8	0.86	21.51	8.46	29.96	156.39	0.67	
7	0.89	22.37	8.16	30.52	126.42	0.58	
6	0.00	0.00	15.98	15.98	95.90	0.50	
5	0.00	0.00	15.98	15.98	79.92	0.42	
4	0.00	0.00	15.98	15.98	63.93	0.33	
3	0.00	0.00	15.98	15.98	47.95	0.25	
2	0.00	0.00	15.98	15.98	31.97	0.17	
1	0.00	0.00	15.98	15.98	15.98	0.08	

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Presribed
Site Name:	HL3
Site Address:	
City:	Mercer Island
Report Date:	2/10/2022
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

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 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.078765
Pervious Total	0.078765
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.078765

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.078765
Impervious Total	0.078765
Basin Total	0.078765

Element Flows To:

Surface	Interflow	Groundwater
Tank 1	Tank 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Tank 1

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 26 ft.
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 0.5 in. Elevation:0 ft.
Orifice 2 Diameter: 1.3 in. Elevation:3.9 ft.
Element Flows To:
Outlet 1 Outlet 2

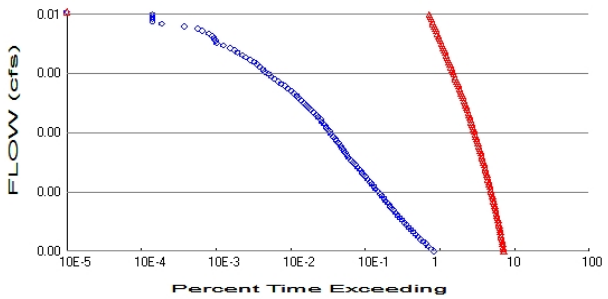
Tank Hydraulic Table

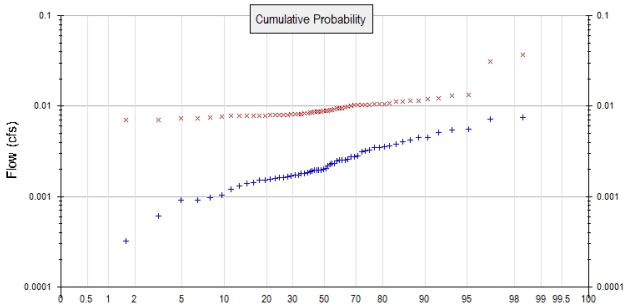
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000000	0.000000	0.000	0.000
0.0556	0.000626	0.000023	0.001	0.000
0.1111	0.000880	0.000065	0.002	0.000
0.1667	0.001071	0.000120	0.002	0.000
0.2222	0.001230	0.000184	0.003	0.000
0.2778	0.001367	0.000256	0.003	0.000
0.3333	0.001489	0.000336	0.003	0.000
0.3889	0.001599	0.000421	0.004	0.000
0.4444	0.001699	0.000513	0.004	0.000
0.5000	0.001791	0.000610	0.004	0.000
0.5556	0.001876	0.000712	0.005	0.000
0.6111	0.001955	0.000818	0.005	0.000
0.6667	0.002029	0.000929	0.005	0.000
0.7222	0.002098	0.001044	0.005	0.000
0.7778	0.002163	0.001162	0.006	0.000
0.8333	0.002224	0.001284	0.006	0.000
0.8889	0.002282	0.001409	0.006	0.000
0.9444	0.002336	0.001537	0.006	0.000
1.0000	0.002388	0.001669	0.006	0.000
1.0556	0.002436	0.001803	0.007	0.000
1.1111	0.002481	0.001939	0.007	0.000
1.1667	0.002525	0.002078	0.007	0.000
1.2222	0.002565	0.002220	0.007	0.000
1.2778	0.002603	0.002363	0.007	0.000
1.3333	0.002639	0.002509	0.007	0.000
1.3889	0.002673	0.002657	0.008	0.000
1.4444	0.002705	0.002806	0.008	0.000
1.5000	0.002735	0.002957	0.008	0.000
1.5556	0.002763	0.003110	0.008	0.000
1.6111	0.002789	0.003264	0.008	0.000
1.6667	0.002814	0.003420	0.008	0.000
1.7222	0.002836	0.003577	0.008	0.000
1.7778	0.002857	0.003735	0.009	0.000
1.8333	0.002876	0.003894	0.009	0.000
1.8889	0.002894	0.004054	0.009	0.000
1.9444	0.002910	0.004216	0.009	0.000
2.0000	0.002924	0.004378	0.009	0.000

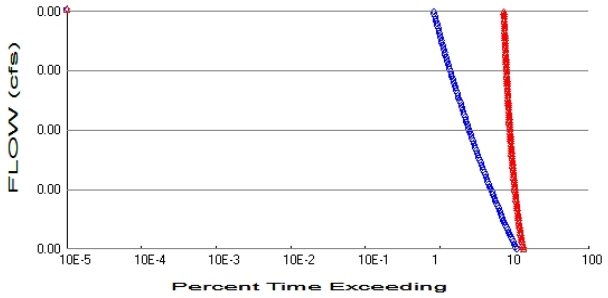
2.0556	0.002937	0.004540	0.009	0.000
2.1111	0.002948	0.004704	0.009	0.000
2.1667	0.002958	0.004868	0.010	0.000
2.2222	0.002966	0.005033	0.010	0.000
2.2778	0.002973	0.005198	0.010	0.000
2.3333	0.002978	0.005363	0.010	0.000
2.3889	0.002981	0.005528	0.010	0.000
2.4444	0.002984	0.005694	0.010	0.000
2.5000	0.002984	0.005860	0.010	0.000
2.5556	0.002984	0.006026	0.010	0.000
2.6111	0.002981	0.006191	0.011	0.000
2.6667	0.002978	0.006357	0.011	0.000
2.7222	0.002973	0.006522	0.011	0.000
2.7778	0.002966	0.006687	0.011	0.000
2.8333	0.002958	0.006852	0.011	0.000
2.8889	0.002948	0.007016	0.011	0.000
2.9444	0.002937	0.007179	0.011	0.000
3.0000	0.002924	0.007342	0.011	0.000
3.0556	0.002910	0.007504	0.011	0.000
3.1111	0.002894	0.007665	0.012	0.000
3.1667	0.002876	0.007826	0.012	0.000
3.2222	0.002857	0.007985	0.012	0.000
3.2778	0.002836	0.008143	0.012	0.000
3.3333	0.002814	0.008300	0.012	0.000
3.3889	0.002789	0.008456	0.012	0.000
3.4444	0.002763	0.008610	0.012	0.000
3.5000	0.002735	0.008763	0.012	0.000
3.5556	0.002705	0.008914	0.012	0.000
3.6111	0.002673	0.009063	0.012	0.000
3.6667	0.002639	0.009211	0.013	0.000
3.7222	0.002603	0.009356	0.013	0.000
3.7778	0.002565	0.009500	0.013	0.000
3.8333	0.002525	0.009641	0.013	0.000
3.8889	0.002481	0.009780	0.013	0.000
3.9444	0.002436	0.009917	0.023	0.000
4.0000	0.002388	0.010051	0.028	0.000
4.0556	0.002336	0.010182	0.031	0.000
4.1111	0.002282	0.010311	0.034	0.000
4.1667	0.002224	0.010436	0.037	0.000
4.2222	0.002163	0.010558	0.040	0.000
4.2778	0.002098	0.010676	0.042	0.000
4.3333	0.002029	0.010791	0.044	0.000
4.3889	0.001955	0.010901	0.046	0.000
4.4444	0.001876	0.011008	0.048	0.000
4.5000	0.001791	0.011110	0.049	0.000
4.5556	0.001699	0.011207	0.259	0.000
4.6111	0.001599	0.011298	0.641	0.000
4.6667	0.001489	0.011384	1.129	0.000
4.7222	0.001367	0.011464	1.693	0.000
4.7778	0.001230	0.011536	2.306	0.000
4.8333	0.001071	0.011600	2.941	0.000
4.8889	0.000880	0.011654	3.570	0.000
4.9444	0.000626	0.011696	4.165	0.000
5.0000	0.000000	0.011720	4.702	0.000
5.0556	0.000000	0.000000	5.161	0.000

