

FINAL STORM DRAINAGE REPORT

5637 E Mercer Way
MERCER ISLAND, WASHINGTON

FOR

Bill Summers
5637 E Mercer Way
Mercer Island, WA 98040



03/10/2025

Project Manager:	Michael A. Moody, P.E., LEED AP
Prepared by	Basel Draw, EIT
Date:	March 2021
Approved by	Michael A. Moody, P.E., LEED AP
Core No.:	18039
Revised:	March 2025
Revised By:	Brackon Rawlinson, EIT



14711 NE 29Th Place, Suite 101
Bellevue, Washington 98007
Ph 425.885.7877
www.coredesigninc.com

Table of Contents

1.0	PROJECT OVERVIEW	3
2.0	CONDITIONS AND REQUIREMENTS SUMMARY	5
2.1	Minimum Requirements	5
2.1.1	Minimum Requirement #1: Preparation of Stormwater Site Plans.....	5
2.1.2	Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP/TESC).....	5
2.1.3	Minimum Requirements #3: Source Control of Pollutants	5
2.1.4	Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls..	5
2.1.5	Minimum Requirement #5: On-Site Stormwater Management.....	5
3.0	OFFSITE ANALYSIS	9
	Downstream Investigation.....	9
	Existing Conditions	9
	<i>Upstream Drainage</i>	9
	<i>Downstream Drainage</i>	9
	<i>Additional Notes</i>	10
4.0	FLOW CONTROL AND WATER QUALITY DESIGN	11
4.1	Basin Modeling.....	11
4.1.1	Existing Conditions.....	11
4.1.2	Existing Soils.....	11
4.1.3	Existing Site Summary.....	11
	Figure 4.1: Existing Conditions Exhibit	12
4.1.4	Developed Conditions.....	13
	Figure 4.2: Developed Conditions Exhibit	14
4.1.5	WWHM Modeling Results	15
4.2	Flow Control BMPs.....	15
4.3	Stream and Wetland Hydrologic Evaluation	18
5.0	FINANCIAL LIABILITY	20
6.0	APPENDIX	21
	King County Parcel Report	21
	DOE Flow Minimum Requirement Flow Charts	21

NRCS Soil Survey Map 21
Mercer Island Detention Requirement Guidelines 21
WWHM Model Reports..... 21

1.0 PROJECT OVERVIEW

The 5637 E Mercer Way property includes one lot on Mercer Island, WA. See Figure 1. 1 Vicinity Map on the following page. The lot, which is currently entirely undeveloped, and a single-family residence will be constructed on the lot as well as a driveway which will connect to the adjacent access drive to the south. The parcel is in the SE ¼ of Section 19, Township 24, Range 5 East, W.M. The King County tax parcel ID numbers for the project parcel is provided below in Table 1. 1.

Table 1. 1 Parcel Areas

King County Parcel ID & Area
(1) Parcel A: 192405-9312 (0.86 Acres)

The parcel is bordered by E Mercer Way to the east by large single-family, hillside lots to the west and south, and a designated Open Space to the north. The existing, on-site area contains heavy vegetation, trees, a wetland, and a stream. The existing site topography slopes from 10% to approximately 80% on the far west end of the property. This project is permitted under reasonable use, and permanent onsite measure, as well as construction BMPs will be employed to mitigate impacts to the wetland, stream, or downstream drainage. Increased runoff will be addressed with a detention pipe at the downslope section of the driveway, per Mercer Island design requirements (see Appendix).

The project is designed using the guidelines and requirements established in the following reference: 2014 Department of Ecology Stormwater Management Manual for the Puget Sound Basin requirements for surface water runoff management and the City of Mercer Island Construction Stormwater Codes.

The King County Parcel and Districts Reports are included in the Appendix.

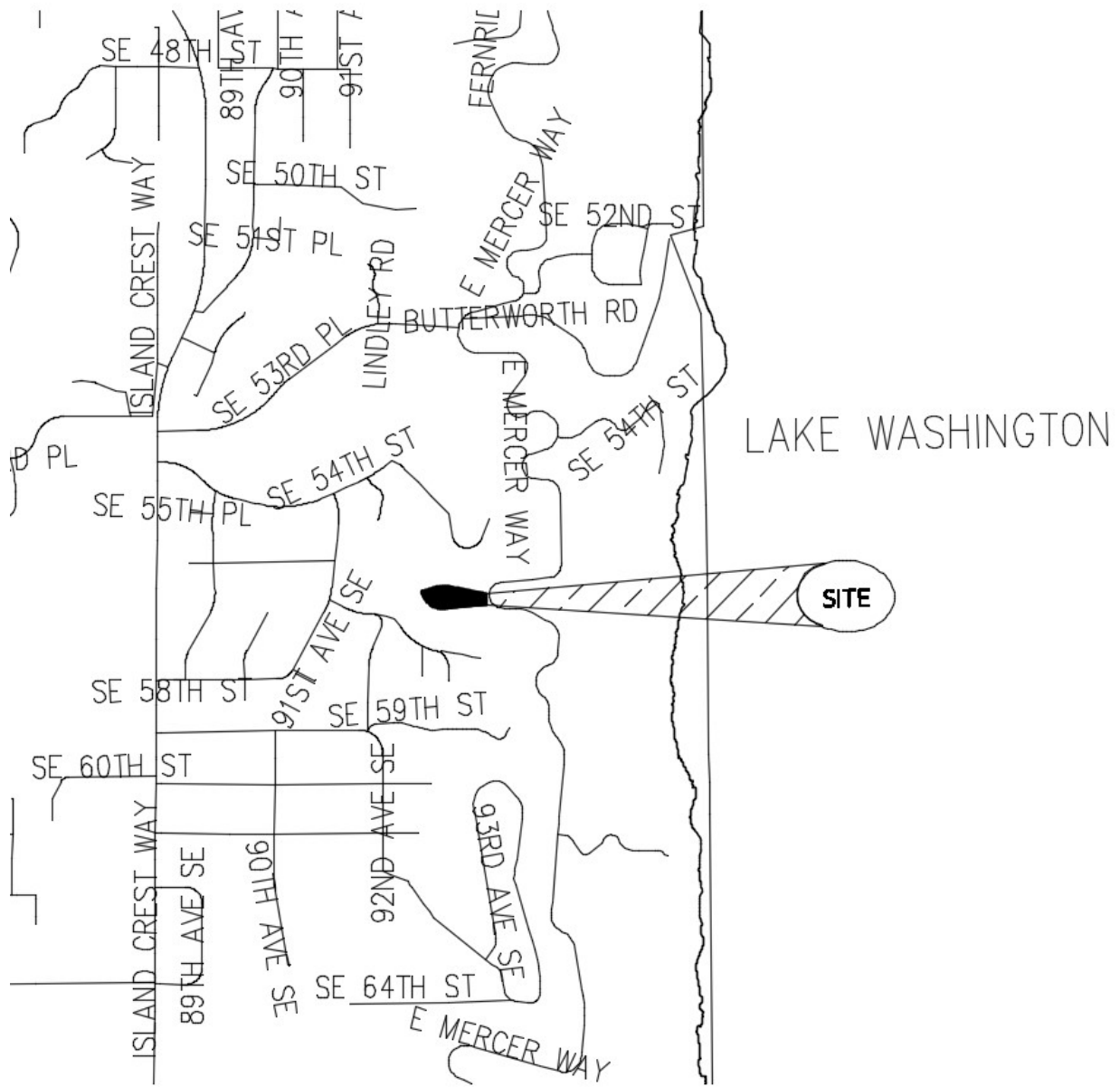


Figure 1. 1 Vicinity Map

2.0 CONDITIONS AND REQUIREMENTS SUMMARY

The site is covered with steep slopes and a wetland/creek designation that crosses the site, making typical construction almost impossible; therefore, construction of the proposed property will be completed under a “reasonable use” permit in the state of Washington.

The proposed project is classified as a development which includes less than 5,000 square feet of new plus replaced impervious surfaces and disturbs less than an acre but does result in a net increase of more than 2,000 sq-ft of impervious surface. Therefore, only Minimum Requirements 1 through 5 will be addressed per the City of Mercer Island Stormwater Management Standards and the 2014 DOE Stormwater Management Manual for Western Washington (SWMMWW). Applicable minimum requirements, and how the project addresses each, are listed below.

2.1 Minimum Requirements

2.1.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

See Site & Stormwater Plan under separate cover.

2.1.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP/TESC)

Due to the sensitive nature of the site and the need for the “reasonable use” permit, the final SWPP will include an elevated degree of TESC BMPs and construction will occur over a reduced area (0.33 acres). A final SWPP report will be included in final submittal.

2.1.3 Minimum Requirements #3: Source Control of Pollutants

The SWMMWW requires that available and reasonable source control measures be adopted on all sites. Source control measures cannot be implemented due to severe site constraints, such as severe slopes and wetland protection. Adding Source Controls would require additional impact to the site.

2.1.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site will occur at the natural location to the east. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and down gradient properties, per SWMMWW Vol 1: 2.5.3. See Section 3 of this report for the downstream analysis and discussion of the natural discharge location.

2.1.5 Minimum Requirement #5: On-Site Stormwater Management

Projects are required to implement On-site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff onsite to the maximum extent feasible without causing

groundwater contamination, flooding, or erosion impacts. Per Mercer Island Standards and Volume I of the 2014 SWMMWW, this project shall be required to meet the minimum standards for sites under 5,000 ft² but over 2,000 ft² of new impervious area. This requirement includes the implementation of LID standards as well as the establishment of a minimum soil depth.

Due to the severe slopes and sensitive wetland/stream concerns on the north end of the site, any LID BMP implementation would be both infeasible and result in an overall increase in impact to the site. Alternatively, the SWMMWW allows for the implementation of BMPs found in an approved list to be used in place of LID measures. This project is susceptible to List #1 Per list #1 the following BMPs were considered for the site:

Lawn and Landscaped Areas

- Post Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V (2014 SWMMWW).
 - Response: Amended soils will be applied to approximately 1,456 SF of disturbed pervious areas within the clearing limits of the project in accordance with BMP T5.13 of the 2014 SWMMWW.

Roofs

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the DOE Manual, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 in Chapter 3 of Volume III (2014 SWMMWW).
 - Response: Per page 941 of the 2014 SWMMWW, the flowpath must be located between the dispersion device and any downstream drainage feature such as a pipe, ditch, stream, river, pond, lake, or wetland. Due to onsite streams and wetlands, the required 100-foot flowpath cannot be attained. Thus, full dispersion systems are infeasible for the project.
- Bioretention BMPs that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.
 - Response: Per the bioretention infeasibility criteria on page 966 of the 2014 SWMMWW, bioretention cannot be placed on slopes greater than 8%. Due to the surrounding site constraints, a bioretention facility cannot be reasonably placed on slopes less than 8%. Thus, bioretention is infeasible.

- Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 in Chapter 3 of Volume III (2014 SWMMWW).
 - Response: Due to onsite slopes which are greater than 15%, the required vegetated flowpath of at least 50 feet in length cannot be maintained between the outlet of the trench and any slope steeper than 15%. Additionally, the 5-foot setback between any edge of the trench and any structure or property line will cause further impacts to the surrounding critical areas; thus, full dispersion is considered infeasible.
- Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections in Section 3.1.3 in Chapter 3 of Volume III (2014 SWMMWW).
 - Response: Due to onsite slopes greater than 20%, erosion hazard areas, and geotechnical recommendations, Perforated Stub-out Connections are not proposed for the project.

Other Hard Surfaces

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 Volume V (2014 SWMMWW).
 - Response: Due to onsite slopes which are greater than 15%, the required vegetated flowpath of at least 50 feet in length cannot be maintained between the outlet of the trench and any slope steeper than 15%. Additionally, the 5-foot setback between any edge of the trench and any structure or property line will cause further impacts to the surrounding critical areas; thus, full dispersion is considered infeasible.
- Permeable pavement in accordance with BMP T5.15 in Chapter 5 of Volume V of the DOE Manual, or Rain Gardens in accordance with Chapter 7 of Volume V of the DOE Manual. The rain garden or bioretention facility must have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.
 - Response: Per the infeasibility criteria on page 923 of the 2014 SWMMWW, permeable pavement cannot be located within an area designated as an erosion hazard, or landslide hazard.
- Bioretention BMPs that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

- Response: Per the bioretention infeasibility criteria on page 966 of the 2014 SWMMWW, bioretention cannot be placed on slopes greater than 8%. Due to the surrounding site constraints, a bioretention facility cannot be reasonably placed on slopes less than 8%. Thus, bioretention is infeasible.
- Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V (2014 SWMMWW).
 - Response: Due to existing site grades, runoff from the walkway cannot be routed over any infiltration facilities or over the necessary length for a dispersion facility without potentially compromising site stability. Therefore, no dispersion BMPs will be employed onsite.

Due to the severe slopes throughout the site, wetland buffers, limited space for dispersion, and geotechnical recommendations, our engineering judgement suggest none of these list items be implemented.

City of Mercer Island Code 15.09, however, includes an additional alternative method to completing Minimum Requirement #5. This requires supplemental detention onsite when no LID options are considered viable, or a fee in lieu for cases where any detention would also be infeasible. The supplemental detention is not related to Minimum Requirement #7 or flow control standards, but rather a final, required design consideration to meet Minimum Requirement #5. The supplement detention is feasible, and therefore, the site design was adjusted to add the detention to meet this minimum requirement (for design details see Section 4.2 of this report).

3.0 OFFSITE ANALYSIS

Downstream Investigation

Date of Field Inspection: April 20, 2018

Weather Conditions: 62 degrees Fahrenheit and mostly sunny. No rain in the past 12 hours.

Existing Conditions

The site maintains a consistent and steep slope, descending east, northeast towards E Mercer Way. The slope varies from 10% to 80% across the lot. Much of the site is saturated wetland or buffer for the stream that runs through the north end of the property. The site is currently undeveloped and remains largely forested with a Type 2 catch basin at the confluence of the E Mercer Way Swale system, the stream, and drainage from the neighboring lot to the south. The Parkwood Ridge Open Space public trail runs along the north end of the property and an access drive bends through the southeast edge of the lot.

Upstream Drainage

The neighboring/uphill plats to the west and north of the site (including the Parkwood Ridge Open Space) have the flows from their respective steep slopes channeled via a mixed conveyance system, comprised of both ditches and PVC conveyance pipes, which runs through the open space or sheet flows into the stream on the north end of the property. Most of these flows enter the stream prior to reaching the property site, though a negligible portion sheet flows through the northwestern tip of the property. Uphill plats to the south and southwest contribute flows from the undeveloped sections of their respective lots which lie on steep slopes and constitute roughly 20% of their total lot areas.

