

# LEVEL 1 DOWNSTREAM ANALYSIS

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## 8814 MI Single-Family Residence

8814 SE 40<sup>th</sup> Street

Mercer Island, WA 98040

Prepared For:

## Luxwest Development LLC

PO Box 2624

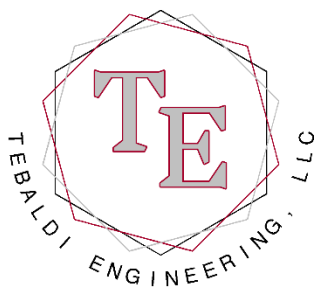
Issaquah, WA 98027

Date: December 9, 2022



12/9/2022

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4625 – 126<sup>th</sup> Avenue East, Edgewood, WA 98372

(206) 450-5096

[www.tebaldiengineering.com](http://www.tebaldiengineering.com)

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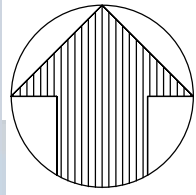
## **1.0 STUDY AREA DEFINITION AND MAPS**

The proposed project site is located within a portion of the Section 7, Township 24 North, Range 5 East of the Willamette Meridian with a total project site area of 0.30 acres. More specifically, the site is located at 8814 SE 40<sup>th</sup> Street, Mercer Island, WA 98040. See Figure 1.1-Vicinity Map in this section for the location of the proposed project site. The existing property currently has an existing home along with the associated driveway and utilities. On-site native soils are classified as Arents-Alderwood per the NRCS soil survey. See soils map in section 2.0.

The site is abutted by single-family development to the north, east and west and SE 40<sup>th</sup> Street to the south. The existing site contains about 13,112 square feet of existing house, driveway and landscaping. The site generally slopes from east to west with slopes ranging from 0 to 20 percent.

### **UPSTREAM DRAINAGE ANALYSIS**

Based on review of the agency GIS maps, topographic survey and observations there are no upstream flows tributary to the project site.