Analysis Results

POC 1







\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.078765
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.078765

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.002316
5 year	0.003637
10 year	0.004386
25 year	0.005179
50 year	0.00567
100 year	0.006087

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.00909
5 year	0.011797
10 year	0.013831
25 year	0.016687
50 year	0.019031
100 year	0.021569

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.002	0.010
1950	0.003	0.009
1951	0.005	0.010
1952	0.002	0.008
1953	0.001	0.008
1954	0.002	0.008
1955	0.003	0.011
1956	0.003	0.009
1957	0.002	0.010
1958	0.002	0.009
1959	0.002	0.008
1960	0.003	0.010
1961	0.002	0.008
1962	0.001	0.007
1963	0.002	0.007
1964	0.002	0.008
1965	0.002	0.008
1966	0.002	0.008
1967	0.003	0.010
1968	0.002	0.008
1969	0.002	0.009
1970	0.002	0.009
1971	0.002	0.008
1972	0.004	0.010
1973	0.002	0.008
1974	0.002	0.007
1975	0.003	0.010
1976	0.002	0.008
1977	0.000	0.008
1978	0.002	0.010
1979	0.001	0.008
1980	0.004	0.009
1981	0.001	0.009
1982	0.003	0.012
1983	0.002	0.010
1984	0.002	0.008
1985	0.001	0.009
1986	0.004	0.011
1987	0.004	0.011
1988	0.001	0.008
1989	0.001	0.007
1990	0.007	0.013
1991	0.004	0.012
1992	0.002	0.009
1993	0.002	0.007
1994	0.001	0.007
1995	0.003	0.009
1996	0.005	0.011
1997	0.005	0.012
1998	0.001	0.008
1999	0.004	0.010
2000	0.002	0.009
2001	0.000	0.008
2002	0.002	0.011
2003	0.003	0.008
2004	0.003	0.037

2005	0.002	0.010
2006	0.003	0.009
2007	0.006	0.013
2008	0.007	0.031
2009	0.003	0.010

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0074	0.0367
2	0.0071	0.0311
3	0.0055	0.0134
4	0.0054	0.0131
5	0.0051	0.0122
6	0.0045	0.0120
7	0.0045	0.0115
8	0.0043	0.0114
9	0.0040	0.0113
10	0.0038	0.0112
11	0.0036	0.0108
12	0.0036	0.0106
13	0.0035	0.0105
14	0.0034	0.0104
15	0.0032	0.0104
16	0.0032	0.0104
17	0.0031	0.0103
18	0.0028	0.0103
19	0.0028	0.0103
20	0.0027	0.0100
21	0.0026	0.0099
22	0.0025	0.0096
23	0.0025	0.0096
24	0.0025	0.0095
25	0.0025	0.0095
26	0.0023	0.0093
27	0.0023	0.0090
28	0.0023	0.0090
29	0.0022	0.0089
30	0.0020	0.0089
31	0.0020	0.0089
32	0.0020	0.0087
33	0.0020	0.0087
34	0.0020	0.0086
35	0.0019	0.0086
36	0.0019	0.0085
37	0.0019	0.0085
38	0.0018	0.0083
39	0.0018	0.0083
40	0.0018	0.0082
41	0.0017	0.0082
42	0.0017	0.0082
43	0.0017	0.0081
44	0.0017	0.0080
45	0.0016	0.0080
46	0.0016	0.0080
47	0.0016	0.0079
48	0.0016	0.0079
49	0.0015	0.0079

50	0.0015	0.0078
51	0.0014	0.0078
52	0.0014	0.0078
53	0.0013	0.0077
54	0.0012	0.0077
55	0.0010	0.0077
56	0.0010	0.0075
57	0.0009	0.0074
58	0.0009	0.0073
59	0.0006	0.0071
60	0.0003	0.0070
61	0.0002	0.0069

LID Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0002	229716	282760	123	Fail
0.0002	221160	278482	125	Fail
0.0002	213674	274632	128	Fail
0.0002	205824	270782	131	Fail
0.0002	198381	267146	134	Fail
0.0002	191259	263724	137	Fail
0.0002	184585	260302	141	Fail
0.0003	178297	257093	144	Fail
0.0003	172886	254527	147	Fail
0.0003	167175	251532	150	Fail
0.0003	161806	248752	153	Fail
0.0003	156630	245971	157	Fail
0.0003	151754	243405	160	Fail
0.0003	147112	240838	163	Fail
0.0003	143070	238699	166	Fail
0.0003	138664	236346	170	Fail
0.0003	134429	233993	174	Fail
0.0004	130386	231855	177	Fail
0.0004	126386	229716	181	Fail
0.0004	122943	228005	185	Fail
0.0004	119264	225866	189	Fail
0.0004	115649	223941	193	Fail
0.0004	112163	222230	198	Fail
0.0004	108783	220305	202	Fail
0.0004	105468	218594	207	Fail
0.0004	102581	217096	211	Fail
0.0004	99543	215385	216	Fail
0.0005	96635	213717	221	Fail
0.0005	93747	212091	226	Fail
0.0005	91031	210551	231	Fail
0.0005	88400	209076	236	Fail
0.0005	86175	207792	241	Fail
0.0005	83737	206338	246	Fail
0.0005	81384	204883	251	Fail
0.0005	79053	203450	257	Fail
0.0005	76850	202124	263	Fail
0.0005	74946	200969	268	Fail
0.0005	72829	199707	274	Fail
0.0006	70904	198445	279	Fail
0.0006	69043	197226	285	Fail
0.0006	67118	196028	292	Fail
0.0006	65321	194831	298	Fail
0.0006	63781	193804	303	Fail
0.0006	62113	192649	310	Fail
0.0006	60552	191579	316	Fail
0.0006	59054	190531	322	Fail
0.0006	57579	189462	329	Fail
0.0006	56103	188435	335	Fail
0.0007	54819	187580	342	Fail
0.0007	53451	186575	349	Fail
0.0007	52125	185569	356	Fail
0.0007	50841	184607	363	Fail
0.0007	49579	183687	370	Fail
0.0007	48339	182789	378	Fail