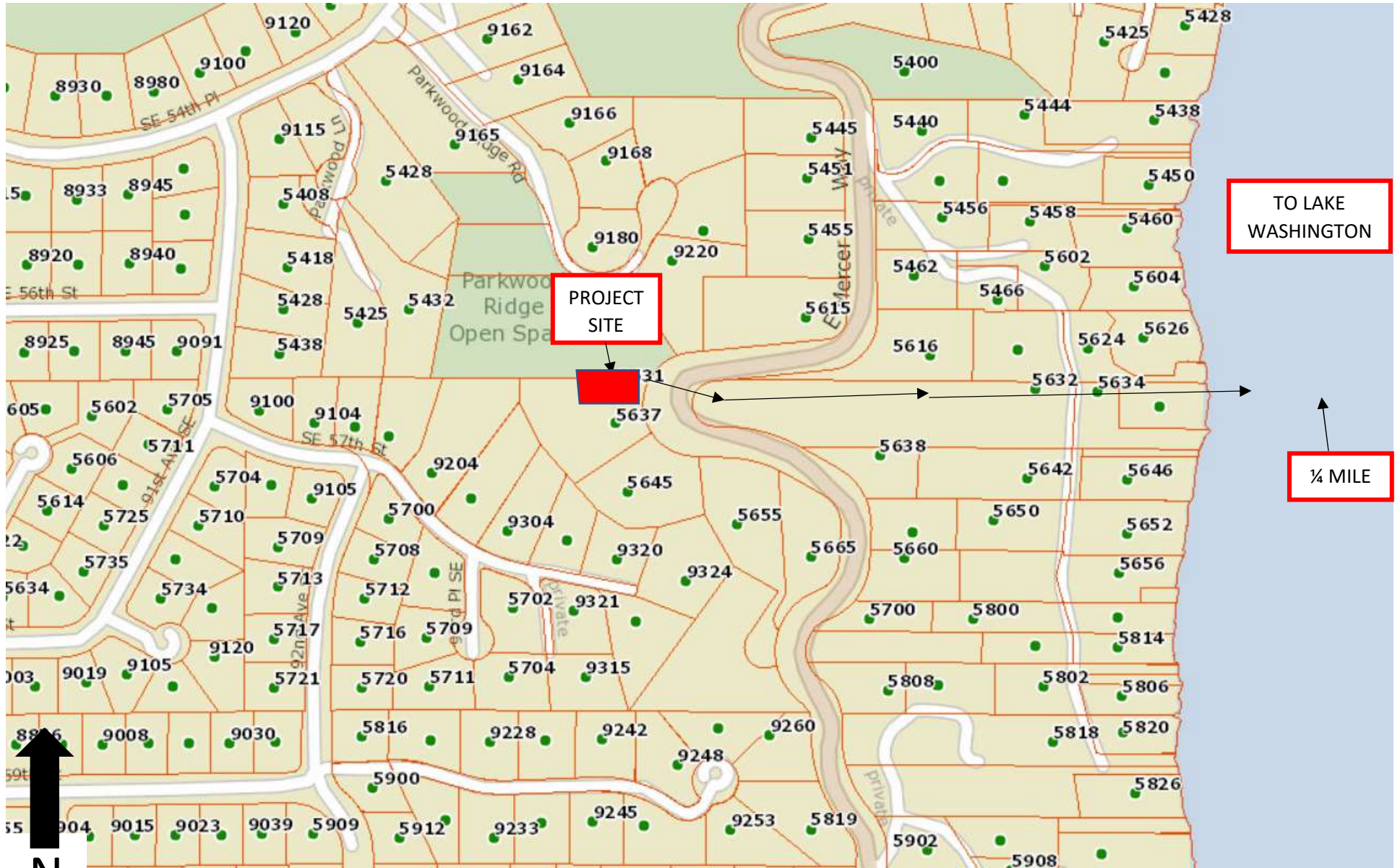
Downstream Drainage

On-site flows drain east, northeast to the overflow catch basin at a local confluence ditch in the Right-of-Way of E Mercer Way. Flows enter the catch basin and are routed east under E Mercer Way by an 18" PVC pipe that outlets into a natural creek bed to the east of the street. The creek bed slopes precipitously down towards the water, before reaching a detention pond at 5646 E Mercer Way. The sediment pond also functions as a natural flow control measure and flows from this pond proceed underground due east, and through an orifice structure located in a catch basin on the east side of Glenhome Drive. From here flows are routed in an 18" PVC pipe into Lake Washington. The ¼ mile downstream analysis occurs 280 feet into Lake Washington. No observable siltation or other environmental concerns appear to exist in the vicinity of that 280-foot extension into the lake.

Additional Notes

Complaints relevant to the project site were reviewed prior to the inspection. All major complaints near the site are either not applicable to the project or have been resolved. One exception is a complaint regarding catch basin clogging due to debris. This can be resolved with standard catch basin maintenance. All catch basins and inlets included metal grating; however, some of the grating appeared covered or otherwise blocked, again resolved through standard catch basin maintenance. Any area-drain or catch basin installations on-site will be designed to minimize clutter or clogging from debris, and construction BMPs will be applied to avoid debris entering the downstream storm system.

FIGURE 3-1: Downstream Drainage Map



N

N.T.S.

4.0 FLOW CONTROL AND WATER QUALITY DESIGN

4.1. Basin Modeling

The drainage analysis for detention sizing was modeled using the City of Mercer Island Detention Requirement Sheet. The sheet contains a table for pre-sized detention vaults for projects which cannot meet LID standards and are under 9,500 ft² of impervious surface (see appendix for additional details).

4.1.1 Existing Conditions

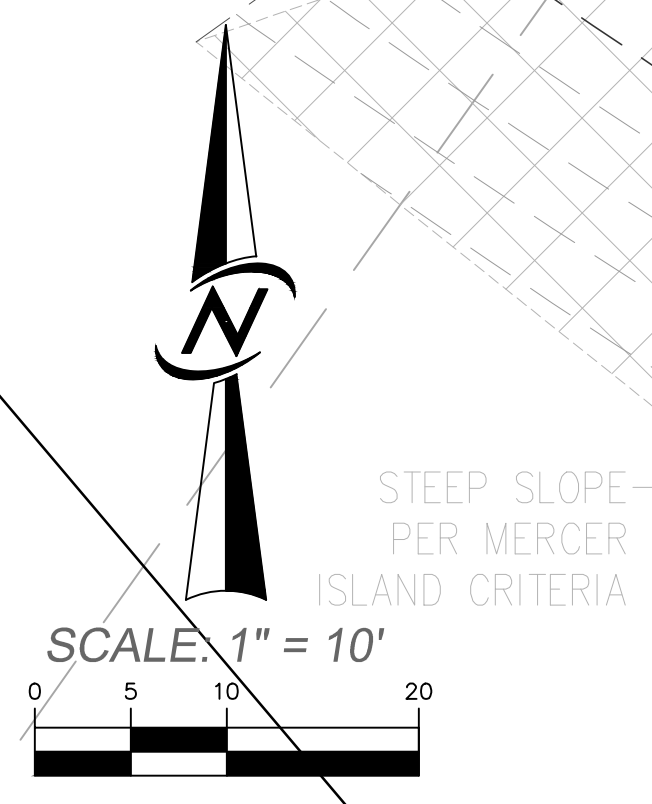
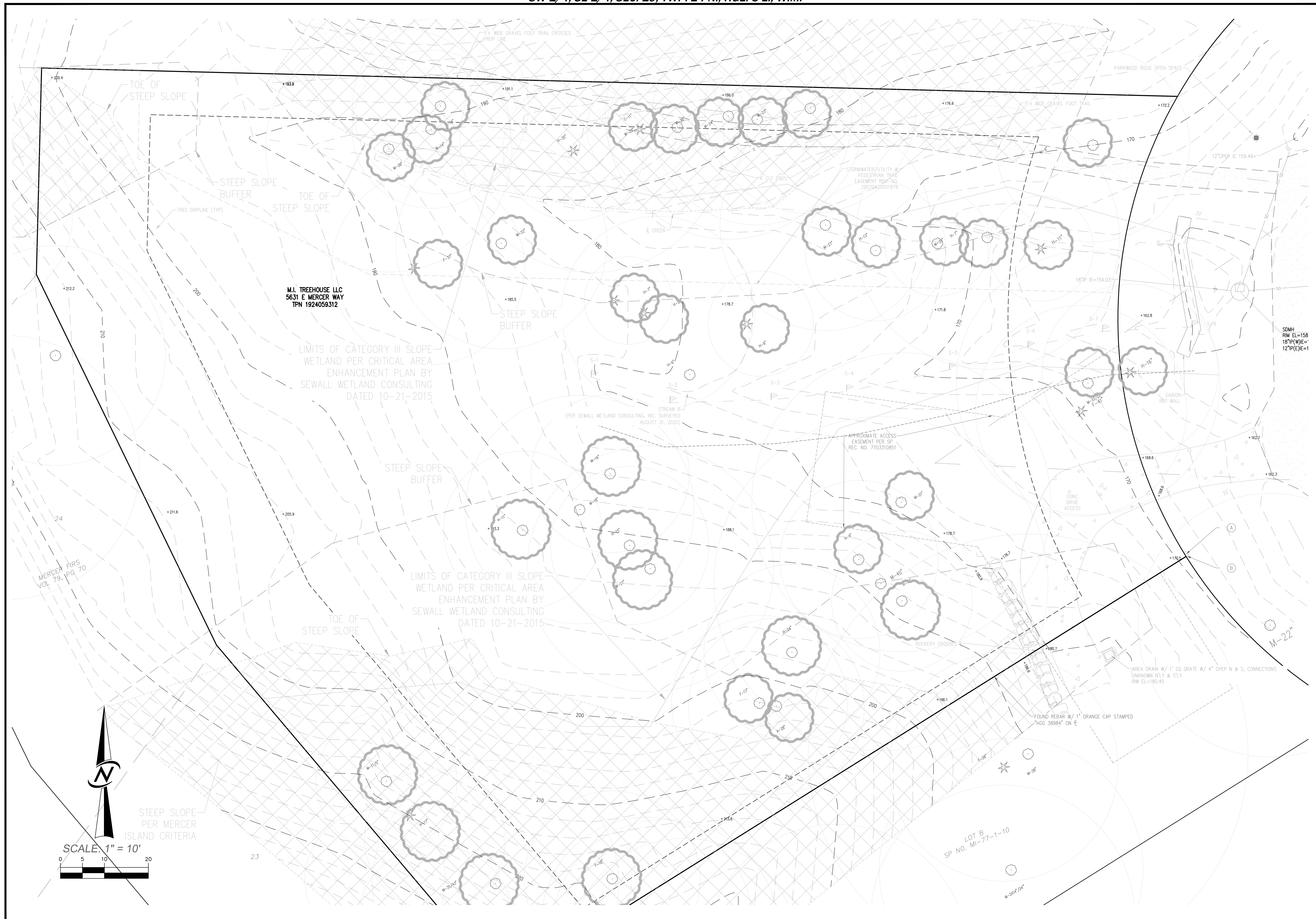
The site consists of one parcel for a total of 0.86 acres. The project parcel is currently undeveloped. The project proposes to construct a single-family home on the property with a walkway and a driveway to provide access. Much of the parcel is encumbered with steep slopes and an active wetland stream traversing the site. These conditions cause the developable area to be reduced to 0.33 acres of land. The disturbance limits for the project are approximately 5,551 SF (0.127 ac).

4.1.2 Existing Soils

The onsite soil type is mapped by NRCS as Alderwood gravelly, sandy loam. Based on the King County Soil types the soil is considered hydraulic soil group C. The NRCS Site Soils Map and King County Soil Types Table are included in the Appendix.

4.1.3 Existing Site Summary

The pre-developed conditions were modeled in WWHM as Second Growth-Forested area with hydrologic soil group C.



DATE	SEPTEMBER 2022
DESIGNED	NICHOLAS JOHNSON
DRAWN	NICHOLAS JOHNSON
APPROVED	MICHAEL A. MOODY
	MICHAEL A. MOODY
	PROJECT MANAGER
SHEET	1
OF	1
PROJECT NUMBER	18039

EXISTING CONDITIONS
5637 MERCER WAY
MI TREEHOUSE, LLC
 11030 SE 30TH ST
 BELLEVUE, WA 98004



CORE
 DESIGN
 ENGINEERING • PLANNING • SURVEYING

14711 NE 29th Place Suite 101
 Bellevue, Washington 98007
 425.885.7877 Fax 425.885.7963



9/14/2022 1:09 PM (A:\2018\18039\DOCUMENTS\ENGINEERING REPORTS\SDP\FINAL\DRAWINGS)\EXISTING CONDITIONS EXHIBIT.DWG

4.1.4 Developed Conditions

The developed condition proposes the construction of a single-family residence and an access easement. Refer to Table 4.1 and 4.2 below for a breakdown of the actual developed areas. The disturbed area for the project is approximately 5,551 sf (0.127 ac). An existing drive borders the west property line and has been modeled using the proposed impervious area.

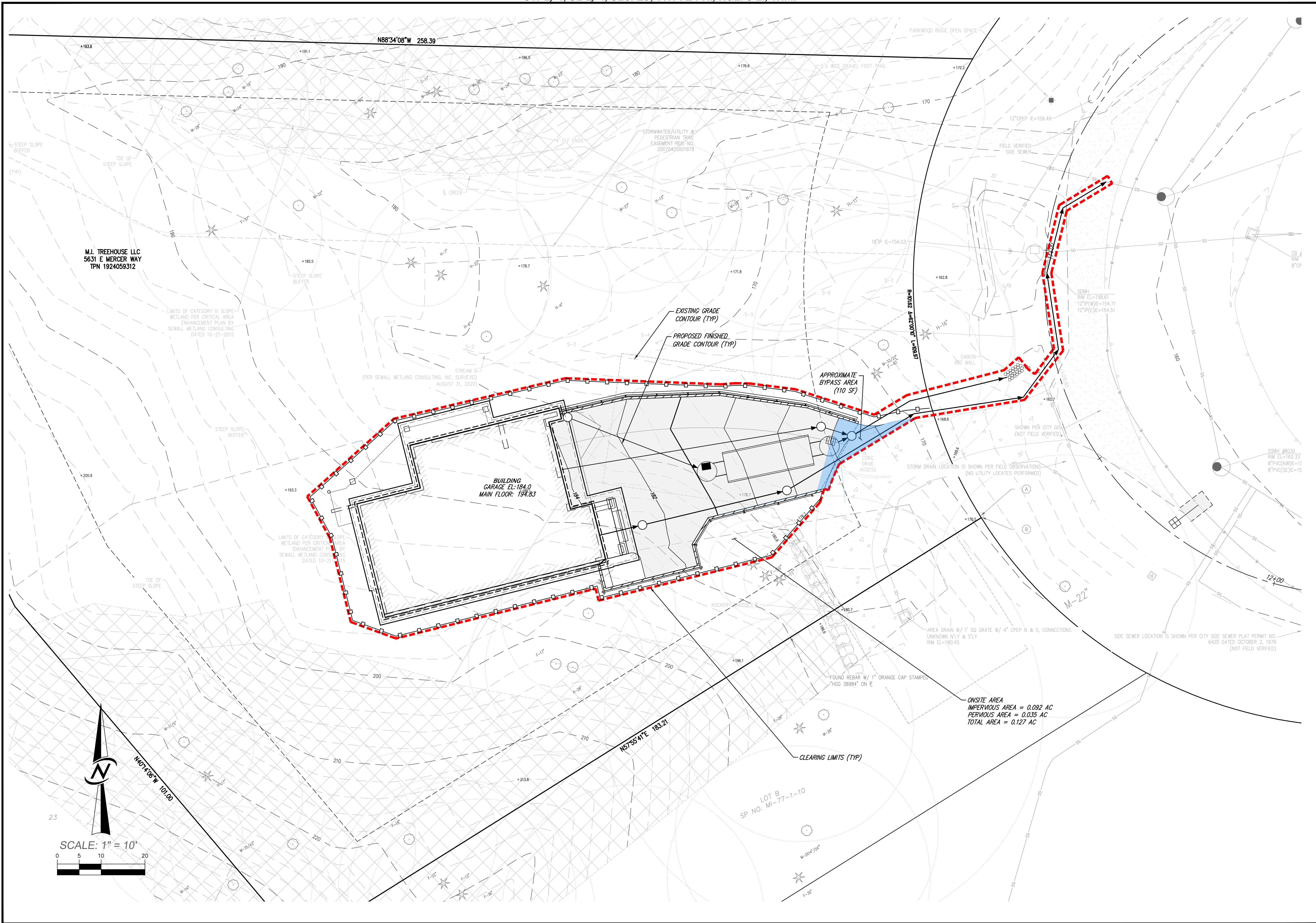
The project is proposing to bypass approximately 110 square feet of new plus replaced driveway/roadway area which is proposed for the project but will bypass the detention system. Refer to the developed conditions exhibit on the following page for an area breakdown.

Table 4.1 Developed Site Disturbed Area Breakdown

Total Area (sf)	5,551
Roofs (with eaves)	2,184
Driveway/Roadway	1,594
Driveway/Roadway (Bypass)	110
Walkway/Patio	135
Impervious Subtotal	4,023
Lawn/Landscaping	1,528
Pervious Subtotal	1,528

Table 4.2 Developed Area Summary

DEVELOPED CONDITIONS	Total Area = 0.127 acres
GROUND COVER	AREA (acres)
Grass/Lawn	0.035
Impervious	0.092



DATE	SEPTEMBER 2022
DESIGNED	NICHOLAS JOHNSON
DRAWN	NICHOLAS JOHNSON
APPROVED	MICHAEL A. MOODY
	MICHAEL A. MOODY
	PROJECT MANAGER

SHEET	OF
1	1

PROJECT NUMBER
18039

DEVELOPED CONDITIONS
5637 MERCER WAY
MI TREEHOUSE, LLC
11030 SE 30TH ST
BELLEVUE, WA 98004

CORE DESIGN
ENGINEERING • PLANNING • SURVEYING

14711 NE 29th Place Suite 101
Bellevue, Washington 98007
425.885.7877 Fax 425.885.7963

MAINTENANCE
SEWER
WATER
GAS
ELECTRIC
TELEPHONE
CABLE
FIBER
RADIO

DATE

REVISIONS

NO.