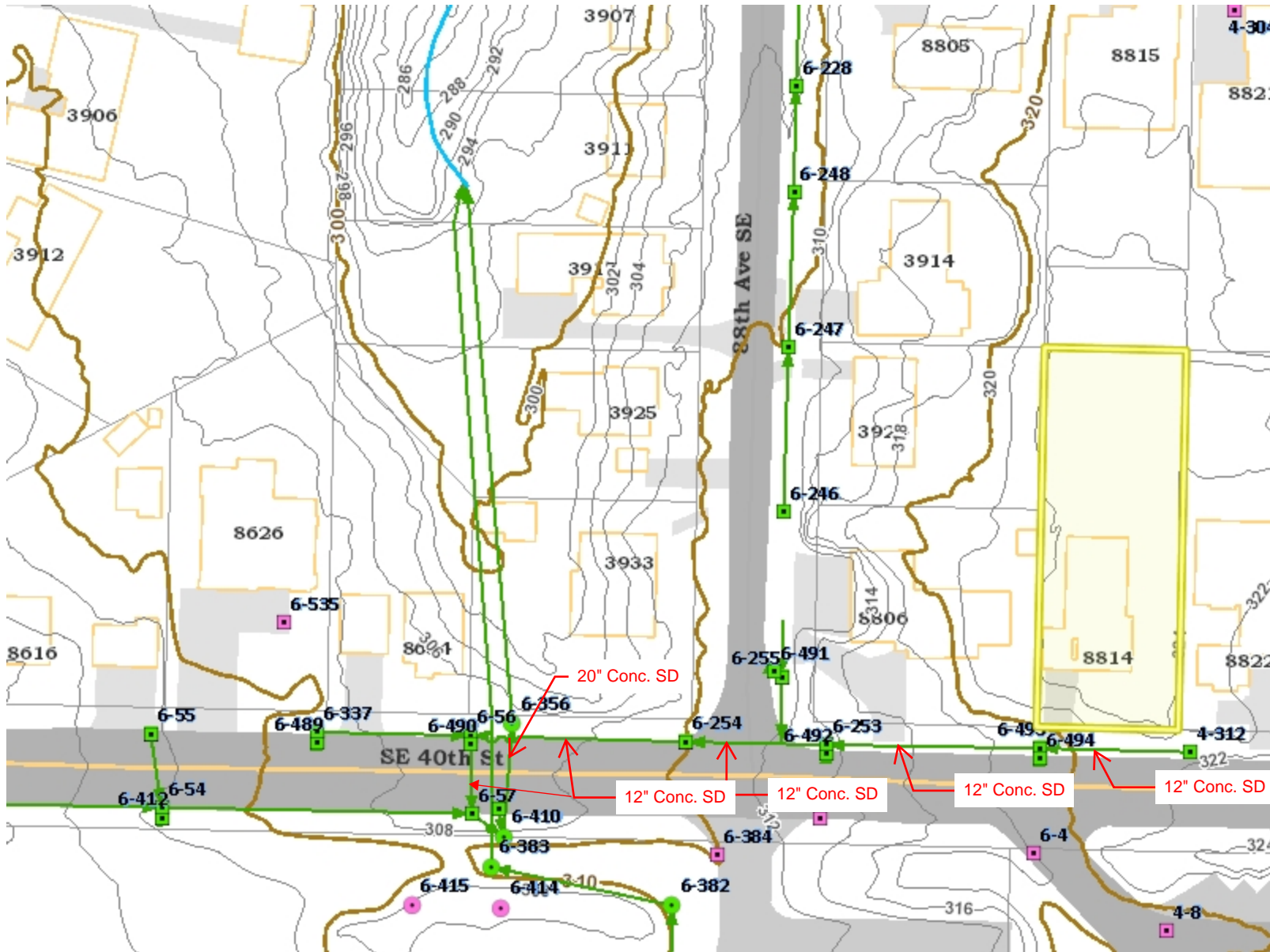


**NORTH**

**← SITE**

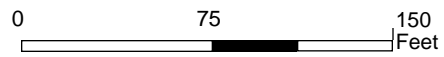
<b>TEBALDI ENGINEERING, LLC</b> <b>4625 - 126TH AVENUE EAST</b> <b>EDGEWOOD, WA 98372</b>	<b>FOR:</b> <b>40TH RESIDENCE</b>	<b>JOB #</b> 
	<b>TITLE:</b> <b>VICINITY MAP</b>	

# Downstream Drainage Map



### Legend

- Storm Catch Basin**
  - CB, City Owned
  - CB, Private
  - CB, Unknown
  - Type 2, City Owned
  - Type 2, Private
  - Type 2, Unknown
- Storm Main**
  - Pipe
  - Open Watercourse
  - Piped Watercourse
  - Ditch
  - Culvert
  - Other
- Storm Main - Private
- Storm Discharge Point
- 10ft Lidar Contours (2016)
- 2ft Lidar Contours (2016)
- Address
- Building
- Property Line
- Docks
- Freeway
- Major Street
- Street
- Paved Driveway
- Paved Road
- Paved Parking Area
- Parks
- Lake Washington



1 inch = 149.820484833333 feet



Disclaimer: These maps were developed by the City of Mercer Island and are intended to be a general purpose digital reference tool. These maps are not an accepted legal instrument for describing, establishing, recording or maintaining descriptions for property concerns or boundaries. The City makes no representation or warranty with respect to the accuracy or currency of these data sets, especially in regard to labeling of surveyed dimensions, or agreement with official sources such as records of survey, or mapped locations of features.

**Notes**

# National Flood Hazard Layer FIRMMette

























122°13'36"W 47°34'41"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

<b>SPECIAL FLOOD HAZARD AREAS</b>		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i> Regulatory Floodway
<b>OTHER AREAS OF FLOOD HAZARD</b>		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
<b>OTHER AREAS</b>		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
<b>GENERAL STRUCTURES</b>		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
<b>OTHER FEATURES</b>		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
<b>MAP PANELS</b>		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
<b>MAP PANELS</b>		Digital Data Available
		No Digital Data Available
		Unmapped
	The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.	

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/9/2022 at 8:24 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



122°12'58"W 47°34'17"N

## **2.0 RESOURCE REVIEW**

**Available Basin Plan:** No basin plan was identified during the preparation of this report.

**Finalized Drainage Studies:** No other finalized drainage studies were identified during the preparation of this report.

**FEMA Maps:** The site has been identified in Zone X

**Wetland Inventory Maps:** There are no wetlands on or near the project site.

**Critical Area Maps:** There are no other critical areas on or near the project site.

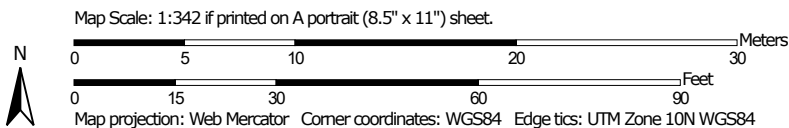
**United States Department of Agriculture King County Soils Survey:** On-site soils consist of Arents-Alderwood type soils.