0.0007	47312	181976	384	Fail
0.0007	46157	181099	392	Fail
0.0007	44981	180179	400	Fail
0.0007	43933	179345	408	Fail
0.0008	42906	178511	416	Fail
0.0008	42008	177805	423	Fail
0.0008	41024	176992	431	Fail
0.0008	40061	176180	439	Fail
0.0008	39077	175388	448	Fail
0.0008	38179	174597	457	Fail
0.0008	37238	173827	466	Fail
0.0008	36468	173142	474	Fail
0.0008	35591	172437	484	Fail
0.0008	34778	171731	493	Fail
0.0009	33944	171046	503	Fail
0.0009	33153	170383	513	Fail
0.0009	32383	169677	523	Fail
0.0009	31720	169078	533	Fail
0.0009	30992	168415	543	Fail
0.0009	30265	167774	554	Fail
0.0009	29538	167153	565	Fail
0.0009	28896	166512	576	Fail
0.0009	28233	165892	587	Fail
0.0009	27613	165335	598	Fail
0.0010	26993	164758	610	Fail
0.0010	26415	164159	621	Fail
0.0010	25816	163560	633	Fail
0.0010	25260	162940	645	Fail
0.0010	24747	162427	656	Fail
0.0010	24234	161828	667	Fail
0.0010	23720	161293	679	Fail
0.0010	23228	160737	691	Fail
0.0010	22779	160224	703	Fail
0.0010	22309	159646	715	Fail
0.0010	21902	159175	726	Fail
0.0011	21474	158662	738	Fail
0.0011	21036	158149	751	Fail
0.0011	20627	157635	764	Fail
0.0011	20223	157122	776	Fail
0.0011	19787	156609	791	Fail
0.0011	19408	156160	804	Fail
0.0011	19017	155646	818	Fail
0.0011	18615	155112	833	Fail
0.0011	18245	154620	847	Fail
0.0011	17879	154128	862	Fail
0.0012	17545	153657	875	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0012	17545	153657	875	Fail
0.0012	16170	151647	937	Fail
0.0012	14964	149657	1000	Fail
0.0013	13860	147690	1065	Fail
0.0013	12814	145743	1137	Fail
0.0014	11819	143861	1217	Fail
0.0014	10902	141915	1301	Fail
0.0015	10117	140075	1384	Fail
0.0015	9390	138321	1473	Fail
0.0016	8729	136525	1564	Fail
0.0016	8156	134728	1651	Fail
0.0017	7593	132718	1747	Fail
0.0017	7071	130643	1847	Fail
0.0018	6590	128333	1947	Fail
0.0018	6145	125980	2050	Fail
0.0018	5781	123756	2140	Fail
0.0019	5431	121510	2237	Fail
0.0019	5103	119456	2340	Fail
0.0020	4808	117510	2444	Fail
0.0020	4528	115542	2551	Fail
0.0021	4254	113596	2670	Fail
0.0021	4017	111692	2780	Fail
0.0022	3784	109767	2900	Fail
0.0022	3546	107864	3041	Fail
0.0023	3339	106003	3174	Fail
0.0023	3138	104057	3316	Fail
0.0023	2954	102174	3458	Fail
0.0024	2787	100228	3596	Fail
0.0024	2597	98260	3783	Fail
0.0025	2449	96442	3938	Fail
0.0025	2304	94538	4103	Fail
0.0026	2162	92656	4285	Fail
0.0026	2026	90860	4484	Fail
0.0027	1896	89149	4701	Fail
0.0027	1790	87459	4885	Fail
0.0028	1687	85748	5082	Fail
0.0028	1588	84101	5296	Fail
0.0028	1483	82347	5552	Fail
0.0029	1381	80700	5843	Fail
0.0029	1292	78925	6108	Fail
0.0030	1217	77256	6348	Fail
0.0030	1155	75652	6549	Fail
0.0031	1098	74005	6739	Fail
0.0031	1048	72444	6912	Fail
0.0032	997	70904	7111	Fail
0.0032	930	69342	7456	Fail
0.0033	883	67802	7678	Fail
0.0033	837	66220	7911	Fail
0.0033	789	64808	8213	Fail
0.0034	743	63354	8526	Fail
0.0034	713	61985	8693	Fail
0.0035	668	60594	9070	Fail
0.0035	631	59119	9369	Fail
0.0036	596	57750	9689	Fail

0.0036	565	56402	9982	Fail
0.0037	539	55033	10210	Fail
0.0037	496	53729	10832	Fail
0.0038	473	52424	11083	Fail
0.0038	434	51076	11768	Fail
0.0038	400	49815	12453	Fail
0.0039	366	48574	13271	Fail
0.0039	348	47333	13601	Fail
0.0040	323	46114	14276	Fail
0.0040	296	44959	15188	Fail
0.0041	272	43761	16088	Fail
0.0041	256	42606	16642	Fail
0.0042	235	41409	17620	Fail
0.0042	217	40318	18579	Fail
0.0043	195	39163	20083	Fail
0.0043	180	38008	21115	Fail
0.0043	158	36960	23392	Fail
0.0044	145	35933	24781	Fail
0.0044	129	34821	26993	Fail
0.0045	119	33816	28416	Fail
0.0045	109	32875	30160	Fail
0.0046	97	31933	32920	Fail
0.0046	91	31014	34081	Fail
0.0047	82	30051	36647	Fail
0.0047	76	29196	38415	Fail
0.0048	69	28340	41072	Fail
0.0048	61	27527	45126	Fail
0.0048	54	26757	49550	Fail
0.0049	48	25966	54095	Fail
0.0049	41	25217	61504	Fail
0.0050	38	24469	64392	Fail
0.0050	33	23763	72009	Fail
0.0051	27	23079	85477	Fail
0.0051	22	22394	101790	Fail
0.0052	21	21710	103380	Fail
0.0052	20	21019	105094	Fail
0.0053	19	20418	107463	Fail
0.0053	17	19753	116194	Fail
0.0054	14	19171	136935	Fail
0.0054	12	18580	154833	Fail
0.0054	8	17988	224850	Fail
0.0055	4	17436	435900	Fail
0.0055	3	16921	564033	Fail
0.0056	3	16414	547133	Fail
0.0056	3	15924	530800	Fail
0.0057	3	15396	513200	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Tank 1 POC	☐	11.27			☐	0.00			
Total Volume Infiltrated		11.27	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.