DATE

4.1.5 WWHM Modeling Results

The existing condition area was assumed to be fully forest in Group C soils. The developed condition area is represented in Tables 4.1 and 4.2. Both conditions were input into WWHM and a model using 15-minute timesteps was executed. The project causes a 0.084 cfs change to the 100-year peak flow which is less than the maximum 0.15 cfs change. Refer to the WWHM Flow Frequency Analysis on the following page. The full WWHM Report Printout has been included in the Appendix of this report.

Flow Frequency			
Flow (cfs)		Predeveloped	Mitigated
2 Year	=	0.0038	0.0434
5 Year	=	0.0062	0.0560
10 Year	=	0.0077	0.0648
25 Year	=	0.0096	0.0767
50 Year	=	0.0109	0.0860
100 Year	=	0.0121	0.0958

4.2. Flow Control BMPs

Per the City of Mercer Island regulation, the project follows the Mercer Island City Code in addendum to the 2014 DOE Manual. As such, the Minimum Requirements 1 through 5 determine whether or not various stormwater BMP measures are required and to what degree. The Mercer Way Project includes less than 5,000 ft² of replaced/new impervious surfaces and therefore is not subject to standard Flow Control BMPs. LID BMPs are typically used to meet minimum requirement 5; however, all LID options are not feasible onsite due to the severe nature of the site constraints. The City of Mercer Island then requires supplemental detention in place of any LID requirements and has provided a pre-sized detention tank table for sites, such as this one, which do not have available LID options (see Appendix for sizing table).

This site will employ a detention pipe, designed using the City of Mercer Island Table 1 to meet Minimum Requirement 5 in accordance with Mercer Island City Code. The 5637 E Mercer Way project site will add approximately 4,023 SF of impervious area, and the site is covered in primarily Class C soils (see Appendix for the NRCS Soils Map of the area). Per the City of Mercer Island Table 1 the project is required to provide a detention pipe with the following dimensions:

- 60" diameter
- 31' in length

Orifice placement and sizing is governed by the City of Mercer Island Table 1 and is as follows:

- First orifice Diameter 0.5"
- Second Orifice Diameter 1.3"

- Separation between first and second orifices, 3.5'

The detention pipe will be subject to HS-20/HS-25 loading. The project has selected a pipe arch equivalent to a 72-inch round diameter pipe. The Contech HEL-COR pipe arch (or approved equivalent) was selected to minimize trenching impact for utility placement. The Contech HEL-COR pipe has been designed to have 2-2/3" x 1/2" corrugations which allows for HS-20/HS-25 loading and a minimum cover of 12-inches (1 foot).

The required volume for the detention system is calculated as follows:

$$\begin{aligned} \text{Required Detention Volume} &= (\text{cross sectional area of pipe}) \times (\text{length of pipe}) \\ &= (\pi * (r^2)) * (l) = (\pi * (2.5 \text{ ft}^2)) * (31 \text{ ft}) = \mathbf{609 \text{ ft}^3} \end{aligned}$$

The provided detention volume is as follows:

Pipe Arch Detention Volume

Cross sectional area of pipe arch = 26.0 ft²

Length of Pipe = 20 ft

Total Detention Volume = **520 ft³**

54" Catch Basin Detention Volume

Cross sectional area of pipe = 15.9 ft²

Length of pipe (height) = 4 ft

Detention Volume (one catch basin) = 63.6 ft³

Total Detention Volume = 2 x (63.6 ft³) = 127.2 ft³ = **127 ft³**

The combined total detention volume of the proposed system is **647 ft³** which provides more storage than is required.

Additional details and placement information can be found on the Stormwater Site Plans. Specifications for the Contech HEL-COR pipe arch have been provided on the following pages.



CONTECH[®]
ENGINEERED SOLUTIONS

HEL-COR[®]
Pipe-Arch

CONTECH[®]
PIPE SOLUTIONS

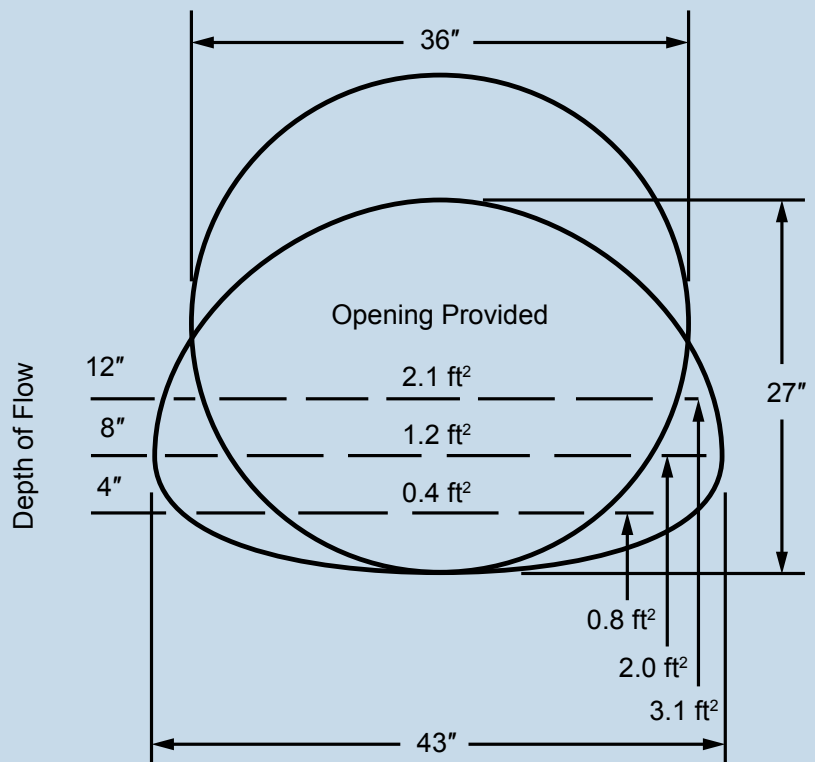
HEL-COR® Pipe-Arch



HEL-COR® Pipe-Arch is a corrugated steel pipe shaped to a span greater than the rise. Pipe-Arch allows for greater flows at lower elevations while providing for a lower profile culvert when soil cover is limited. Pipe-Arch design distributes the area horizontally to provide adequate capacity without raising the grade.

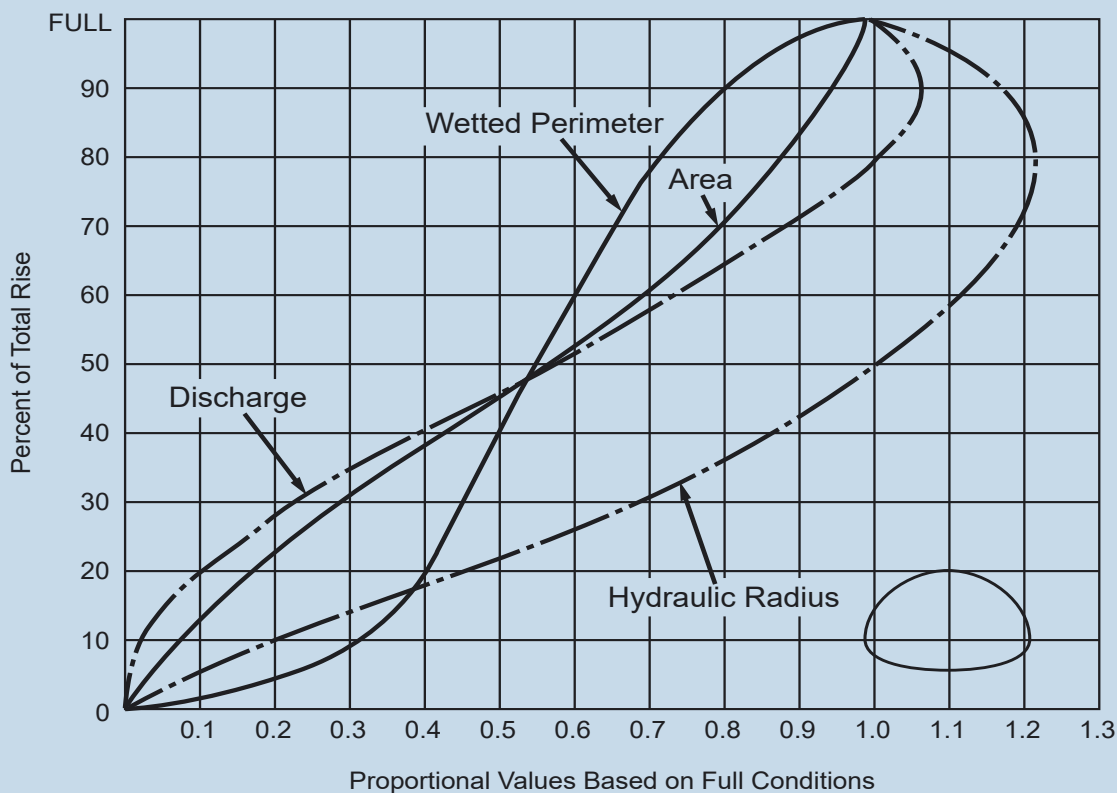
Hydraulic Considerations

At the 12" elevation, a 36-inch diameter corrugated steel pipe-arch equivalent will provide **nearly 1.5 times the water flow** as a 36-inch diameter round pipe.



Full-Flow Data for HEL-COR® Pipe-Arch

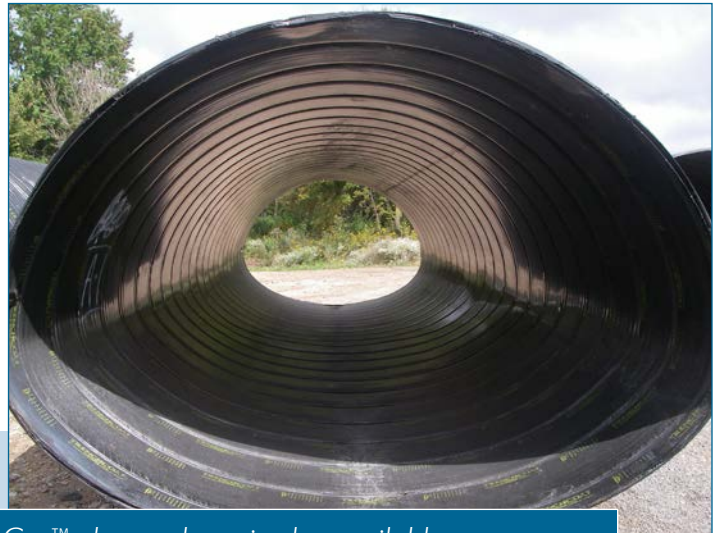
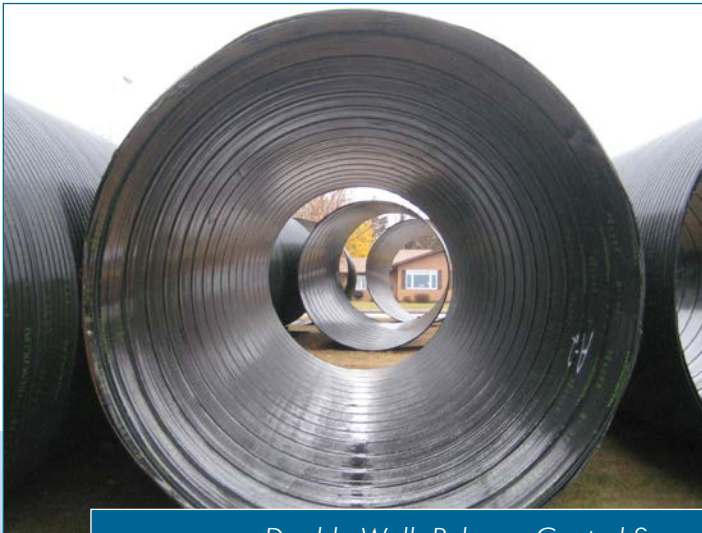
CORRUGATIONS 2 2/3" X 1/2"				CORRUGATIONS 3" x 1" and 5" x 1"			
Diameter (in)	Pipe-Arch Equiv. Size (in)	Waterway Area (ft ²)	Hydraulic Radius, A/πD (ft)	Diameter (in)	Pipe-Arch Equiv. Size (in)	Waterway Area (ft ²)	Hydraulic Radius, A/πD (ft)
15	17 x 13	1.1	0.280	54	60 x 46	15.6	1.104
18	21 x 15	1.6	0.340	60	66 x 51	19.3	1.230
21	24 x 18	2.2	0.400	66	73 x 55	23.2	1.343
24	28 x 20	2.9	0.462	72	81 x 59	27.4	1.454
30	35 x 24	4.5	0.573	78	87 x 63	32.1	1.573
36	42 x 29	6.5	0.690	84	95 x 67	37.0	1.683
42	49 x 33	8.9	0.810	90	103 x 71	42.4	1.800
48	57 x 38	11.6	0.924	96	112 x 75	48.0	1.911
54	64 x 43	14.7	1.040	102	117 x 79	54.2	2.031
60	71 x 47	18.1	1.153	108	128 x 83	60.5	2.141
66	77 x 52	21.9	1.268	114	137 x 87	67.4	2.259
72	83 x 57	26.0	1.380	120	142 x 91	74.5	2.373



HEL-COR® Pipe-Arch

Product Availability

From a 17" span X 13" rise to 142" span X 91" rise, HEL-COR® Pipe-Arch is available in galvanized steel, aluminized steel, polymer-coated steel, bituminous-coated steel and aluminum alloy.



Double Wall, Polymer-Coated Smooth Cor™ shown above is also available in both round and pipe-arch shapes.

Applications

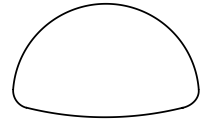
- Drainage culverts, canals, and ditch enclosures
- Storm sewers and drainage pipe
- Stormwater detention and infiltration
- Rehabilitating storm sewers, irrigation pipe and small culverts
- Small span bridges



Large diameter Pipe-Arch manufactured in a chain arch press.

Heights of Cover for HEL-COR® Pipe-Arch

H 20 and H 25 Live Loads for 2 2/3" x 1/2" Pipe-Arch					
Diameter (in)	Size		Minimum Gage (in)	Minimum Cover (in)	Maximum Cover (ft) 2 Tons/ft ² Corner Bearing Pressure
	Span x Rise (in)				
15	17 x 13		0.064	12	16
18	21 x 15		0.064	12	15
21	24 x 18		0.064	12	15
24	28 x 20		0.064	12	15
30	35 x 24		0.064	12	15
36	42 x 29		0.064	12	15
42	49 x 33		0.064*	12	15
48	57 x 38		0.064*	12	15
54	64 x 43		0.079*	12	15
60	71 x 47		0.109*	12	15
66	77 x 52		0.109*	12	15
72	83 x 57		0.138*	12	15



* These values are based on the AISI Flexibility Factor limit (0.0433 x 1.5) for pipe-arch.