**Migrating River Studies:** There are no rivers on or near the project site.

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 18, Sep 8, 2022

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

Date(s) aerial images were photographed: Jul 6, 2020—Jul 20, 2020

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
AmC	Arents, Alderwood material, 6 to 15 percent slopes	0.3	100.0%
<b>Totals for Area of Interest</b>		<b>0.3</b>	<b>100.0%</b>

### **3.0 FIELD INSPECTION**

Based on observations, no problems were identified during resource review. In review of the downstream stormwater system, it appears that adequate capacity is in place with the existing development. The existing condition consists of 3,238 SF of impervious surface.

Based on field reconnaissance performed on November 6, 2022, no downstream flooding issues were identified. The proposed project will not have an adverse impact on the downstream system.

See Offsite Drainage System Table in this section.



#### **4.0 DRAINAGE SYSTEM DESCRIPTION AND PROBLEMS DESCRIPTION**

The downstream drainage path consists of discharge from the subject property into the existing storm drainage on S. 40th Street. Runoff flows west for several hundred feet before discharging into a natural conveyance flowing north for approximately 1/2 mile. Runoff continues north in a catch basin and pipe system until discharging into Lake Washington..

No problems have been identified through the Level 1 Downstream Analysis.

## **5.0 MITIGATION OF EXISTING OR POTENTIAL PROBLEMS**

The proposed development does not exhibit any potential problems. The existing condition consists of 3,238 SF of impervious surface and the proposed condition consists of 4,957 SF of impervious surface. This increase in impervious results in approximately 0.03 CFS increase of runoff to the downstream system (see enclosed WWHM calculations). Conveyance calculations were run for a 12-inch concrete pipe at 1% (ex. road slope is almost 5%) showing that it can convey 3.57 CFS. Considering only 3 SFRs and about 500 feet of road contribute to the existing drainage system, the downstream system would not be compromised by an increase of 0.03 CFS of runoff. See calculations/maps at end of report.

As a result, this project will not aggravate or create any new problems based on the above information.

### Pipe Conveyance Capacity

Capacity of 12-inch pipe at 1.0%

Flow (cfs)	$Q=VA$	3.572395
Velocity (fps)	$V=(k/n)(A/P)^{2/3}S^{1/2}$	4.548515
	k=	1.49
Manning's n	n=	0.013
X-Sec Area (sf)	$A=\pi r^2$	0.785398
Pipe Radius (ft)	r=	0.5
Wetted Perim.	$P=2\pi r$	3.141593
Slope (ft/ft)	S=slope	0.01

**WWHM2012**  
**PROJECT REPORT**



## General Model Information

TRUST Project Name: v  
Site Name: Veresko  
Site Address:  
City:  
Report Date: 11/8/2022  
Gage: Seatac  
Data Start: 1948/10/01  
Data End: 2009/09/30  
Timestep: 15 Minute  
Precip Scale: 1.000  
Version Date: 2022/07/07  
Version: 4.2.18

## POC Thresholds

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

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## *Landuse Basin Data*

### *Predeveloped Land Use*

#### Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROOF TOPS FLAT	0.074
Impervious Total	0.074
Basin Total	0.074

## *Mitigated Land Use*

### Basin 1

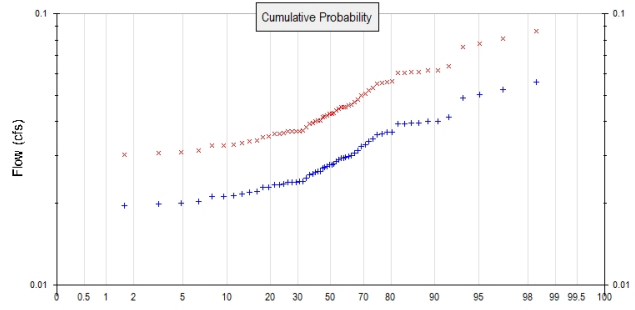
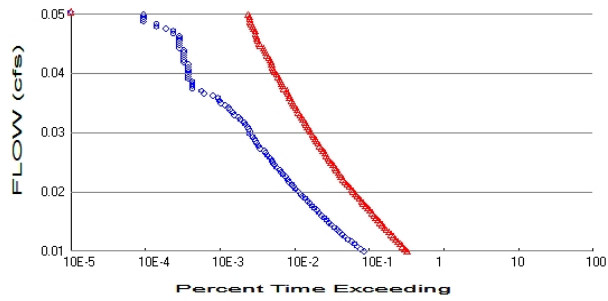
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROOF TOPS FLAT	0.114
Impervious Total	0.114
Basin Total	0.114