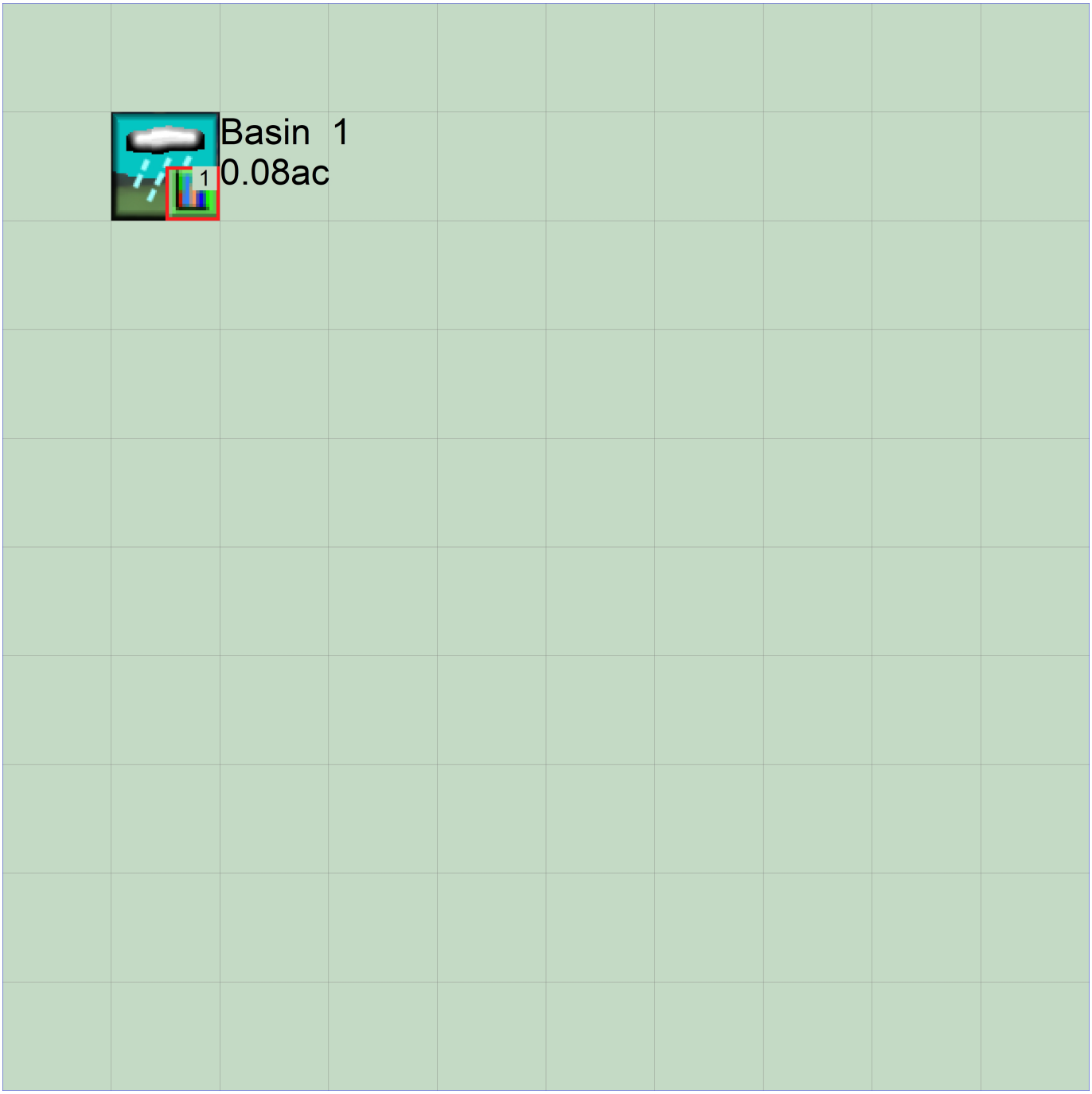
PERLND Changes

No PERLND changes have been made.

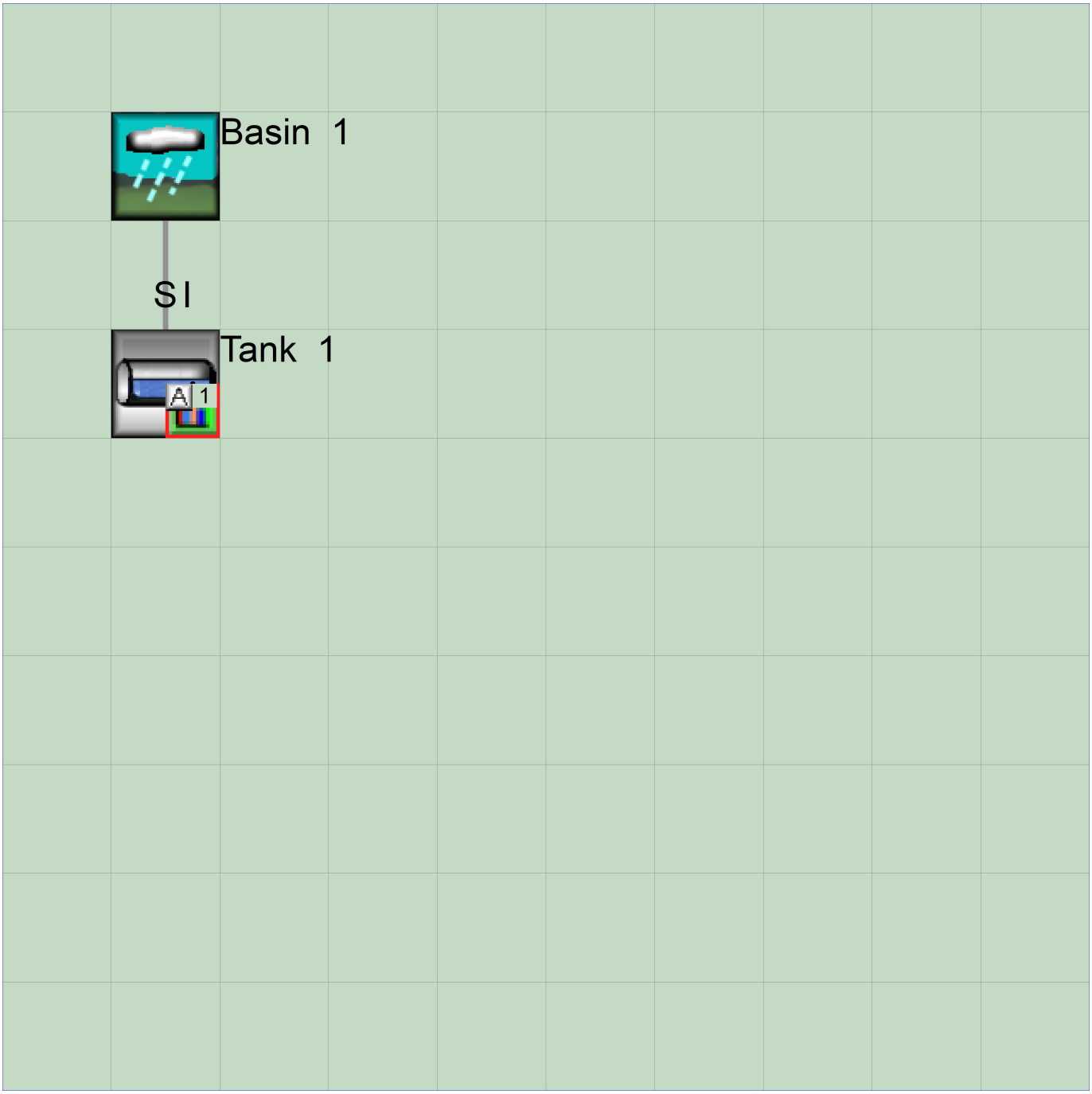
IMPLND Changes

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   Presribed.wdm
MESSU       25   PrePresribed.MES
            27   PrePresribed.L61
            28   PrePresribed.L62
            30   POCPresribed1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   10     C, Forest, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         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  *********
   10         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 ***
   10         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
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10             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           ***
  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  1***
PERLND  10                    0.078765     COPY   501     12
PERLND  10                    0.078765     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   Presribed.wdm
MESSU       25   MitPresribed.MES
            27   MitPresribed.L61
            28   MitPresribed.L62
            30   POCPresribed1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      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        Tank  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                          in  out           ***
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  END PRINT-INFO