H 20 and H 25 Live Loads for 3" x 1" Pipe-Arch					
Diameter (in)	Size		Minimum Gage (in)	Minimum Cover (in)	Maximum Cover (ft) 2 Tons/ft ² Corner Bearing Pressure
	Min. Span (in)	Max. Rise (in)			
48	53 (-2.4)	41 (+2.4)	0.079	12	25
54	60 (-2.7)	46 (+2.7)	0.079	15	25
60	66 (-3.0)	51 (+3.0)	0.079	15	25
66	73 (-3.3)	55 (+3.3)	0.079	18	24
72	81 (-3.6)	59 (+3.6)	0.079	18	21
78	87 (-4.4)	63 (+4.4)	0.079	18	20
84	95 (-4.8)	67 (+4.8)	0.079	18	20
90	103 (-5.2)	71 (+5.2)	0.079	18	20
96	112 (-5.6)	75 (+5.6)	0.079	21	20
102	117 (-5.9)	79 (+5.9)	0.109	21	19
108	128 (-6.4)	83 (+6.4)	0.109	24	19
114	137 (-6.9)	87 (+6.9)	0.109	24	19

H 20 and H 25 Live Loads for 5" x 1" Pipe-Arch					
Diameter (in)	Size		Minimum Gage (in)	Minimum Cover (in)	Maximum Cover (ft) 2 Tons/ft ² Corner Bearing Pressure
	Min. Span (in)	Max. Rise (in)			
54	60 (-2.7)	46 (+2.7)	0.109	18	21
60	66 (-3.0)	51 (+3.0)	0.109	18	21
66	73 (-3.3)	55 (+3.3)	0.109	18	21
72	81 (-3.6)	59 (+3.6)	0.109	18	21
78	87 (-4.4)	63 (+4.4)	0.109	18	20
84	95 (-4.8)	67 (+4.8)	0.109	18	20
90	103 (-5.2)	71 (+5.2)	0.109	18	20
96	112 (-5.6)	75 (+5.6)	0.109	21	20
102	117 (-5.9)	79 (+5.9)	0.109	21	19
108	128 (-6.4)	83 (+6.4)	0.109	24	19
114	137 (-6.9)	87 (+6.9)	0.109	24	19
120	142 (-7.1)	91 (+7.1)	0.138	24	19

Larger sizes are available in some areas of the United States. Check with your local Contech representative. Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances, no tolerance in opposite direction.

HEL-COR® Pipe-Arch

End Treatments Available



A 64' long piece of HEL-COR® Pipe-Arch with beveled ends ready to ship to the project site. Check your local Contech representative for availability of special lengths.

Steel headwalls can improve the hydraulic capacity of Pipe-Arch culverts.



THE CONTECH ADVANTAGE

For more than a century, Contech has provided innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. With a portfolio that includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products, our team is ready to help you to design, build, and support your next project.

Supporting every aspect of your project, from concept to installation, Contech is here to help! Our extensive network of local experts offers you comprehensive project management, technical support, and customer service.



AGENCY/REGULATORY GUIDANCE

Our team is ready to provide you with expert advice and assistance on local regulatory requirements, resulting in faster approvals.



SOLUTION DEVELOPMENT

Our engineers can review your requirements, weigh all options, and recommend the optimal solution to integrate with your site designs.



TECHNICAL EXPERTISE

Our engineers assist by providing product-specific engineering calculations such as hydraulics, buoyancy, foundation reactions, and unit sizing.



COST ESTIMATES

We can quickly provide engineer's cost estimates to assist with your solution selection process.



SITE SPECIFIC DRAWINGS

Our engineers can provide site-specific drawings for proposals, project meetings, and submittals, helping you be more efficient with your time.



ON-SITE ASSISTANCE

Contractors know time is money, so we provide preconstruction meetings, delivery coordination, and on-site installation support to ensure a timely, smooth installation.



Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.



STORMWATER SOLUTIONS



PIPE SOLUTIONS



STRUCTURE SOLUTIONS

FOR MORE INFORMATION CALL:

Corporate Office - Ohio (Cincinnati)	513-645-7000
California (Roseville)	800-548-4667
Colorado (Denver)	720-587-2700
Florida (Orlando)	321-348-3520
Maine (Scarborough)	207-885-9830
Maryland (Baltimore)	410-740-8490
Oregon (Portland)	503-258-3180
Texas (Dallas)	972-590-2000

www.ContechES.com | 800-338-1122



© 2023 Contech Engineered Solutions LLC, a QUIRKETE Company

800-338-1122

www.ContechES.com

All Rights Reserved. Printed in the USA.

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.



SPECIFICATION FOR CORRUGATED METAL PIPE

ALUMINIZED STEEL TYPE 2

1.0 GENERAL

- 1.1 This specification covers the manufacture and installation of the Aluminized Steel Type 2 corrugated steel pipe or pipe-arch (CSP) detailed in the project plans.

2.0 DESIGN STANDARDS

- 2.1 The CSP meets the design parameters of the American Association of State Highway and Transportation Officials (AASHTO) Standard Specification for Highway Bridges, AASHTO LRFD Bridge Design, and/or the American Iron and Steel Institute (AISI).

3.0 MATERIAL

- 3.1 The Aluminized Steel Type 2 coils shall conform to the applicable requirements of AASHTO M 274 or ASTM A929.

4.0 PIPE

- 4.1 The CSP shall be manufactured in accordance with the applicable requirements of AASHTO M 36 or ASTM A760. The pipe sizes, gauges and corrugations shall be as shown on the project plans.
- 4.2 All fabrication of the product shall occur within the United States.

5.0 COUPLING BANDS

- 5.1 Coupling bands for the CSP shall be made of the same base metal and coatings as the CSP to a minimum of 18 gauge.
- 5.2 Ends of the CSP are rerolled with annular corrugations for proper indexing.
- 5.3 Connection fasteners will be provided.

6.0 HANDLING & ASSEMBLY

- 6.1 Refer to the recommendations of the National Corrugated Steel Pipe Association's (NCSPA).

7.0 INSTALLATION

- 7.1 The installation shall be in accordance with AASHTO Standard Specifications for Highway Bridges, LRFD Section 26, Division II, NCSPA, or ASTM A798 and in conformance with the project plans and specifications. If there are any inconsistencies or conflicts, the contractor must bring them to the attention of the project engineer.
- 7.2 It is always the contractor's responsibility to follow OSHA guidelines for safe practices.

8.0 CONSTRUCTION LOADS

- 8.1 Construction loads may be greater than design loads. The contractor shall follow the recommendations for additional compacted material per manufacturer's or NCSPA guidelines.

4.3 Stream and Wetland Hydrologic Evaluation

The project discharges to an existing water course which flows into wetland areas downstream. A condition of approval for the project is for a hydrologist to analyze the impact, if any, of the discharge from the project site and recommend necessary mitigation if deemed appropriate. Core Design, Inc. has conducted a hydrologic evaluation and analyzed the impacts, if any, to the system.

The pre-project conditions were evaluated via the most recent aerial imagery and topographical survey data of the area to determine the landcover types which are used to model the existing conditions in WWHM2012. Refer to Table 4.3 below for a summary of the pre-project conditions areas. The post-project condition areas used for the model match those of Table 4.2 in this report.

Table 4.3 Pre-project Condition Landcover Areas

PRE-PROJECT CONDITIONS	Total Area = 0.127 acres
GROUND COVER	AREA (acres)
Till-Forest	0.069
Wetland	0.056
Impervious	0.002

The values in Table 4.3 were input into WWHM as the Pre-developed “Pre-project” condition and values in Table 4.2 as the Developed “Post-project” condition. The Predeveloped “Pre-project” conditions were connected to Point of Compliance (POC) 1 in the model. The Developed “Post-project” conditions include the detention system and the associated tributary area. The surface and interflow flows of the area tributary to the tank were routed to the tank and the groundwater was connected to POC 1.

The model results show an increase at the 2-year of 0.0025, a decrease at the 10-year, and 100-year peak flow of 0.0015 cfs and 0.0063 cfs, respectively. Refer to the flow frequency analysis provided by WWHM on the following page. Refer to the Appendix of this report for the full WWHM analysis report.

Flow Frequency		
Flow(cfs)	Predeveloped	Mitigated
2 Year =	0.0065	0.0090
5 Year =	0.0114	0.0116
10 Year =	0.0148	0.0133
25 Year =	0.0191	0.0156
50 Year =	0.0223	0.0173
100 Year =	0.0253	0.0190

It is Core Design's professional opinion that the discharge from the project site causes a negligible increase at the 2-year peak flow and a negligible decrease at the 10-year and 100-year peak flows; thus, no adverse impacts are expected through the 100-year storm event. Additionally, the discharge is to the same stream system which flows through the project site.

5.0 FINANCIAL LIABILITY

A site improvement Bond Quantities Worksheet will be provided prior to permit approval.

6.0 APPENDIX

King County Parcel Report

DOE Flow Minimum Requirement Flow Charts

NRCS Soil Survey Map

Technical Memo

Mercer Island Detention Requirement Guidelines

WWHM Model Reports

King County Department of Assessments

Fair, Equitable, and Understandable Property Valuations

You're In: [Assessor](#) >> [Look up Property Info](#) >> [eReal Property](#)

[Department of Assessments](#)

500 Fourth Avenue, Suite ADM-AS-0708, Seattle, WA 98104

Office Hours: Mon - Fri 8:30 a.m. to 4:30 p.m.

TEL: 206-296-7300 FAX: 206-296-5107 TTY: 206-296-7888

[Send us mail](#)

ADVERTISEMENT

- [New Search](#)
- [Property Tax Bill](#)
- [Map This Property](#)
- [Glossary of Terms](#)
- [Area Report](#)
- [Property Detail](#)

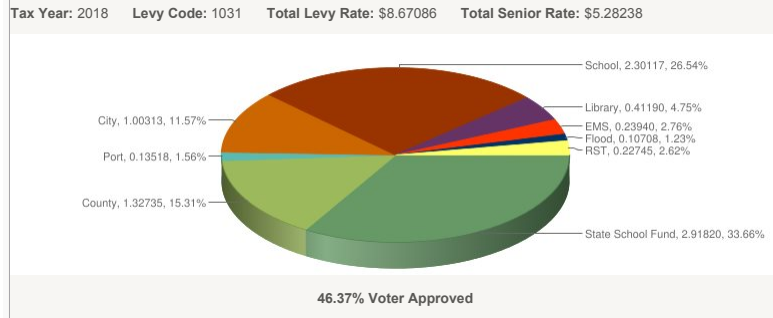
PARCEL

Parcel Number	192405-9312
Name	MI TREEHOUSE LLC
Site Address	
Legal	LOT A MERCER IS SP 77-1-10 REC AF #7703310851 SD SP DAF POR OF NE 1/4 OF SW 1/4 AND OF GL 3 LY BTWN LNS PLW & DIST 1700 FT & 2350 FT N OF SLY LN OF SEC & LY WLY OF E MERCER WAY BLVD LESS POR PLATTED EL DORADO ESTATES ALSO LESS POR PLATTED MERCER FIRS

BUILDING 1

Year Built		<input type="text" value=""/>
Total Square Footage		
Number Of Bedrooms		
Number Of Baths		
Grade		
Condition		
Lot Size	37554	
Views	No	
Waterfront		

TOTAL LEVY RATE DISTRIBUTION



[Click here to see levy distribution comparison by year.](#)

TAX ROLL HISTORY

Valued Year	Tax Year	Appraised Land Value (\$)	Appraised Imps Value (\$)	Appraised Total (\$)	Taxable Land Value (\$)	Taxable Imps Value (\$)	Taxable Total (\$)
2017	2018	35,000	0	35,000	35,000	0	35,000
2016	2017	32,094	0	32,094	32,094	0	32,094
2015	2016	32,094	0	32,094	32,094	0	32,094
2014	2015	32,094	0	32,094	32,094	0	32,094
2013	2014	190,000	0	190,000	190,000	0	190,000
2012	2013	176,000	0	176,000	176,000	0	176,000
2011	2012	186,000	0	186,000	186,000	0	186,000
2010	2011	195,000	0	195,000	195,000	0	195,000
2009	2010	201,000	0	201,000	201,000	0	201,000
2008	2009	250,000	0	250,000	250,000	0	250,000
2007	2008	250,000	0	250,000	250,000	0	250,000
2006	2007	359,000	0	359,000	359,000	0	359,000
2005	2006	359,000	0	359,000	359,000	0	359,000
2004	2005	330,000	0	330,000	330,000	0	330,000
2003	2004	330,000	0	330,000	330,000	0	330,000
2002	2003	330,000	0	330,000	330,000	0	330,000
2001	2002	210,000	0	210,000	210,000	0	210,000
2000	2001	183,000	0	183,000	183,000	0	183,000
1999	2000	147,000	0	147,000	147,000	0	147,000
1998	1999	140,000	0	140,000	140,000	0	140,000
1997	1998	0	0	0	87,000	0	87,000

Reference Links:

- [King County Taxing Districts Codes and Levies \(PDF\)](#)
- [King County Tax Links](#)
- [Property Tax Advisor](#)
- [Washington State Department of Revenue \(External link\)](#)
- [Washington State Board of Tax Appeals \(External link\)](#)
- [Board of Appeals/Equalization](#)
- [Districts Report](#)
- [iMap](#)
- [Recorder's Office](#)
- [Scanned images of surveys and other map documents](#)

ADVERTISEMENT

1996	1997	0	0	0	80,000	0	80,000
1994	1995	0	0	0	80,000	0	80,000
1992	1993	0	0	0	63,700	0	63,700
1990	1991	0	0	0	65,000	0	65,000
1988	1989	0	0	0	40,500	0	40,500
1986	1987	0	0	0	54,000	0	54,000
1984	1985	0	0	0	46,000	0	46,000
1982	1983	0	0	0	46,000	0	46,000

ADVERTISEMENT

Updated: March 17, 2016

[Share](#)
[Tweet](#)
[Email](#)
[Print](#)

Information for...

[Residents](#)
[Businesses](#)
[Job seekers](#)
[Volunteers](#)
[King County employees](#)

Do more online

[Trip Planner](#)
[Property tax information & payment](#)
[Jail inmate look up](#)
[Parcel viewer or iMap](#)
[Public records](#)
[More online tools...](#)

Get help

[Contact us](#)
[Customer service](#)
[Phone list](#)
[Employee directory](#)
[Subscribe to alerts](#)

Stay connected! [View King County social media](#)



© King County, WA 2018 [Privacy](#) [Accessibility](#) [Terms of use](#)

Information for...