*Routing Elements*  
*Predeveloped Routing*

## *Mitigated Routing*

# Analysis Results

## POC 1



+ Predeveloped    x Mitigated

### Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0  
 Total Impervious Area: 0.074

### Mitigated Landuse Totals for POC #1

Total Pervious Area: 0  
 Total Impervious Area: 0.114

Flow Frequency Method: Log Pearson Type III 17B

### Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.028214
5 year	0.035637
10 year	0.040681
25 year	0.047223
50 year	0.052231
100 year	0.05736

### Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.043464
5 year	0.0549
10 year	0.06267
25 year	0.072749
50 year	0.080463
100 year	0.088365

## Annual Peaks

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

Year	Predeveloped	Mitigated
1949	0.037	0.056
1950	0.039	0.061
1951	0.023	0.035
1952	0.020	0.031
1953	0.022	0.034
1954	0.023	0.035
1955	0.026	0.040
1956	0.026	0.039
1957	0.029	0.045
1958	0.023	0.036

1959	0.024	0.037
1960	0.023	0.036
1961	0.025	0.038
1962	0.022	0.033
1963	0.024	0.037
1964	0.024	0.036
1965	0.030	0.046
1966	0.020	0.031
1967	0.034	0.053
1968	0.039	0.060
1969	0.027	0.042
1970	0.026	0.040
1971	0.031	0.048
1972	0.032	0.050
1973	0.020	0.030
1974	0.029	0.044
1975	0.033	0.051
1976	0.022	0.034
1977	0.024	0.037
1978	0.029	0.045
1979	0.040	0.062
1980	0.036	0.056
1981	0.029	0.045
1982	0.042	0.064
1983	0.034	0.052
1984	0.021	0.033
1985	0.029	0.045
1986	0.025	0.039
1987	0.039	0.061
1988	0.024	0.037
1989	0.030	0.046
1990	0.050	0.077
1991	0.040	0.062
1992	0.021	0.033
1993	0.018	0.028
1994	0.020	0.031
1995	0.026	0.040
1996	0.028	0.043
1997	0.027	0.042
1998	0.027	0.042
1999	0.056	0.086
2000	0.028	0.043
2001	0.031	0.047
2002	0.036	0.055
2003	0.028	0.043
2004	0.052	0.081
2005	0.024	0.037
2006	0.021	0.033
2007	0.049	0.075
2008	0.039	0.061
2009	0.036	0.056

### Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0560	0.0863
2	0.0524	0.0808
3	0.0503	0.0775

4	0.0490	0.0755
5	0.0416	0.0640
6	0.0402	0.0619
7	0.0402	0.0619
8	0.0395	0.0608
9	0.0395	0.0608
10	0.0393	0.0606
11	0.0392	0.0604
12	0.0365	0.0563
13	0.0365	0.0562
14	0.0360	0.0555
15	0.0357	0.0551
16	0.0345	0.0531
17	0.0338	0.0521
18	0.0329	0.0508
19	0.0324	0.0499
20	0.0313	0.0483
21	0.0306	0.0472
22	0.0299	0.0461
23	0.0298	0.0460
24	0.0295	0.0454
25	0.0294	0.0453
26	0.0293	0.0452
27	0.0290	0.0447
28	0.0286	0.0441
29	0.0279	0.0430
30	0.0278	0.0429
31	0.0278	0.0428
32	0.0274	0.0422
33	0.0272	0.0420
34	0.0270	0.0416
35	0.0263	0.0405
36	0.0261	0.0403
37	0.0260	0.0401
38	0.0256	0.0394
39	0.0255	0.0393
40	0.0248	0.0382
41	0.0240	0.0370
42	0.0240	0.0370
43	0.0240	0.0369
44	0.0239	0.0368
45	0.0239	0.0368
46	0.0235	0.0363
47	0.0235	0.0361
48	0.0234	0.0361
49	0.0229	0.0353
50	0.0228	0.0352
51	0.0222	0.0341
52	0.0219	0.0338
53	0.0216	0.0333
54	0.0213	0.0329
55	0.0212	0.0326
56	0.0211	0.0326
57	0.0203	0.0313
58	0.0200	0.0308
59	0.0199	0.0307
60	0.0196	0.0302
61	0.0183	0.0282