  PWAT-PARM1
```

```
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
IMPLND   1                      0.0788     RCHRES   1      5

******Routing******
IMPLND   1                    0.078765     COPY     1     15
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     Tank  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  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      0.01       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
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
```

FTABLES
FTABLE 1
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		
0.055556	0.000626	0.000023	0.001599		
0.111111	0.000880	0.000065	0.002261		
0.166667	0.001071	0.000120	0.002770		
0.222222	0.001230	0.000184	0.003198		
0.277778	0.001367	0.000256	0.003576		
0.333333	0.001489	0.000336	0.003917		
0.388889	0.001599	0.000421	0.004231		
0.444444	0.001699	0.000513	0.004523		
0.500000	0.001791	0.000610	0.004797		
0.555556	0.001876	0.000712	0.005057		
0.611111	0.001955	0.000818	0.005303		
0.666667	0.002029	0.000929	0.005539		
0.722222	0.002098	0.001044	0.005765		
0.777778	0.002163	0.001162	0.005983		
0.833333	0.002224	0.001284	0.006193		
0.888889	0.002282	0.001409	0.006396		
0.944444	0.002336	0.001537	0.006593		
1.000000	0.002388	0.001669	0.006784		
1.055556	0.002436	0.001803	0.006970		
1.111111	0.002481	0.001939	0.007151		
1.166667	0.002525	0.002078	0.007328		
1.222222	0.002565	0.002220	0.007500		
1.277778	0.002603	0.002363	0.007669		
1.333333	0.002639	0.002509	0.007834		
1.388889	0.002673	0.002657	0.007995		
1.444444	0.002705	0.002806	0.008154		
1.500000	0.002735	0.002957	0.008309		
1.555556	0.002763	0.003110	0.008461		
1.611111	0.002789	0.003264	0.008611		
1.666667	0.002814	0.003420	0.008758		
1.722222	0.002836	0.003577	0.008903		
1.777778	0.002857	0.003735	0.009046		
1.833333	0.002876	0.003894	0.009186		
1.888889	0.002894	0.004054	0.009324		
1.944444	0.002910	0.004216	0.009460		
2.000000	0.002924	0.004378	0.009594		
2.055556	0.002937	0.004540	0.009727		
2.111111	0.002948	0.004704	0.009857		
2.166667	0.002958	0.004868	0.009986		
2.222222	0.002966	0.005033	0.010113		
2.277778	0.002973	0.005198	0.010239		
2.333333	0.002978	0.005363	0.010363		
2.388889	0.002981	0.005528	0.010486		
2.444444	0.002984	0.005694	0.010607		
2.500000	0.002984	0.005860	0.010727		
2.555556	0.002984	0.006026	0.010845		
2.611111	0.002981	0.006191	0.010963		
2.666667	0.002978	0.006357	0.011079		
2.722222	0.002973	0.006522	0.011193		
2.777778	0.002966	0.006687	0.011307		
2.833333	0.002958	0.006852	0.011420		
2.888889	0.002948	0.007016	0.011531		
2.944444	0.002937	0.007179	0.011641		
3.000000	0.002924	0.007342	0.011751		
3.055556	0.002910	0.007504	0.011859		
3.111111	0.002894	0.007665	0.011966		
3.166667	0.002876	0.007826	0.012073		
3.222222	0.002857	0.007985	0.012178		
3.277778	0.002836	0.008143	0.012283		
3.333333	0.002814	0.008300	0.012386		
3.388889	0.002789	0.008456	0.012489		
3.444444	0.002763	0.008610	0.012591		
3.500000	0.002735	0.008763	0.012692		
3.555556	0.002705	0.008914	0.012792		

```
  3.611111  0.002673  0.009063  0.012892
  3.666667  0.002639  0.009211  0.012991
  3.722222  0.002603  0.009356  0.013089
  3.777778  0.002565  0.009500  0.013186
  3.833333  0.002525  0.009641  0.013283
  3.888889  0.002481  0.009780  0.013379
  3.944444  0.002436  0.009917  0.023142
  4.000000  0.002388  0.010051  0.028071
  4.055556  0.002336  0.010182  0.031750
  4.111111  0.002282  0.010311  0.034827
  4.166667  0.002224  0.010436  0.037531
  4.222222  0.002163  0.010558  0.039973
  4.277778  0.002098  0.010676  0.042220
  4.333333  0.002029  0.010791  0.044312
  4.388889  0.001955  0.010901  0.046279
  4.444444  0.001876  0.011008  0.048142
  4.500000  0.001791  0.011110  0.049915
  4.555556  0.001699  0.011207  0.259884
  4.611111  0.001599  0.011298  0.641047
  4.666667  0.001489  0.011384  1.129081
  4.722222  0.001367  0.011464  1.693273
  4.777778  0.001230  0.011536  2.306633
  4.833333  0.001071  0.011600  2.941740
  4.888889  0.000880  0.011654  3.570527
  4.944444  0.000626  0.011696  4.165587
  5.000000  0.001000  0.011720  4.702362
  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   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1005 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        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  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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WWHM2012

PROJECT REPORT

General Model Information

Project Name:	HLStormTech
Site Name:	HL StormTech
Site Address:	
City:	Mercer Island
Report Date:	2/10/2022
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

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 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.078765
Pervious Total	0.078765
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.078765

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.078765
Impervious Total	0.078765
Basin Total	0.078765

Element Flows To:

Surface	Interflow	Groundwater
SSD Table 1	SSD Table 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

SSD Table 1

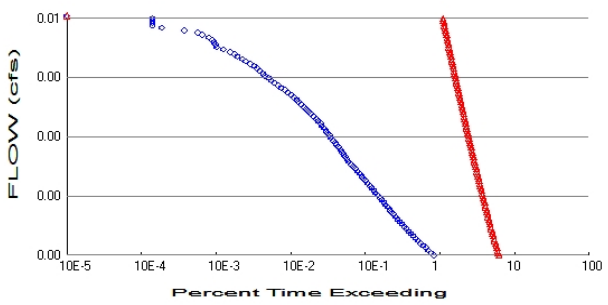
Depth: 2.08 ft.
Discharge Structure: 1
Riser Height: 2 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 2 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