[Get help](#)

Do more online

Figure I-2.4.1 Flow Chart for Determining Requirements for New Development

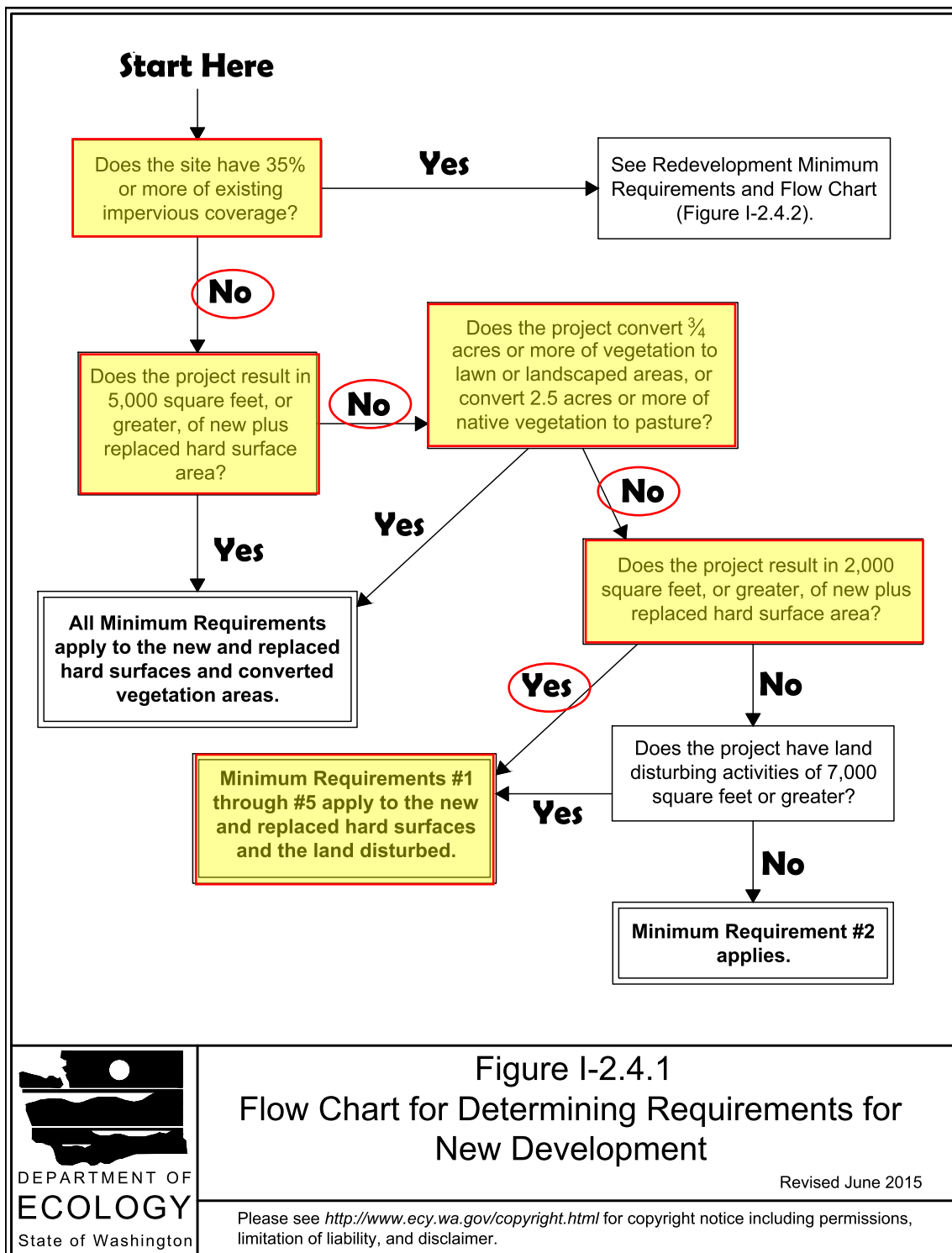
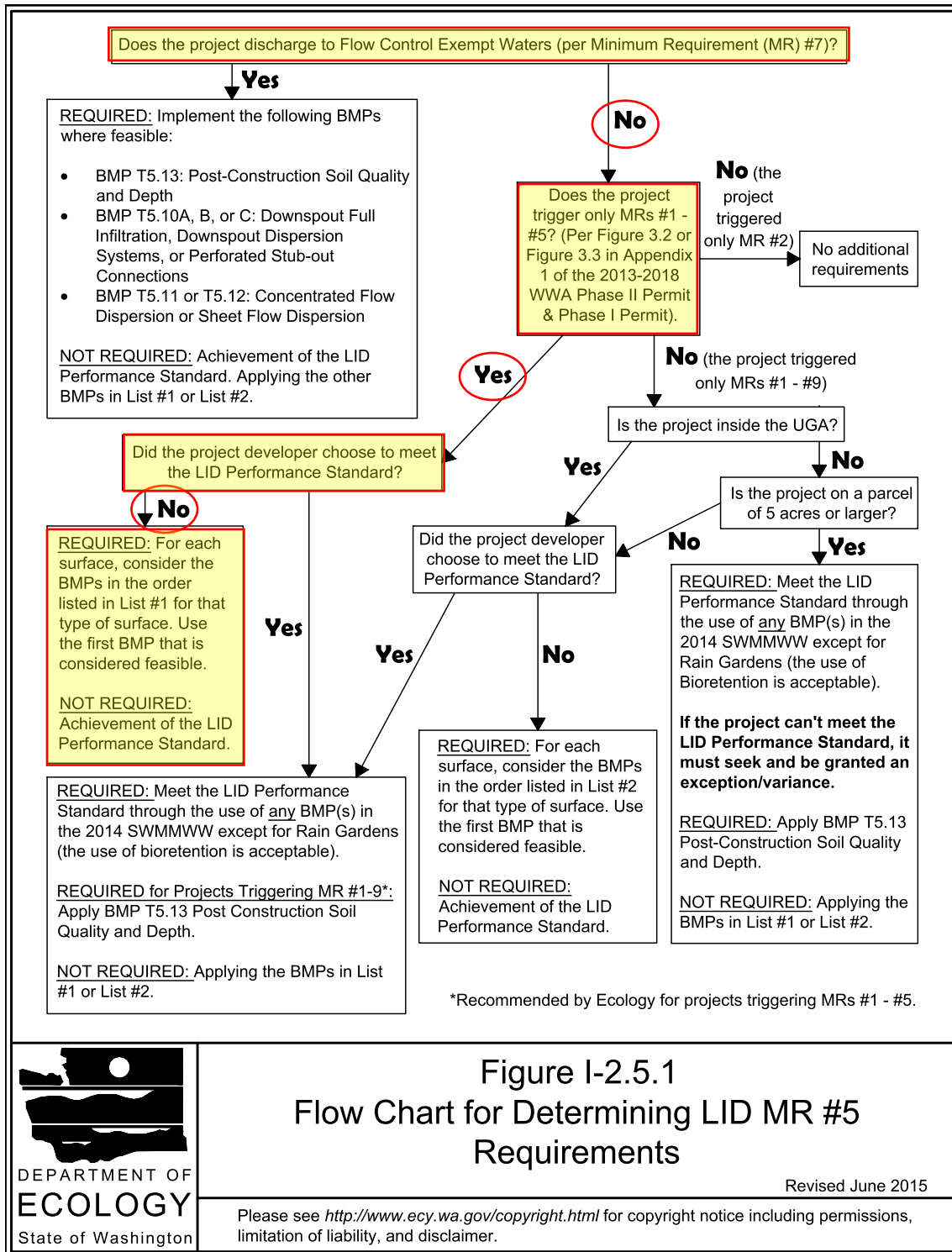


Figure I-2.4.1
Flow Chart for Determining Requirements for
New Development

Revised June 2015

Please see <http://www.ecy.wa.gov/copyright.html> for copyright notice including permissions, limitation of liability, and disclaimer.

Figure I-2.5.1 Flow Chart for Determining LID MR #5 Requirements



**Figure I-2.5.1
Flow Chart for Determining LID MR #5
Requirements**

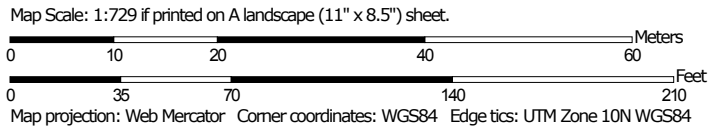
Revised June 2015

Please see <http://www.ecy.wa.gov/copyright.html> for copyright notice including permissions, limitation of liability, and disclaimer.

Soil Map—King County Area, Washington




Soil Map may not be valid at this scale.





MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: King County Area, Washington

Survey Area Data: Version 13, Sep 7, 2017

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

Date(s) aerial images were photographed: Aug 31, 2013—Oct 6, 2013

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	1.4	99.6%
KpD	Kitsap silt loam, 15 to 30 percent slopes	0.0	0.4%
Totals for Area of Interest		1.4	100.0%



- 14711 NE 29Th Place, Suite 101
- Bellevue, Washington 98007
- Ph 425.885.7877
- www.coredesigninc.com

TECHNICAL MEMORANDUM

To: Evan Maxim
Planning Manager
City of Mercer Island

From: Michael A. Moody, P.E., LEED-AP
Project Engineer

Date: March 23, 2018

Re: RUE CAO 15-001 (MI Treehouse Project) Supplemental Evaluation

The purpose of this memorandum is to provide additional documentation and evaluation for the above referenced project as requested in your email dated February 2, 2018 and a letter from the City Attorney (Kari L. Sand) dated December 26, 2017 (both provided as attachments for reference).

More specifically this memo intends to provide the City with our Civil Engineering opinion and/or technical responses to Items A, B and E in the City's December 26, 2017 letter so that processing of the Reasonable Use Exemption permit may continue.

Item A: Geotechnical / Civil (drainage) Engineering:

Our additional analysis of the existing condition for the Type 2 Watercourse located on-site and conveying water downstream of the project site discovered that the system currently experiences siltation throughout the year.

The proposed project will likely adversely impact siltation in the watercourse during construction without temporary erosion and sediment control measures beyond those required at minimum. The project will therefore apply additional BMPs to reduce impacts during construction including:

- Restricted construction dates (dry season construction only)
- Additional filter fabric fence (double layer)
- Restricted clearing limit footprint (clear only what is necessary for the home and driveway as discussed in the *Revised Critical Areas Report* provided under separate cover)
- Restricted construction entrance disturbance (no excavation at existing driveway, add quarry spalls per typical, maintain daily)

The proposed project is unlikely to impact siltation or flooding in the watercourse in the permanent condition. Refer to the *Revised Critical Areas Report* for more information and detail regarding permanent impacts and proposed mitigation.

The proposed project will apply and comply with the Washington State Department of Ecology's 2014 Stormwater Management Manual for Western Washington (2014 DOE) per City of Mercer Island Stormwater Code.

In addition to the 2014 DOE Manual, the project proposes to apply downstream analysis standards and recommendations in the 2016 King County Surface Water Design Manual considered equivalent to the 2014 DOE Manual.

Item B: Wetland / watercourse impacts:

A Revised Critical Areas Report has been prepared and is included under separate cover (by Sewall Wetland Consulting Inc). Also included under separate cover (by Healey-Jorgensen Architects) is a Site Plan Wetland that shows the optimized site shifted to minimize critical area and critical area buffer impacts.

It is our professional opinion that together these supplemental documents address Item B from the City's December 2017 comment letter. Temporary and permanent critical area impacts are well documented in the revised report and clearly shown on the updated site plan. These documents also provide both narrative and graphical representation of reductions to critical area impacts as a result of the revised site plan.

Item E: Technical corrections:

A Revised Critical Areas Report has been prepared and is included under separate cover (by Sewall Wetland Consulting Inc). Also included under separate cover (by Healey-Jorgensen Architects) is a Site Plan Wetland that shows the optimized site shifted to minimize critical area and critical area buffer impacts.

It is our professional opinion that together these supplemental documents address Item E from the City's December 2017 comment letter. Temporary and permanent critical area impacts are well documented in the revised report and clearly shown on the updated site plan.

CITY OF MERCER ISLAND

DEVELOPMENT SERVICES GROUP

9611 SE 36TH STREET | MERCER ISLAND, WA 98040

PHONE: 206.275.7605 | www.mercergov.org

Inspection Requests: Online: www.MyBuildingPermits.com VM: 206.275.7730



ON-SITE DETENTION DESIGN REQUIREMENTS

General Requirements

This guidance applies only to projects that meet the thresholds specified below in “Is On-site Detention Required for My Project?” if all of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces.

Is On-site Detention Required For My Project?

YES, if my project:

- 1) Results in 2,000 square feet, or greater, of new plus replaced hard surface area, or
- 2) Has a land disturbing activity or 7,000 square feet or greater, or
- 3) Results in a **net increase** of impervious surface of 500 square feet or greater.

AND

- 1) All of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces, and
- 2) Drainage from the site will be discharged to a storm and surface water system that includes a watercourse or there is a capacity constraint in the system.

NO, if my project:

- 1) Results in less than 2,000 square feet of new plus replaced hard surface area, and
- 2) Has a land disturbing activity less than 7,000 square feet, and
- 3) Results in a **net increase of less than 500 square feet** of impervious surface area.
- 4) The project discharges **directly** to Lake Washington, or findings from a ¼-mile downstream analysis confirm that the downstream system is free of capacity constraints.

Designing Your On-Site Detention System

All on-site detention system designs must be prepared by a professional engineer registered in the State of Washington. The Standard On-site Detention System worksheet (Attachment 1) must be submitted on 18" x 24" (minimum) size sheets.

Construction that results in 500 to 9,500 square feet of new plus replaced impervious surfaces:

Size system according to Table 1. The configuration of the on-site detention system shall be as shown on Attachment 1 (Standard On-Site Detention Systems Worksheet) or as specifically designed by the engineer for the site.

Note:

- The applicant may pay a fee-in-lieu-of constructing an on-site detention system when allowed by the City Engineer. The fee will not be an option when in the opinion of the City Engineer, undetained runoff from the development may adversely exacerbate an existing problem (MICC 15.11) or if flow control is required by Minimum Requirement #7.
- **Construction that results in more than 9,500 square feet of new plus replaced impervious surfaces and/or exceeds a 100-year flow frequency of 0.15 cubic feet per second (for moderate and steep sloped sites greater than a 5% slope):** Size system according to Minimum Requirement #7 (Flow Control) in the Stormwater Management Manual for Western Washington (Ecology 2014).

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
4,001 to 5,000 sf	36"	134	91	0.5	0.5	2.8	2.2	1.7	1.5
	48"	73	49	0.5	0.5	3.6	2.9	1.6	1.5
	60"	46	31	0.5	0.5	4.6	3.5	1.6	1.3
5,001 to 6,000 sf	36"	162	109	0.5	0.5	2.7	2.2	1.8	1.6
	48"	90	59	0.5	0.5	3.5	2.9	1.7	1.5
	60"	54	37	0.5	0.5	4.6	3.6	1.6	1.4
6,001 to 7,000 sf	36"	192	128	0.5	0.5	2.7	2.2	1.9	1.8
	48"	102	68	0.5	0.5	3.7	2.9	1.9	1.6
	60"	64	43	0.5	0.5	4.6	3.6	1.8	1.5
7,001 to 8,000 sf	36"	216	146	0.5	0.5	2.8	2.2	2.0	1.9
	48"	119	79	0.5	0.5	3.8	2.9	2.2	1.7
	60"	73	49	0.5	0.5	4.5	3.6	2.0	1.6
8,001 to 8,500 sf ⁽¹⁾	36"	228	155	0.5	0.5	2.8	2.2	2.1	1.9
	48"	124	84	0.5	0.5	3.7	2.9	1.9	1.8
	60"	77	53	0.5	0.5	4.6	3.6	2.0	1.6
8,501 to 9,000 sf	36"	NA ⁽¹⁾	164	0.5	0.5	NA ⁽¹⁾	2.2	NA ⁽¹⁾	1.9
	48"	NA ⁽¹⁾	89	0.5	0.5	NA ⁽¹⁾	2.9	NA ⁽¹⁾	1.9
	60"	NA ⁽¹⁾	55	0.5	0.5	NA ⁽¹⁾	3.6	NA ⁽¹⁾	1.7
9,001 to 9,500 sf ⁽²⁾	36"	NA ⁽¹⁾	174	0.5	0.5	NA ⁽¹⁾	2.2	NA ⁽¹⁾	2.1
	48"	NA ⁽¹⁾	94	0.5	0.5	NA ⁽¹⁾	2.9	NA ⁽¹⁾	2.0
	60"	NA ⁽¹⁾	58	0.5	0.5	NA ⁽¹⁾	3.7	NA ⁽¹⁾	1.7

Notes:

▪ Minimum Requirement #7 (Flow Control) is required when the 100-year flow frequency causes a 0.15 cubic feet per second increase (when modeled in WWHM with a 15-minute timestep). Breakpoints shown in this table are based on a flat slope (0-5%). The 100-year flow frequency will need to be evaluated on a site-specific basis for projects on moderate (5-15%) or steep (> 15%) slopes.

- Soil type to be determined by geotechnical analysis or soil map.
- Sizing includes a Volume Correction Factor of 120%.
- Upper bound contributing area used for sizing.