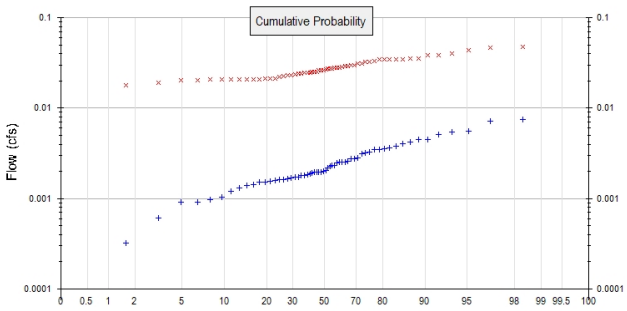
SSD Table Hydraulic Table

Stage (feet)	Area (ac.)	Volume (ac-ft.)	Outlet Struct	NotUsed	NotUsed	NotUsed	NotUsed
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.080	0.003	0.000	0.031	0.000	0.000	0.000	0.000
0.170	0.003	0.001	0.045	0.000	0.000	0.000	0.000
0.250	0.003	0.001	0.054	0.000	0.000	0.000	0.000
0.330	0.003	0.001	0.062	0.000	0.000	0.000	0.000
0.420	0.003	0.002	0.070	0.000	0.000	0.000	0.000
0.500	0.003	0.002	0.077	0.000	0.000	0.000	0.000
0.580	0.003	0.003	0.083	0.000	0.000	0.000	0.000
0.670	0.003	0.004	0.089	0.000	0.000	0.000	0.000
0.750	0.003	0.004	0.094	0.000	0.000	0.000	0.000
0.830	0.003	0.005	0.099	0.000	0.000	0.000	0.000
0.920	0.003	0.006	0.104	0.000	0.000	0.000	0.000
1.000	0.003	0.006	0.109	0.000	0.000	0.000	0.000
1.080	0.003	0.007	0.113	0.000	0.000	0.000	0.000
1.170	0.003	0.007	0.117	0.000	0.000	0.000	0.000
1.250	0.003	0.008	0.121	0.000	0.000	0.000	0.000
1.330	0.003	0.008	0.125	0.000	0.000	0.000	0.000
1.420	0.003	0.009	0.129	0.000	0.000	0.000	0.000
1.500	0.003	0.009	0.133	0.000	0.000	0.000	0.000
1.580	0.003	0.010	0.136	0.000	0.000	0.000	0.000
1.670	0.003	0.010	0.140	0.000	0.000	0.000	0.000
1.750	0.003	0.010	0.144	0.000	0.000	0.000	0.000
1.830	0.003	0.011	0.147	0.000	0.000	0.000	0.000
1.920	0.003	0.011	0.150	0.000	0.000	0.000	0.000
2.000	0.003	0.011	0.154	0.000	0.000	0.000	0.000
2.080	0.003	0.012	0.516	0.000	0.000	0.000	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.078765
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.078765

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.002316
5 year	0.003637
10 year	0.004386
25 year	0.005179
50 year	0.00567
100 year	0.006087

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.026707
5 year	0.032878
10 year	0.036905
25 year	0.041966
50 year	0.045733
100 year	0.049509

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.002	0.035
1950	0.003	0.034
1951	0.005	0.023
1952	0.002	0.021
1953	0.001	0.020
1954	0.002	0.021
1955	0.003	0.027
1956	0.003	0.026
1957	0.002	0.028
1958	0.002	0.021

1959	0.002	0.021
1960	0.003	0.022
1961	0.002	0.025
1962	0.001	0.021
1963	0.002	0.025
1964	0.002	0.024
1965	0.002	0.028
1966	0.002	0.021
1967	0.003	0.031
1968	0.002	0.034
1969	0.002	0.025
1970	0.002	0.023
1971	0.002	0.029
1972	0.004	0.031
1973	0.002	0.018
1974	0.002	0.025
1975	0.003	0.030
1976	0.002	0.021
1977	0.000	0.021
1978	0.002	0.030
1979	0.001	0.035
1980	0.004	0.035
1981	0.001	0.028
1982	0.003	0.038
1983	0.002	0.032
1984	0.002	0.021
1985	0.001	0.028
1986	0.004	0.025
1987	0.004	0.032
1988	0.001	0.024
1989	0.001	0.028
1990	0.007	0.044
1991	0.004	0.035
1992	0.002	0.019
1993	0.002	0.017
1994	0.001	0.021
1995	0.003	0.023
1996	0.005	0.029
1997	0.005	0.026
1998	0.001	0.025
1999	0.004	0.048
2000	0.002	0.026
2001	0.000	0.027
2002	0.002	0.033
2003	0.003	0.027
2004	0.003	0.047
2005	0.002	0.024
2006	0.003	0.021
2007	0.006	0.040
2008	0.007	0.038
2009	0.003	0.036

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0074	0.0482
2	0.0071	0.0467
3	0.0055	0.0439

4	0.0054	0.0403
5	0.0051	0.0384
6	0.0045	0.0383
7	0.0045	0.0355
8	0.0043	0.0353
9	0.0040	0.0350
10	0.0038	0.0346
11	0.0036	0.0345
12	0.0036	0.0344
13	0.0035	0.0344
14	0.0034	0.0334
15	0.0032	0.0325
16	0.0032	0.0324
17	0.0031	0.0314
18	0.0028	0.0312
19	0.0028	0.0298
20	0.0027	0.0297
21	0.0026	0.0292
22	0.0025	0.0290
23	0.0025	0.0284
24	0.0025	0.0282
25	0.0025	0.0282
26	0.0023	0.0279
27	0.0023	0.0276
28	0.0023	0.0274
29	0.0022	0.0272
30	0.0020	0.0266
31	0.0020	0.0263
32	0.0020	0.0262
33	0.0020	0.0261
34	0.0020	0.0252
35	0.0019	0.0251
36	0.0019	0.0250
37	0.0019	0.0249
38	0.0018	0.0248
39	0.0018	0.0245
40	0.0018	0.0243
41	0.0017	0.0242
42	0.0017	0.0236
43	0.0017	0.0231
44	0.0017	0.0231
45	0.0016	0.0227
46	0.0016	0.0222
47	0.0016	0.0214
48	0.0016	0.0214
49	0.0015	0.0213
50	0.0015	0.0210
51	0.0014	0.0210
52	0.0014	0.0209
53	0.0013	0.0209
54	0.0012	0.0208
55	0.0010	0.0208
56	0.0010	0.0207
57	0.0009	0.0205
58	0.0009	0.0205
59	0.0006	0.0192
60	0.0003	0.0178
61	0.0002	0.0173