⁽¹⁾ On Type B soils, new plus replaced impervious surface areas exceeding 8,500 sf trigger Minimum Requirement #7 (Flow Control)

⁽²⁾ On Type C soils, new plus replaced impervious surface areas exceeding 9,500 sf trigger Minimum Requirement #7 (Flow Control)

⁽³⁾ Minimum orifice diameter = 0.5 inches

in = inch

ft = feet

sf = square feet

Basis of Sizing Assumptions:

Sized per MR#5 in the Stormwater Management Manual for Puget Sound Basin (1992 Ecology Manual)

SBUH, Type 1A, 24-hour hydrograph

2-year, 24-hour storm = 2 in; 10-year, 24-hour storm = 3 in; 100-year, 24-hour storm = 4 in

Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)

Developed = impervious (CN = 98)

0.5 foot of sediment storage in detention pipe

Overland slope = 5%

WWHM2012
PROJECT REPORT

General Model Information

WWHM2012 Project Name: 18039 No Detention

Site Name: MI Treehouse
Site Address: 5637 E Mercer Way
City: Mercer Island
Report Date: 3/10/2025
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.000
Version Date: 2024/10/15
Version: 4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use C, Forest, Mod	acre 0.127
Pervious Total	0.127
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.127

Element Flow Components:		
Surface	Interflow	Groundwater
Component Flows To:		
POC 1	POC 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use C, Lawn, Mod	acre 0.035
Pervious Total	0.035
Impervious Land Use ROADS MOD	acre 0.092
Impervious Total	0.092
Basin Total	0.127

Element Flow Components:

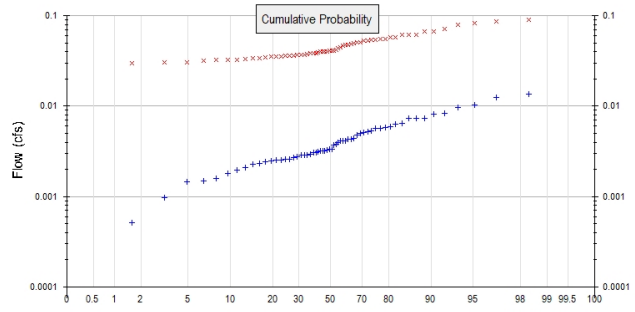
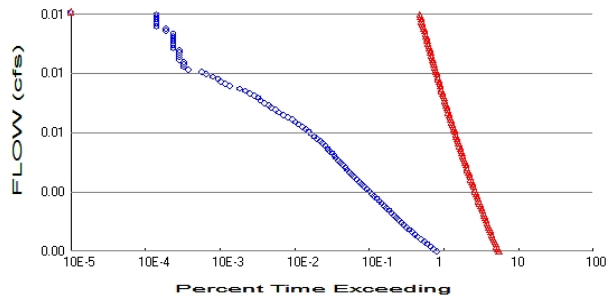
Surface	Interflow	Groundwater
Component Flows To:		
POC 1	POC 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.127
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.035
 Total Impervious Area: 0.092

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.003781
5 year	0.006196
10 year	0.007749
25 year	0.009596
50 year	0.010875
100 year	0.01207

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.043358
5 year	0.055958
10 year	0.064842
25 year	0.076708
50 year	0.086029
100 year	0.095773

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.004	0.058
1950	0.005	0.055
1951	0.008	0.034
1952	0.003	0.028
1953	0.002	0.032
1954	0.003	0.035
1955	0.005	0.041
1956	0.004	0.037
1957	0.003	0.042
1958	0.004	0.035

1959	0.003	0.037
1960	0.006	0.039
1961	0.003	0.036
1962	0.002	0.030
1963	0.003	0.038
1964	0.004	0.036
1965	0.003	0.043
1966	0.002	0.031
1967	0.006	0.053
1968	0.003	0.067
1969	0.003	0.040
1970	0.003	0.040
1971	0.003	0.049
1972	0.006	0.050
1973	0.003	0.030
1974	0.003	0.046
1975	0.004	0.045
1976	0.003	0.037
1977	0.000	0.036
1978	0.003	0.051
1979	0.002	0.061
1980	0.007	0.071
1981	0.002	0.042
1982	0.005	0.061
1983	0.004	0.048
1984	0.002	0.032
1985	0.001	0.041
1986	0.006	0.036
1987	0.006	0.054
1988	0.002	0.035
1989	0.001	0.055
1990	0.014	0.079
1991	0.007	0.067
1992	0.003	0.033
1993	0.003	0.038
1994	0.001	0.033
1995	0.004	0.037
1996	0.010	0.051
1997	0.007	0.040
1998	0.002	0.040
1999	0.008	0.091
2000	0.003	0.041
2001	0.001	0.048
2002	0.003	0.053
2003	0.005	0.054
2004	0.005	0.087
2005	0.004	0.034
2006	0.004	0.032
2007	0.010	0.082
2008	0.013	0.062
2009	0.006	0.058

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0137	0.0906
2	0.0126	0.0869
3	0.0103	0.0825

4	0.0096	0.0792
5	0.0083	0.0710
6	0.0081	0.0668
7	0.0074	0.0668
8	0.0074	0.0619
9	0.0073	0.0613
10	0.0065	0.0612
11	0.0063	0.0582
12	0.0059	0.0582
13	0.0058	0.0552
14	0.0057	0.0550
15	0.0057	0.0541
16	0.0053	0.0538
17	0.0052	0.0529
18	0.0051	0.0529
19	0.0050	0.0509
20	0.0048	0.0505
21	0.0044	0.0501
22	0.0044	0.0487
23	0.0043	0.0480
24	0.0041	0.0480
25	0.0041	0.0463
26	0.0041	0.0450
27	0.0040	0.0435
28	0.0038	0.0423
29	0.0037	0.0415
30	0.0033	0.0412
31	0.0033	0.0409
32	0.0033	0.0405
33	0.0032	0.0403
34	0.0032	0.0400
35	0.0032	0.0399
36	0.0031	0.0398
37	0.0031	0.0389
38	0.0031	0.0384
39	0.0030	0.0382
40	0.0029	0.0375
41	0.0029	0.0370
42	0.0029	0.0368
43	0.0028	0.0368
44	0.0027	0.0365
45	0.0026	0.0361
46	0.0026	0.0358
47	0.0026	0.0356
48	0.0025	0.0353
49	0.0025	0.0351
50	0.0024	0.0348
51	0.0023	0.0343
52	0.0023	0.0336
53	0.0021	0.0333
54	0.0020	0.0326
55	0.0018	0.0324
56	0.0016	0.0322
57	0.0015	0.0316
58	0.0015	0.0307
59	0.0010	0.0302
60	0.0005	0.0296
61	0.0004	0.0277

Duration Flows

The Duration Matching **Failed**

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0019	17090	116077	679	Fail
0.0020	15490	112270	724	Fail
0.0021	14070	108655	772	Fail
0.0022	12808	105425	823	Fail
0.0023	11569	102174	883	Fail
0.0023	10519	99009	941	Fail
0.0024	9563	96057	1004	Fail
0.0025	8759	93298	1065	Fail
0.0026	8040	90560	1126	Fail
0.0027	7347	87887	1196	Fail
0.0028	6733	85320	1267	Fail
0.0029	6192	82839	1337	Fail
0.0030	5730	80507	1405	Fail
0.0031	5309	78262	1474	Fail
0.0032	4924	76187	1547	Fail
0.0033	4571	74134	1621	Fail
0.0033	4237	72080	1701	Fail
0.0034	3951	70112	1774	Fail
0.0035	3643	68145	1870	Fail
0.0036	3390	66284	1955	Fail
0.0037	3133	64423	2056	Fail
0.0038	2915	62712	2151	Fail
0.0039	2706	60958	2252	Fail
0.0040	2490	59333	2382	Fail
0.0041	2314	57878	2501	Fail
0.0042	2136	56295	2635	Fail
0.0043	1972	54777	2777	Fail
0.0043	1825	53344	2922	Fail
0.0044	1702	51932	3051	Fail
0.0045	1577	50563	3206	Fail
0.0046	1442	49258	3415	Fail
0.0047	1325	48039	3625	Fail
0.0048	1232	46799	3798	Fail
0.0049	1147	45601	3975	Fail
0.0050	1083	44403	4100	Fail
0.0051	1020	43227	4237	Fail
0.0052	947	42157	4451	Fail
0.0052	886	41131	4642	Fail
0.0053	824	40061	4861	Fail
0.0054	760	39077	5141	Fail
0.0055	725	38115	5257	Fail
0.0056	674	37174	5515	Fail
0.0057	623	36233	5815	Fail
0.0058	589	35377	6006	Fail
0.0059	549	34522	6288	Fail
0.0060	506	33687	6657	Fail
0.0061	469	32853	7004	Fail
0.0062	427	32040	7503	Fail
0.0062	388	31270	8059	Fail
0.0063	356	30479	8561	Fail
0.0064	328	29752	9070	Fail
0.0065	298	29046	9746	Fail
0.0066	270	28383	10512	Fail
0.0067	241	27720	11502	Fail

0.0068	218	27078	12421	Fail
0.0069	198	26437	13352	Fail
0.0070	173	25795	14910	Fail
0.0071	152	25217	16590	Fail
0.0072	130	24576	18904	Fail
0.0072	119	24062	20220	Fail
0.0073	104	23506	22601	Fail
0.0074	95	23036	24248	Fail
0.0075	83	22501	27109	Fail
0.0076	74	22009	29741	Fail
0.0077	69	21539	31215	Fail
0.0078	61	21010	34442	Fail
0.0079	53	20538	38750	Fail
0.0080	46	20069	43628	Fail
0.0081	39	19590	50230	Fail
0.0082	29	19160	66068	Fail
0.0082	25	18737	74948	Fail
0.0083	22	18347	83395	Fail
0.0084	20	17956	89780	Fail
0.0085	17	17522	103070	Fail
0.0086	14	17162	122585	Fail
0.0087	12	16822	140183	Fail
0.0088	8	16435	205437	Fail
0.0089	7	16057	229385	Fail
0.0090	7	15731	224728	Fail
0.0091	7	15389	219842	Fail
0.0092	6	15066	251100	Fail
0.0092	6	14786	246433	Fail
0.0093	6	14476	241266	Fail
0.0094	6	14172	236200	Fail
0.0095	6	13892	231533	Fail
0.0096	5	13608	272160	Fail
0.0097	5	13327	266540	Fail
0.0098	5	13060	261200	Fail
0.0099	5	12805	256100	Fail
0.0100	5	12530	250600	Fail
0.0101	5	12262	245239	Fail
0.0101	5	11995	239900	Fail
0.0102	4	11740	293500	Fail
0.0103	4	11456	286400	Fail
0.0104	3	11210	373666	Fail
0.0105	3	10996	366533	Fail
0.0106	3	10771	359033	Fail
0.0107	3	10568	352266	Fail
0.0108	3	10341	344700	Fail
0.0109	3	10132	337733	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.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

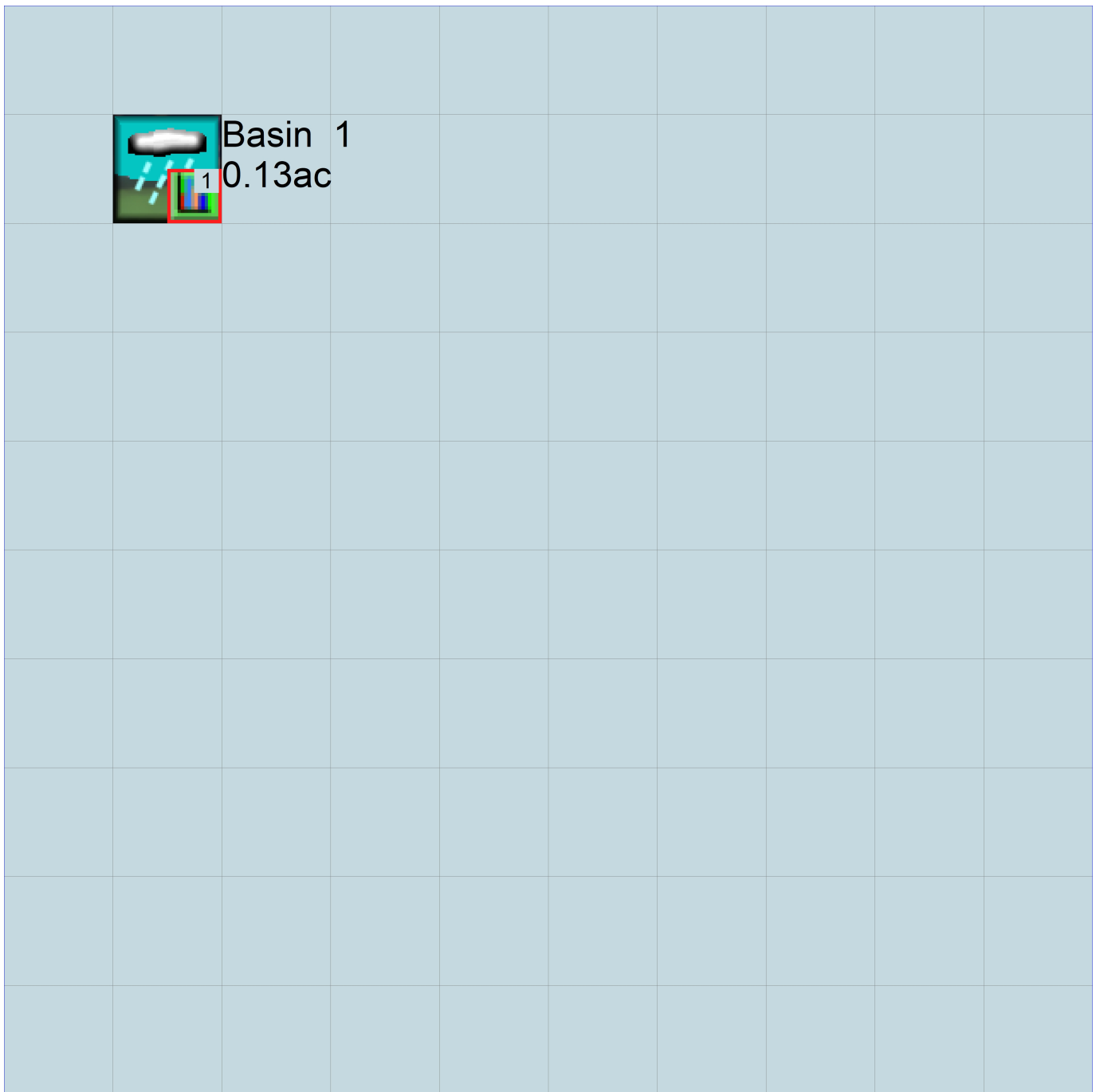
No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Basin 1
0.13ac

Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WVHM4 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      18039 No Detention.wdm
MESSU    25      Pre18039 No Detention.MES
          27      Pre18039 No Detention.L61
          28      Pre18039 No Detention.L62
          30      POC18039 No Detention1.dat
```

END FILES

OPN SEQUENCE

```
INGRP              INDELT 00:15
  PERLND           11
  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      ***
```

```
11      C, Forest, Mod      1      1      1      1      27      0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
# - # ATMP SNOW PWAT  SED  PST  PWG  PQAL MSTL PEST NITR PHOS TRAC ***
11      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 *****
11      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 ***
11 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
11 0 4.5 0.08 400 0.1 0.5 0.996
END PWAT-PARM2

PWAT-PARM3
<PLS > PWATER input info: Part 3 ***
# - # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
11 0 0 2 2 0 0 0
END PWAT-PARM3

PWAT-PARM4
<PLS > PWATER input info: Part 4 ***
# - # CEPSC UZSN NSUR INTFW IRC LZETP ***
11 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
11 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->	<Name> #	<--Area-->	<-factor-->	<-Target->	<Name> #	MBLK	Tbl#	***
Basin	1							
PERLND	11		0.127	COPY	501		12	
PERLND	11		0.127	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	***	ODGTFG for each	FUNCT for each	***
# - #	VC A1 A2 A3	ODFVFG for each	***	possible exit	***
	FG FG FG FG	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
	*** ac-ft	for each possible exit
		Initial value of OUTDGT
		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

```
WVHM4 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      18039 No Detention.wdm
MESSU    25      Mit18039 No Detention.MES
          27      Mit18039 No Detention.L61
          28      Mit18039 No Detention.L62
          30      POC18039 No Detention1.dat
```

END FILES

OPN SEQUENCE

```
INGRP          INDELT 00:15
  PERLND        17
  IMPLND         2
  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 ***
```

```
17 C, Lawn, Mod 1 1 1 1 27 0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
```

```
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
17 0 0 1 0 0 0 0 0 0 0 0 0 0
```

END ACTIVITY

PRINT-INFO

```
<PLS > ***** Print-flags ***** PIVL PYR
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *****
17 0 0 4 0 0 0 0 0 0 0 0 0 0 1 9
```

END PRINT-INFO

PWAT-PARM1

<PLS > PWATER variable monthly parameter value flags ***
- # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRC VLE INFC HWT ***
17 0 0 0 0 0 0 0 0 0 0 0

END PWAT-PARM1

PWAT-PARM2

<PLS > PWATER input info: Part 2 ***
- # ***FOREST LZSN INFILT LSUR SLSUR KVARY AGWRC
17 0 4.5 0.03 400 0.1 0.5 0.996

END PWAT-PARM2

PWAT-PARM3

<PLS > PWATER input info: Part 3 ***
- # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
17 0 0 2 2 0 0 0

END PWAT-PARM3

PWAT-PARM4

<PLS > PWATER input info: Part 4 ***
- # CEPSC UZSN NSUR INTFW IRC LZETP ***
17 0.1 0.25 0.25 6 0.5 0.25

END PWAT-PARM4

PWAT-STATE1

<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
- # *** CEPS SURS UZS IFWS LZS AGWS GWVS
17 0 0 0 0 2.5 1 0

END PWAT-STATE1

END PERLND

IMPLND

GEN-INFO

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

END GEN-INFO

*** Section IWATER***

ACTIVITY

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

END ACTIVITY

PRINT-INFO

<ILS > ***** Print-flags ***** PIVL PYR
- # ATMP SNOW IWAT SLD IWG IQAL *****
2 0 0 4 0 0 4 1 9

END PRINT-INFO

IWAT-PARM1

<PLS > IWATER variable monthly parameter value flags ***
- # CSNO RTOP VRS VNN RTLI ***
2 0 0 0 0 0

END IWAT-PARM1

IWAT-PARM2

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

END IWAT-PARM2

IWAT-PARM3

<PLS > IWATER input info: Part 3 ***
- # ***PETMAX PETMIN
2 0 0

END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES

<-Volume->	<Member>	SsysSgap<--Mult-->	Tran	<-Target	vols>	<-Grp>	<-Member->	***	
<Name>	#	<Name>	#	tem strg<-factor->	strg	<Name>	#	#	***
WDM	2	PREC	ENGL	1		PERLND	1 999	EXTNL	PREC
WDM	2	PREC	ENGL	1		IMPLND	1 999	EXTNL	PREC
WDM	1	EVAP	ENGL	0.76		PERLND	1 999	EXTNL	PETINP
WDM	1	EVAP	ENGL	0.76		IMPLND	1 999	EXTNL	PETINP

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***
<Name>	#	<Name>	#	#<-factor->	strg	<Name>	#	<Name>	tem strg	strg***
COPY	1	OUTPUT	MEAN	1 1	48.4	WDM	701	FLOW	ENGL	REPL
COPY	501	OUTPUT	MEAN	1 1	48.4	WDM	801	FLOW	ENGL	REPL

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member->	<--Mult-->	<Target>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	#<-factor->	<Name>	<Name>	# # #***
MASS-LINK		12					
PERLND	PWATER	SURO		0.083333	COPY	INPUT	MEAN
END MASS-LINK		12					
MASS-LINK		13					
PERLND	PWATER	IFWO		0.083333	COPY	INPUT	MEAN
END MASS-LINK		13					
MASS-LINK		15					
IMPLND	IWATER	SURO		0.083333	COPY	INPUT	MEAN
END MASS-LINK		15					

END MASS-LINK

END RUN

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2025; All Rights Reserved.

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

www.clearcreeksolutions.com

WWHM2012
PROJECT REPORT

General Model Information

WWHM2012 Project Name: 18039 Wetland Model

Site Name: MI Treehouse
Site Address: 5637 E Mercer Way
City: Mercer Island
Report Date: 3/10/2025
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.000
Version Date: 2024/10/15
Version: 4.3.1

POC Thresholds

Low Flow Threshold for POC1: 50 Percent of the 2 Year
High Flow Threshold for POC1: 50 Year

Landuse Basin Data

Predeveloped Land Use

Pre-project Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	0.069
SAT, Forest, Mod	0.056
Pervious Total	0.125
Impervious Land Use	acre
ROADS MOD	0.002
Impervious Total	0.002
Basin Total	0.127

Element Flow Components:

Surface	Interflow	Groundwater
Component Flows To:		
POC 1	POC 1	

Mitigated Land Use

Post-project Area Trib to Tank

Bypass:	Yes
GroundWater:	No
Pervious Land Use C, Lawn, Mod	acre 0.071
Pervious Total	0.071
Impervious Land Use ROADS MOD	acre 0.035
Impervious Total	0.035
Basin Total	0.106

Element Flow Components:

Surface	Interflow	Groundwater
Component Flows To:		
Tank 1	Tank 1	POC 1

Post-project Area not Trib to Tank

Bypass: Yes

GroundWater: No

Pervious Land Use acre
C, Lawn, Mod 0.018

Pervious Total 0.018

Impervious Land Use acre
ROADS MOD 0.003

Impervious Total 0.003

Basin Total 0.021

Element Flow Components:

Surface	Interflow	Groundwater
Component Flows To:		
POC 1	POC 1	POC 1

Routing Elements
Predeveloped Routing

Mitigated Routing

Tank 1

Dimensions
 Depth: 4.75 ft.
 Tank Type: Arched
 Width: 6.92 ft.
 Height: 4.75 ft.
 Length: 20 ft.
 Discharge Structure
 Riser Height: 4 ft.
 Riser Diameter: 12 in.
 Orifice 1 Diameter: 0.500 in. Elevation:0 ft.
 Orifice 2 Diameter: 1.300 in. Elevation:3.5 ft.
 Element Outlets:
 Outlet 1 Outlet 2
 Outlet Flows To:

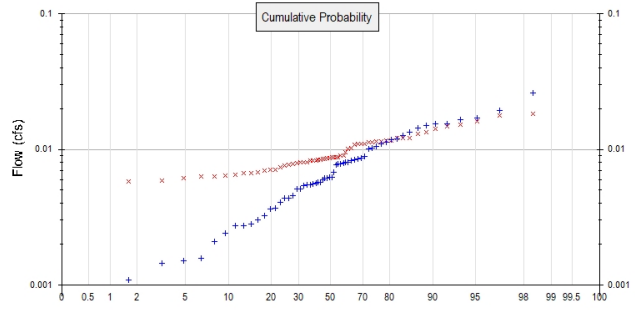
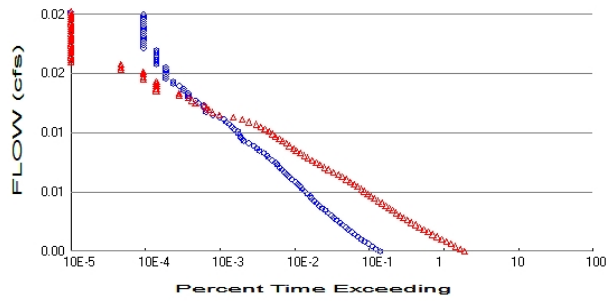
Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0528	0.000	0.000	0.001	0.000
0.1056	0.000	0.000	0.002	0.000
0.1583	0.001	0.000	0.002	0.000
0.2111	0.001	0.000	0.003	0.000
0.2639	0.001	0.000	0.003	0.000
0.3167	0.001	0.000	0.003	0.000
0.3694	0.001	0.000	0.004	0.000
0.4222	0.001	0.000	0.004	0.000
0.4750	0.001	0.000	0.004	0.000
0.5278	0.002	0.000	0.004	0.000
0.5806	0.002	0.000	0.005	0.000
0.6333	0.002	0.000	0.005	0.000
0.6861	0.002	0.001	0.005	0.000
0.7389	0.002	0.001	0.005	0.000
0.7917	0.002	0.001	0.006	0.000
0.8444	0.002	0.001	0.006	0.000
0.8972	0.002	0.001	0.006	0.000
0.9500	0.002	0.001	0.006	0.000
1.0028	0.002	0.001	0.006	0.000
1.0556	0.002	0.002	0.007	0.000
1.1083	0.002	0.002	0.007	0.000
1.1611	0.002	0.002	0.007	0.000
1.2139	0.002	0.002	0.007	0.000
1.2667	0.002	0.002	0.007	0.000
1.3194	0.002	0.002	0.007	0.000
1.3722	0.002	0.002	0.007	0.000
1.4250	0.002	0.003	0.008	0.000
1.4778	0.002	0.003	0.008	0.000
1.5306	0.003	0.003	0.008	0.000
1.5833	0.003	0.003	0.008	0.000
1.6361	0.003	0.003	0.008	0.000
1.6889	0.003	0.003	0.008	0.000
1.7417	0.003	0.003	0.009	0.000
1.7944	0.003	0.004	0.009	0.000

1.8472	0.003	0.004	0.009	0.000
1.9000	0.003	0.004	0.009	0.000
1.9528	0.003	0.004	0.009	0.000
2.0056	0.003	0.004	0.009	0.000
2.0583	0.003	0.004	0.009	0.000
2.1111	0.003	0.005	0.009	0.000
2.1639	0.003	0.005	0.010	0.000
2.2167	0.003	0.005	0.010	0.000
2.2694	0.003	0.005	0.010	0.000
2.3222	0.003	0.005	0.010	0.000
2.3750	0.003	0.005	0.010	0.000
2.4278	0.003	0.006	0.010	0.000
2.4806	0.003	0.006	0.010	0.000
2.5333	0.003	0.006	0.010	0.000
2.5861	0.003	0.006	0.010	0.000
2.6389	0.003	0.006	0.011	0.000
2.6917	0.003	0.006	0.011	0.000
2.7444	0.003	0.007	0.011	0.000
2.7972	0.003	0.007	0.011	0.000
2.8500	0.003	0.007	0.011	0.000
2.9028	0.003	0.007	0.011	0.000
2.9556	0.003	0.007	0.011	0.000
3.0083	0.003	0.007	0.011	0.000
3.0611	0.003	0.008	0.011	0.000
3.1139	0.003	0.008	0.012	0.000
3.1667	0.003	0.008	0.012	0.000
3.2194	0.003	0.008	0.012	0.000
3.2722	0.002	0.008	0.012	0.000
3.3250	0.002	0.008	0.012	0.000
3.3778	0.002	0.009	0.012	0.000
3.4306	0.002	0.009	0.012	0.000
3.4833	0.002	0.009	0.012	0.000
3.5361	0.002	0.009	0.021	0.000
3.5889	0.002	0.009	0.026	0.000
3.6417	0.002	0.009	0.030	0.000
3.6944	0.002	0.009	0.033	0.000
3.7472	0.002	0.010	0.035	0.000
3.8000	0.002	0.010	0.038	0.000
3.8528	0.002	0.010	0.040	0.000
3.9056	0.002	0.010	0.042	0.000
3.9583	0.002	0.010	0.044	0.000
4.0111	0.002	0.010	0.058	0.000
4.0639	0.002	0.010	0.219	0.000
4.1167	0.002	0.010	0.468	0.000
4.1694	0.002	0.011	0.771	0.000
4.2222	0.002	0.011	1.098	0.000
4.2750	0.001	0.011	1.421	0.000
4.3278	0.001	0.011	1.711	0.000
4.3806	0.001	0.011	1.947	0.000
4.4333	0.001	0.011	2.118	0.000
4.4861	0.001	0.011	2.237	0.000
4.5389	0.001	0.011	2.373	0.000
4.5917	0.001	0.011	2.485	0.000
4.6444	0.000	0.011	2.592	0.000
4.6972	0.000	0.011	2.694	0.000
4.7500	0.000	0.011	2.793	0.000
4.8028	0.000	0.000	2.889	0.000

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.125
 Total Impervious Area: 0.002

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.089
 Total Impervious Area: 0.038

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.00651
5 year	0.011416
10 year	0.014822
25 year	0.019127
50 year	0.022273
100 year	0.025337

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.009011
5 year	0.011594
10 year	0.013337
25 year	0.015586
50 year	0.017298
100 year	0.019044

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.006	0.011
1950	0.015	0.012
1951	0.016	0.011
1952	0.005	0.007
1953	0.003	0.006
1954	0.008	0.007
1955	0.011	0.009
1956	0.010	0.008
1957	0.005	0.010
1958	0.006	0.008

1959	0.006	0.007
1960	0.010	0.011
1961	0.009	0.008
1962	0.001	0.006
1963	0.006	0.008
1964	0.008	0.008
1965	0.012	0.009
1966	0.004	0.007
1967	0.015	0.012
1968	0.004	0.009
1969	0.009	0.008
1970	0.004	0.008
1971	0.006	0.009
1972	0.014	0.011
1973	0.006	0.007
1974	0.006	0.008
1975	0.008	0.011
1976	0.008	0.008
1977	0.003	0.006
1978	0.002	0.009
1979	0.004	0.007
1980	0.005	0.012
1981	0.003	0.009
1982	0.008	0.014
1983	0.005	0.008
1984	0.008	0.007
1985	0.002	0.008
1986	0.004	0.011
1987	0.008	0.011
1988	0.001	0.006
1989	0.003	0.006
1990	0.013	0.018
1991	0.017	0.015
1992	0.003	0.008
1993	0.002	0.006
1994	0.001	0.005
1995	0.007	0.008
1996	0.017	0.013
1997	0.012	0.012
1998	0.006	0.008
1999	0.011	0.013
2000	0.009	0.009
2001	0.001	0.006
2002	0.006	0.012
2003	0.006	0.009
2004	0.005	0.015
2005	0.008	0.010
2006	0.010	0.009
2007	0.026	0.016
2008	0.019	0.018
2009	0.013	0.012

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0259	0.0183
2	0.0195	0.0178
3	0.0171	0.0160

4	0.0166	0.0151
5	0.0155	0.0148
6	0.0154	0.0141
7	0.0150	0.0134
8	0.0144	0.0129
9	0.0134	0.0121
10	0.0127	0.0121
11	0.0119	0.0120
12	0.0117	0.0116
13	0.0113	0.0116
14	0.0110	0.0115
15	0.0105	0.0115
16	0.0102	0.0113
17	0.0101	0.0112
18	0.0088	0.0110
19	0.0086	0.0109
20	0.0085	0.0109
21	0.0084	0.0108
22	0.0083	0.0103
23	0.0081	0.0101
24	0.0081	0.0095
25	0.0079	0.0089
26	0.0078	0.0089
27	0.0078	0.0088
28	0.0077	0.0087
29	0.0068	0.0087
30	0.0063	0.0087
31	0.0062	0.0087
32	0.0062	0.0087
33	0.0062	0.0085
34	0.0060	0.0084
35	0.0057	0.0084
36	0.0057	0.0083
37	0.0056	0.0083
38	0.0056	0.0083
39	0.0055	0.0083
40	0.0054	0.0080
41	0.0054	0.0080
42	0.0051	0.0080
43	0.0051	0.0079
44	0.0045	0.0078
45	0.0044	0.0076
46	0.0044	0.0076
47	0.0041	0.0073
48	0.0037	0.0071
49	0.0036	0.0071
50	0.0032	0.0070
51	0.0030	0.0068
52	0.0028	0.0067
53	0.0027	0.0067
54	0.0027	0.0065
55	0.0024	0.0064
56	0.0021	0.0063
57	0.0016	0.0063
58	0.0015	0.0062
59	0.0015	0.0059
60	0.0011	0.0058
61	0.0009	0.0053

Duration Flows

The Duration Matching **Failed**

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0033	2994	40489	1352	Fail
0.0034	2614	35334	1351	Fail
0.0036	2336	30650	1312	Fail
0.0038	2078	26522	1276	Fail
0.0040	1850	23100	1248	Fail
0.0042	1665	20061	1204	Fail
0.0044	1494	17473	1169	Fail
0.0046	1359	15139	1113	Fail
0.0048	1230	13182	1071	Fail
0.0050	1128	11520	1021	Fail
0.0052	1033	10057	973	Fail
0.0054	939	8868	944	Fail
0.0056	857	7803	910	Fail
0.0058	775	6906	891	Fail
0.0059	718	6128	853	Fail
0.0061	665	5512	828	Fail
0.0063	595	4894	822	Fail
0.0065	549	4378	797	Fail
0.0067	497	3957	796	Fail
0.0069	459	3540	771	Fail
0.0071	425	3151	741	Fail
0.0073	388	2806	723	Fail
0.0075	360	2498	693	Fail
0.0077	342	2248	657	Fail
0.0079	316	2027	641	Fail
0.0081	289	1837	635	Fail
0.0082	273	1674	613	Fail
0.0084	255	1488	583	Fail
0.0086	234	1329	567	Fail
0.0088	220	1190	540	Fail
0.0090	196	1059	540	Fail
0.0092	178	923	518	Fail
0.0094	167	821	491	Fail
0.0096	156	709	454	Fail
0.0098	144	611	424	Fail
0.0100	134	540	402	Fail
0.0102	124	470	379	Fail
0.0104	118	417	353	Fail
0.0106	107	369	344	Fail
0.0107	96	320	333	Fail
0.0109	91	287	315	Fail
0.0111	82	253	308	Fail
0.0113	72	225	312	Fail
0.0115	67	207	308	Fail
0.0117	60	183	305	Fail
0.0119	52	166	319	Fail
0.0121	44	147	334	Fail
0.0123	42	133	316	Fail
0.0125	40	118	295	Fail
0.0127	38	108	284	Fail
0.0129	37	97	262	Fail
0.0131	33	85	257	Fail
0.0132	31	75	241	Fail
0.0134	29	65	224	Fail