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0012	17545	132546	755	Fail
0.0012	16170	129488	800	Fail
0.0012	14964	126558	845	Fail
0.0013	13860	123798	893	Fail
0.0013	12814	121103	945	Fail
0.0014	11819	118515	1002	Fail
0.0014	10902	115927	1063	Fail
0.0015	10117	113468	1121	Fail
0.0015	9390	111136	1183	Fail
0.0016	8729	108912	1247	Fail
0.0016	8156	106794	1309	Fail
0.0017	7593	104677	1378	Fail
0.0017	7071	102645	1451	Fail
0.0018	6590	100613	1526	Fail
0.0018	6145	98602	1604	Fail
0.0018	5781	96806	1674	Fail
0.0019	5431	94902	1747	Fail
0.0019	5103	93105	1824	Fail
0.0020	4808	91330	1899	Fail
0.0020	4528	89726	1981	Fail
0.0021	4254	88015	2068	Fail
0.0021	4017	86347	2149	Fail
0.0022	3784	84785	2240	Fail
0.0022	3546	83224	2346	Fail
0.0023	3339	81662	2445	Fail
0.0023	3138	80165	2554	Fail
0.0023	2954	78775	2666	Fail
0.0024	2787	77342	2775	Fail
0.0024	2597	75887	2922	Fail
0.0025	2449	74540	3043	Fail
0.0025	2304	73214	3177	Fail
0.0026	2162	71931	3327	Fail
0.0026	2026	70647	3487	Fail
0.0027	1896	69385	3659	Fail
0.0027	1790	68166	3808	Fail
0.0028	1687	66947	3968	Fail
0.0028	1588	65813	4144	Fail
0.0028	1483	64658	4359	Fail
0.0029	1381	63482	4596	Fail
0.0029	1292	62348	4825	Fail
0.0030	1217	61258	5033	Fail
0.0030	1155	60252	5216	Fail
0.0031	1098	59204	5391	Fail
0.0031	1048	58199	5553	Fail
0.0032	997	57172	5734	Fail
0.0032	930	56167	6039	Fail
0.0033	883	55140	6244	Fail
0.0033	837	54221	6478	Fail
0.0033	789	53280	6752	Fail
0.0034	743	52381	7049	Fail
0.0034	713	51483	7220	Fail
0.0035	668	50649	7582	Fail
0.0035	631	49836	7897	Fail
0.0036	596	49045	8229	Fail

0.0036	565	48232	8536	Fail
0.0037	539	47483	8809	Fail
0.0037	496	46713	9417	Fail
0.0038	473	45943	9713	Fail
0.0038	434	45195	10413	Fail
0.0038	400	44467	11116	Fail
0.0039	366	43697	11939	Fail
0.0039	348	42970	12347	Fail
0.0040	323	42264	13084	Fail
0.0040	296	41601	14054	Fail
0.0041	272	40917	15043	Fail
0.0041	256	40254	15724	Fail
0.0042	235	39591	16847	Fail
0.0042	217	38970	17958	Fail
0.0043	195	38329	19655	Fail
0.0043	180	37751	20972	Fail
0.0043	158	37110	23487	Fail
0.0044	145	36511	25180	Fail
0.0044	129	35933	27855	Fail
0.0045	119	35356	29710	Fail
0.0045	109	34800	31926	Fail
0.0046	97	34222	35280	Fail
0.0046	91	33666	36995	Fail
0.0047	82	33153	40430	Fail
0.0047	76	32618	42918	Fail
0.0048	69	32126	46559	Fail
0.0048	61	31591	51788	Fail
0.0048	54	31121	57631	Fail
0.0049	48	30629	63810	Fail
0.0049	41	30158	73556	Fail
0.0050	38	29688	78126	Fail
0.0050	33	29217	88536	Fail
0.0051	27	28768	106548	Fail
0.0051	22	28297	128622	Fail
0.0052	21	27912	132914	Fail
0.0052	20	27485	137425	Fail
0.0053	19	27057	142405	Fail
0.0053	17	26608	156517	Fail
0.0054	14	26180	187000	Fail
0.0054	12	25816	215133	Fail
0.0054	8	25389	317362	Fail
0.0055	4	24982	624550	Fail
0.0055	3	24597	819900	Fail
0.0056	3	24234	807800	Fail
0.0056	3	23849	794966	Fail
0.0057	3	23464	782133	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
SSD Table 1 POC	☐	11.27			☐	0.00			
Total Volume Infiltrated		11.27	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.

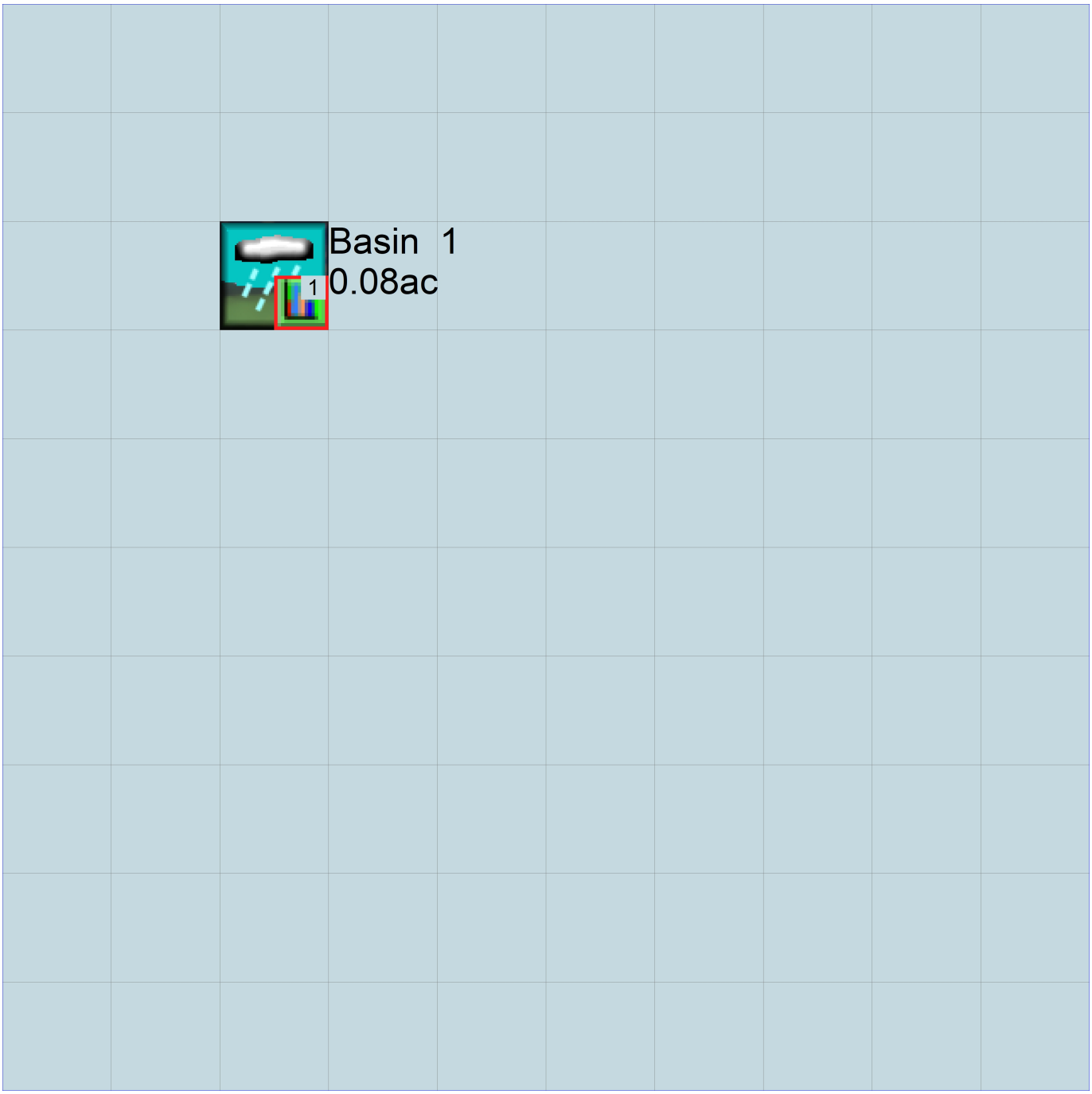
PERLND Changes

No PERLND changes have been made.