0.0136	26	52	200	Fail
0.0138	24	42	175	Fail
0.0140	21	32	152	Fail
0.0142	17	21	123	Fail
0.0144	14	17	121	Fail
0.0146	14	15	107	Pass
0.0148	13	14	107	Pass
0.0150	13	13	100	Pass
0.0152	11	10	90	Pass
0.0154	10	9	90	Pass
0.0155	8	8	100	Pass
0.0157	8	6	75	Pass
0.0159	8	6	75	Pass
0.0161	7	3	42	Pass
0.0163	7	3	42	Pass
0.0165	6	3	50	Pass
0.0167	5	3	60	Pass
0.0169	5	3	60	Pass
0.0171	4	2	50	Pass
0.0173	4	2	50	Pass
0.0175	4	2	50	Pass
0.0177	4	2	50	Pass
0.0179	4	1	25	Pass
0.0180	4	1	25	Pass
0.0182	3	1	33	Pass
0.0184	3	0	0	Pass
0.0186	3	0	0	Pass
0.0188	3	0	0	Pass
0.0190	3	0	0	Pass
0.0192	3	0	0	Pass
0.0194	3	0	0	Pass
0.0196	2	0	0	Pass
0.0198	2	0	0	Pass
0.0200	2	0	0	Pass
0.0202	2	0	0	Pass
0.0204	2	0	0	Pass
0.0205	2	0	0	Pass
0.0207	2	0	0	Pass
0.0209	2	0	0	Pass
0.0211	2	0	0	Pass
0.0213	2	0	0	Pass
0.0215	2	0	0	Pass
0.0217	2	0	0	Pass
0.0219	2	0	0	Pass
0.0221	2	0	0	Pass
0.0223	2	0	0	Pass

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.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

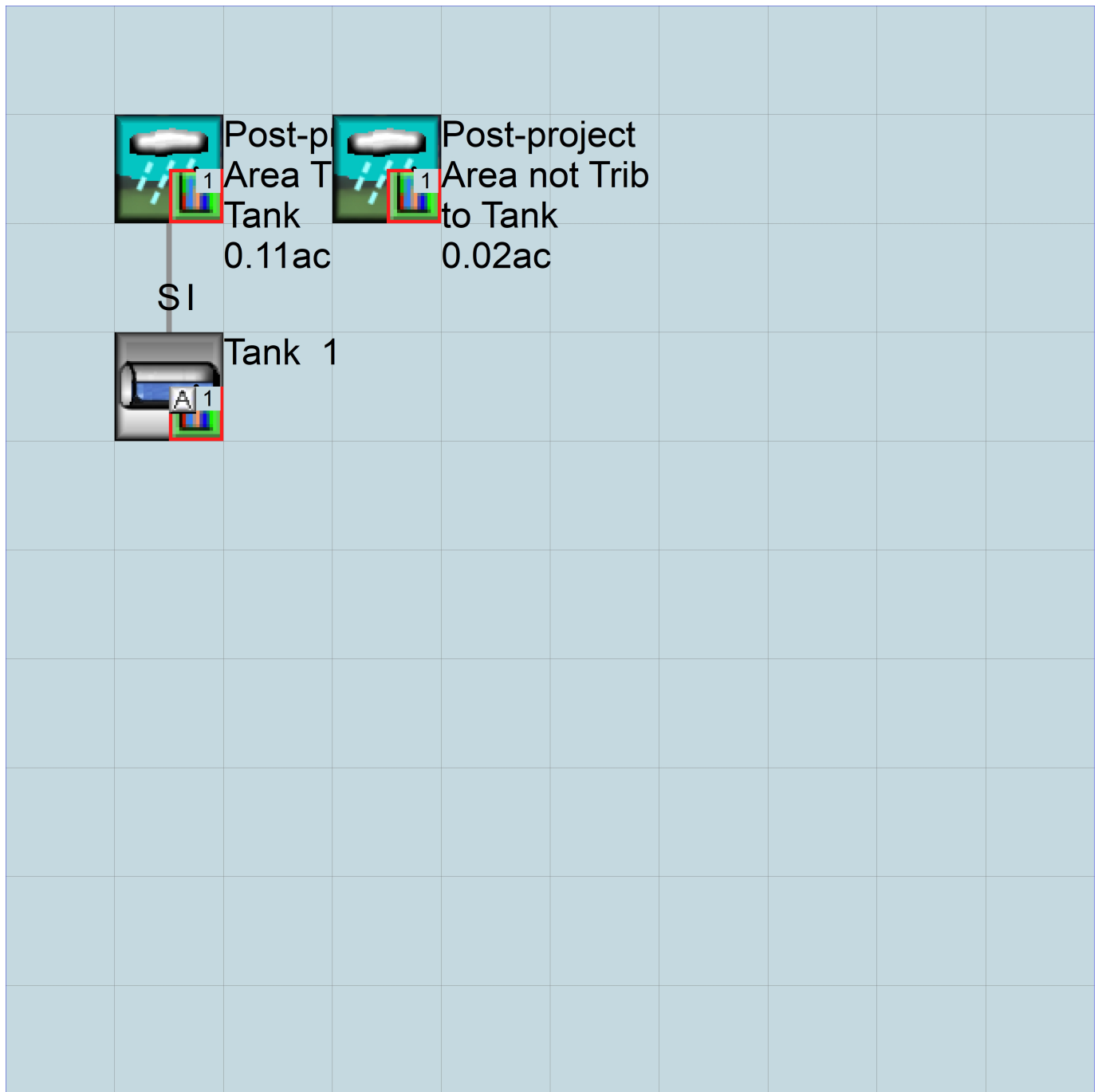
No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Pre-project
Area
0.13ac

Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

RUN

GLOBAL

WVHM4 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	18039 Wetland Model.wdm	
MESSU	25	Mit18039 Wetland Model.MES	
	27	Mit18039 Wetland Model.L61	
	28	Mit18039 Wetland Model.L62	
	30	POC18039 Wetland Model1.dat	

END FILES

OPN SEQUENCE

INGRP INDELT 00:15
PERLND 17
IMPLND 2
RCHRES 1
COPY 1
COPY 501
COPY 601
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
601 1 1
END TIMESERIES

END COPY

GENER

OPCODE
OPCD ***
END OPCODE
PARM
K ***
END PARM

END GENER

PERLND

GEN-INFO
<PLS ><-----Name----->NBLKS Unit-systems Printer ***
- # User t-series Engl Metr ***
in out ***
17 C, Lawn, Mod 1 1 1 1 27 0
END GEN-INFO
*** Section PWATER***

ACTIVITY

<PLS > ***** Active Sections *****
- # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
17 0 0 1 0 0 0 0 0 0 0 0 0 0

END ACTIVITY

PRINT-INFO

```

<PLS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW PWAT  SED  PST  PWG  PQAL MSTL PEST NITR PHOS TRAC  *****
17  0  0  4  0  0  0  0  0  0  0  0  0  0  1  9
END PRINT-INFO

```

```

PWAT-PARM1
<PLS > PWATER variable monthly parameter value flags ***
# - # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
17  0  0  0  0  0  0  0  0  0  0  0
END PWAT-PARM1

```

```

PWAT-PARM2
<PLS > PWATER input info: Part 2 *****
# - # ***FOREST  LZSN  INFILT  LRSUR  SLSUR  KVARY  AGWRC
17  0  4.5  0.03  400  0.1  0.5  0.996
END PWAT-PARM2

```

```

PWAT-PARM3
<PLS > PWATER input info: Part 3 *****
# - # ***PETMAX  PETMIN  INFEXP  INFILD  DEEPFR  BASETP  AGWETP
17  0  0  2  2  0  0
END PWAT-PARM3

```

```

PWAT-PARM4
<PLS > PWATER input info: Part 4 *****
# - # CEPSC  UZSN  NSUR  INTFW  IRC  LZETP ***
17  0.1  0.25  0.25  6  0.5  0.25
END PWAT-PARM4

```

```

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS  SURS  UZS  IFWS  LZS  AGWS  GWVS
17  0  0  0  0  2.5  1  0
END PWAT-STATE1

```

END PERLND

IMPLND

```

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

```

```

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

```

```

PRINT-INFO
<ILS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW IWAT  SLD  IWG IQAL  *****
2  0  0  4  0  0  4  1  9
END PRINT-INFO

```

```

IWAT-PARM1
<PLS > IWATER variable monthly parameter value flags ***
# - # CSNO RTOP VRS  VNN RTLI  ***
2  0  0  0  0  0
END IWAT-PARM1

```

```

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

```

```

IWAT-PARM3
<PLS >          IWATER input info: Part 3          ***
# - # ***PETMAX    PETMIN
2   0             0
END IWAT-PARM3

```

```

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

```

END IMPLND

```

SCHEMATIC
<-Source->          <--Area-->          <-Target->      MBLK      ***
<Name> #           <-factor->          <Name> #      Tbl#      ***
Post-project Area Trib to Tank***
PERLND 17           0.071             RCHRES 1       2
PERLND 17           0.071             RCHRES 1       3
IMPLND 2            0.035             RCHRES 1       5
Post-project Area Trib to Tank***
PERLND 17           0.071             COPY 501      14
PERLND 17           0.071             COPY 601      14
Post-project Area not Trib to Tank***
PERLND 17           0.018             COPY 501      12
PERLND 17           0.018             COPY 601      12
PERLND 17           0.018             COPY 501      13
PERLND 17           0.018             COPY 601      13
PERLND 17           0.018             COPY 501      14
PERLND 17           0.018             COPY 601      14
IMPLND 2            0.003             COPY 501      15
IMPLND 2            0.003             COPY 601      15

```

```

*****Routing*****
PERLND 17           0.071             COPY 1        12
IMPLND 2            0.035             COPY 1        15
PERLND 17           0.071             COPY 1        13
RCHRES 1            1             COPY 501      16
END SCHEMATIC

```

```

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> #      <Name> # #<-factor->strg <Name> # #      <Name> # #      ***
COPY 501 OUTPUT MEAN 1 1 48.4 DISPLY 1 INPUT TIMSER 1

```

```

<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> #      <Name> # #<-factor->strg <Name> # #      <Name> # #      ***
END NETWORK

```

```

RCHRES
GEN-INFO
RCHRES          Name          Nexits      Unit Systems      Printer          ***
# - #<-----><----> User T-series  Engr 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 NUGF 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 *****

```


2.005556	0.003139	0.004757	0.009608
2.058333	0.003149	0.004923	0.009733
2.111111	0.003158	0.005090	0.009857
2.163889	0.003165	0.005257	0.009980
2.216667	0.003170	0.005424	0.010101
2.269444	0.003174	0.005591	0.010220
2.322222	0.003176	0.005759	0.010338
2.375000	0.003177	0.005927	0.010455
2.427778	0.003176	0.006094	0.010571
2.480556	0.003174	0.006262	0.010685
2.533333	0.003170	0.006429	0.010798
2.586111	0.003165	0.006596	0.010910
2.638889	0.003158	0.006763	0.011021
2.691667	0.003149	0.006930	0.011130
2.744444	0.003139	0.007096	0.011239
2.797222	0.003127	0.007261	0.011347
2.850000	0.003113	0.007426	0.011453
2.902778	0.003098	0.007590	0.011559
2.955556	0.003081	0.007753	0.011663
3.008333	0.003062	0.007915	0.011767
3.061111	0.003042	0.008076	0.011870
3.113889	0.003020	0.008236	0.011972
3.166667	0.002996	0.008394	0.012073
3.219444	0.002970	0.008552	0.012173
3.272222	0.002942	0.008708	0.012272
3.325000	0.002912	0.008862	0.012371
3.377778	0.002880	0.009015	0.012469
3.430556	0.002846	0.009166	0.012566
3.483333	0.002810	0.009316	0.012662
3.536111	0.002772	0.009463	0.012759
3.588889	0.002731	0.009608	0.012855
3.641667	0.002688	0.009751	0.012951
3.694444	0.002642	0.009892	0.013047
3.747222	0.002593	0.010030	0.013143
3.800000	0.002542	0.010165	0.013239
3.852778	0.002487	0.010298	0.013335
3.905556	0.002429	0.010428	0.013431
3.958333	0.002368	0.010555	0.013527
4.011111	0.002303	0.010678	0.013623
4.063889	0.002234	0.010798	0.013719
4.116667	0.002160	0.010914	0.013815
4.169444	0.002081	0.011026	0.013911
4.222222	0.001997	0.011133	0.014007
4.275000	0.001906	0.011236	0.014103
4.327778	0.001808	0.011334	0.014199
4.380556	0.001702	0.011427	0.014295
4.433333	0.001585	0.011514	0.014391
4.486111	0.001456	0.011594	0.014487
4.538889	0.001310	0.011667	0.014583
4.591667	0.001141	0.011732	0.014679
4.644444	0.000937	0.011787	0.014775
4.697222	0.000666	0.011830	0.014871
4.750000	0.001000	0.011853	0.014967

END FTABLE 1

END FTABLES

EXT SOURCES

<-Volume->	<Member>	SsysSgap<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	tem strg<-factor->	strg	<Name>	# #
WDM	2	PREC	ENGL	1	PERLND	1 999 EXTNL	PREC
WDM	2	PREC	ENGL	1	IMPLND	1 999 EXTNL	PREC
WDM	1	EVAP	ENGL	0.76	PERLND	1 999 EXTNL	PETINP
WDM	1	EVAP	ENGL	0.76	IMPLND	1 999 EXTNL	PETINP

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***
<Name>	#	<Name>	#	#<-factor->	strg	<Name>	#	<Name>	tem strg	strg***
COPY	1	OUTPUT	MEAN	1 1	48.4	WDM	701	FLOW	ENGL	REPL

COPY	501	OUTPUT	MEAN	1	1	48.4	WDM	801	FLOW	ENGL	REPL
COPY	601	OUTPUT	MEAN	1	1	48.4	WDM	901	FLOW	ENGL	REPL
RCHRES	1	HYDR	RO	1	1	1	WDM	1004	FLOW	ENGL	REPL
RCHRES	1	HYDR	STAGE	1	1	1	WDM	1005	STAG	ENGL	REPL

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member->	<--Mult-->	<Target>	<-Grp>	<-Member->***
<Name>		<Name> #	#<-factor-->	<Name>		<Name> # #***
MASS-LINK		2				
PERLND	PWATER	SURO	0.083333	RCHRES	INFLOW	IVOL
END MASS-LINK		2				
MASS-LINK		3				
PERLND	PWATER	IFWO	0.083333	RCHRES	INFLOW	IVOL
END MASS-LINK		3				
MASS-LINK		5				
IMPLND	IWATER	SURO	0.083333	RCHRES	INFLOW	IVOL
END MASS-LINK		5				
MASS-LINK		12				
PERLND	PWATER	SURO	0.083333	COPY	INPUT	MEAN
END MASS-LINK		12				
MASS-LINK		13				
PERLND	PWATER	IFWO	0.083333	COPY	INPUT	MEAN
END MASS-LINK		13				
MASS-LINK		14				
PERLND	PWATER	AGWO	0.083333	COPY	INPUT	MEAN
END MASS-LINK		14				
MASS-LINK		15				
IMPLND	IWATER	SURO	0.083333	COPY	INPUT	MEAN
END MASS-LINK		15				
MASS-LINK		16				
RCHRES	ROFLOW			COPY	INPUT	MEAN
END MASS-LINK		16				

END MASS-LINK

END RUN

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2025; All Rights Reserved.

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

www.clearcreeksolutions.com