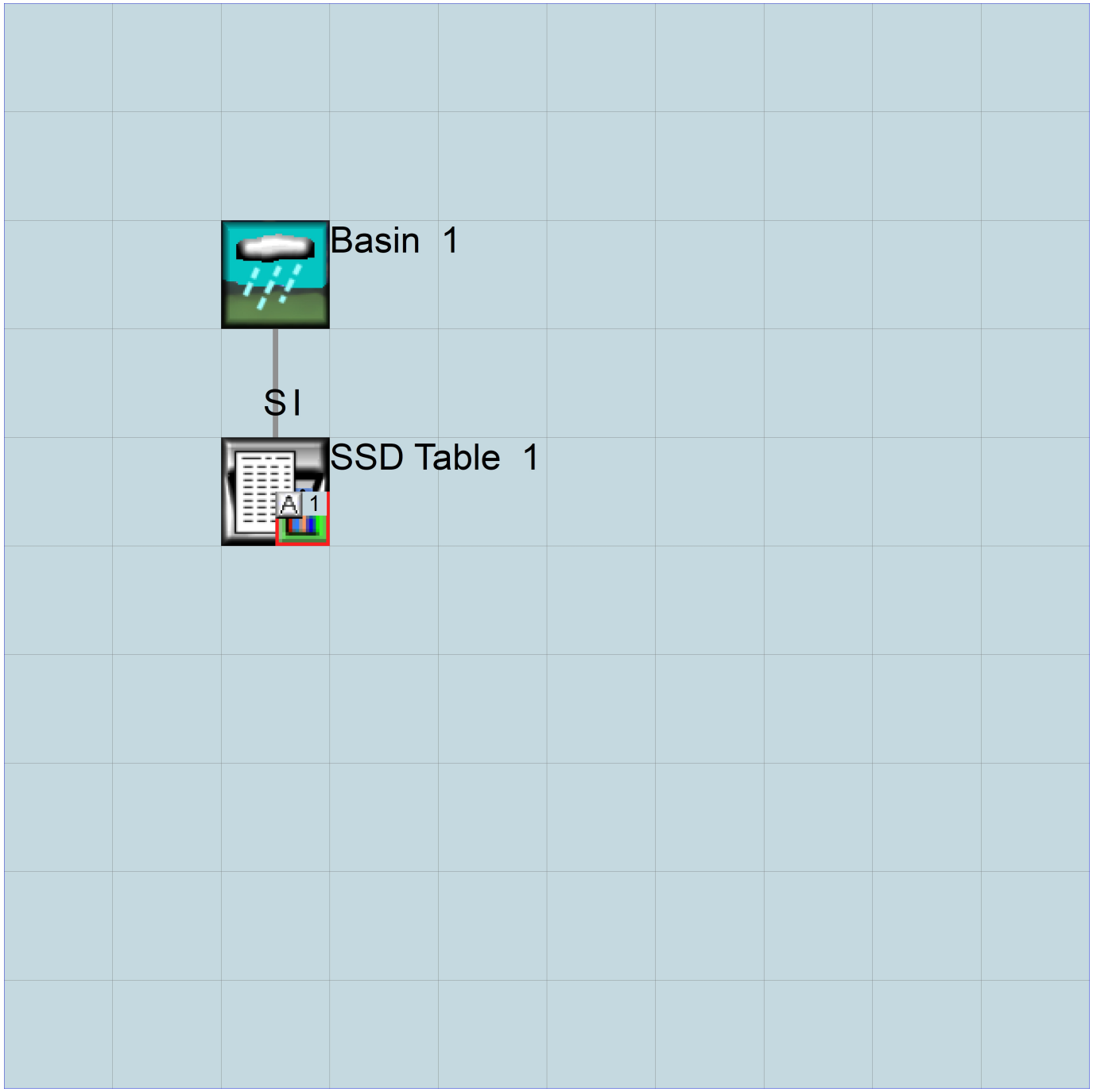
IMPLND Changes

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   HLStormTech.wdm
MESSU       25   PreHLStormTech.MES
            27   PreHLStormTech.L61
            28   PreHLStormTech.L62
            30   POCHLStormTech1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   10     C, Forest, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         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  *********
   10         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 ***
   10         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
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10             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           ***
  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  1***
PERLND  10                    0.078765     COPY   501     12
PERLND  10                    0.078765     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   HLStormTech.wdm
MESSU       25   MitHLStormTech.MES
            27   MitHLStormTech.L61
            28   MitHLStormTech.L62
            30   POCHLStormTech1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      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        SSD Table  1               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                          in  out           ***
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  END PRINT-INFO

  PWAT-PARM1
```

```
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
IMPLND   1                      0.0788     RCHRES   1      5

******Routing******
IMPLND   1                    0.078765     COPY     1     15
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     SSD Table  1            1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  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      0.01       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
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
```

```
FTABLES
  FTABLE      1
   26    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000000  0.000000  0.000000
  0.080000  0.003122  0.000366  0.030702
  0.170000  0.003122  0.000733  0.044755
  0.250000  0.003122  0.001100  0.054274
  0.330000  0.003122  0.001467  0.062356
  0.420000  0.003122  0.001834  0.070347
  0.500000  0.003122  0.002201  0.076754
  0.580000  0.003122  0.002902  0.082667
  0.670000  0.003122  0.003590  0.088850
  0.750000  0.003122  0.004264  0.094005
  0.830000  0.003122  0.004923  0.098891
  0.920000  0.003122  0.005565  0.104115
  1.000000  0.003122  0.006186  0.108547
  1.080000  0.003122  0.006783  0.112806
  1.170000  0.003122  0.007351  0.117412
  1.250000  0.003122  0.007883  0.121359
  1.330000  0.003122  0.008358  0.125183
  1.420000  0.003122  0.008775  0.129349
  1.500000  0.003122  0.009161  0.132943
  1.580000  0.003122  0.009528  0.136442
  1.670000  0.003122  0.009895  0.140274
  1.750000  0.003122  0.010262  0.143594
  1.830000  0.003122  0.010629  0.146840
  1.920000  0.003122  0.010996  0.150407
  2.000000  0.003122  0.011363  0.153509
  2.080000  0.003122  0.011729  0.516178
  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        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  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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