## Duration Flows

The Duration Matching **Failed**

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0141	1805	6876	380	Fail
0.0145	1636	6367	389	Fail
0.0149	1475	5942	402	Fail
0.0153	1343	5540	412	Fail
0.0156	1228	5140	418	Fail
0.0160	1102	4776	433	Fail
0.0164	1003	4451	443	Fail
0.0168	920	4147	450	Fail
0.0172	854	3874	453	Fail
0.0176	790	3595	455	Fail
0.0180	726	3382	465	Fail
0.0183	665	3189	479	Fail
0.0187	611	2997	490	Fail
0.0191	571	2789	488	Fail
0.0195	533	2607	489	Fail
0.0199	488	2462	504	Fail
0.0203	451	2321	514	Fail
0.0207	420	2169	516	Fail
0.0210	389	2033	522	Fail
0.0214	364	1902	522	Fail
0.0218	339	1781	525	Fail
0.0222	316	1686	533	Fail
0.0226	296	1567	529	Fail
0.0230	271	1456	537	Fail
0.0233	256	1378	538	Fail
0.0237	238	1297	544	Fail
0.0241	221	1225	554	Fail
0.0245	206	1144	555	Fail
0.0249	196	1066	543	Fail
0.0253	181	1005	555	Fail
0.0257	171	956	559	Fail
0.0260	161	896	556	Fail
0.0264	148	856	578	Fail
0.0268	139	818	588	Fail
0.0272	135	768	568	Fail
0.0276	122	733	600	Fail
0.0280	113	698	617	Fail
0.0284	108	657	608	Fail
0.0287	105	617	587	Fail
0.0291	100	595	595	Fail
0.0295	92	564	613	Fail
0.0299	87	544	625	Fail
0.0303	84	514	611	Fail
0.0307	73	486	665	Fail
0.0311	71	457	643	Fail
0.0314	65	435	669	Fail
0.0318	63	419	665	Fail
0.0322	62	401	646	Fail
0.0326	58	381	656	Fail
0.0330	54	366	677	Fail
0.0334	54	348	644	Fail
0.0337	52	331	636	Fail
0.0341	50	317	634	Fail
0.0345	46	302	656	Fail

0.0349	45	289	642	Fail
0.0353	40	274	685	Fail
0.0357	38	263	692	Fail
0.0361	33	252	763	Fail
0.0364	32	241	753	Fail
0.0368	29	230	793	Fail
0.0372	28	220	785	Fail
0.0376	25	210	839	Fail
0.0380	22	201	913	Fail
0.0384	21	193	919	Fail
0.0388	20	183	914	Fail
0.0391	17	180	1058	Fail
0.0395	13	171	1315	Fail
0.0399	12	167	1391	Fail
0.0403	9	153	1700	Fail
0.0407	9	148	1644	Fail
0.0411	9	142	1577	Fail
0.0414	9	139	1544	Fail
0.0418	8	135	1687	Fail
0.0422	8	126	1575	Fail
0.0426	8	121	1512	Fail
0.0430	8	114	1425	Fail
0.0434	8	110	1375	Fail
0.0438	8	107	1337	Fail
0.0441	8	105	1312	Fail
0.0445	7	104	1485	Fail
0.0449	7	100	1428	Fail
0.0453	7	95	1357	Fail
0.0457	7	90	1285	Fail
0.0461	7	87	1242	Fail
0.0465	7	84	1200	Fail
0.0468	6	81	1350	Fail
0.0472	6	73	1216	Fail
0.0476	6	72	1200	Fail
0.0480	6	68	1133	Fail
0.0484	6	66	1100	Fail
0.0488	6	65	1083	Fail
0.0492	5	63	1260	Fail
0.0495	5	63	1260	Fail
0.0499	4	60	1500	Fail
0.0503	3	58	1933	Fail
0.0507	3	56	1866	Fail
0.0511	2	54	2700	Fail
0.0515	2	53	2650	Fail
0.0518	2	53	2650	Fail
0.0522	2	51	2550	Fail

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

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

## Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet

On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

# LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

## *Model Default Modifications*

Total of 0 changes have been made.

### *PERLND Changes*

No PERLND changes have been made.

### *IMPLND Changes*

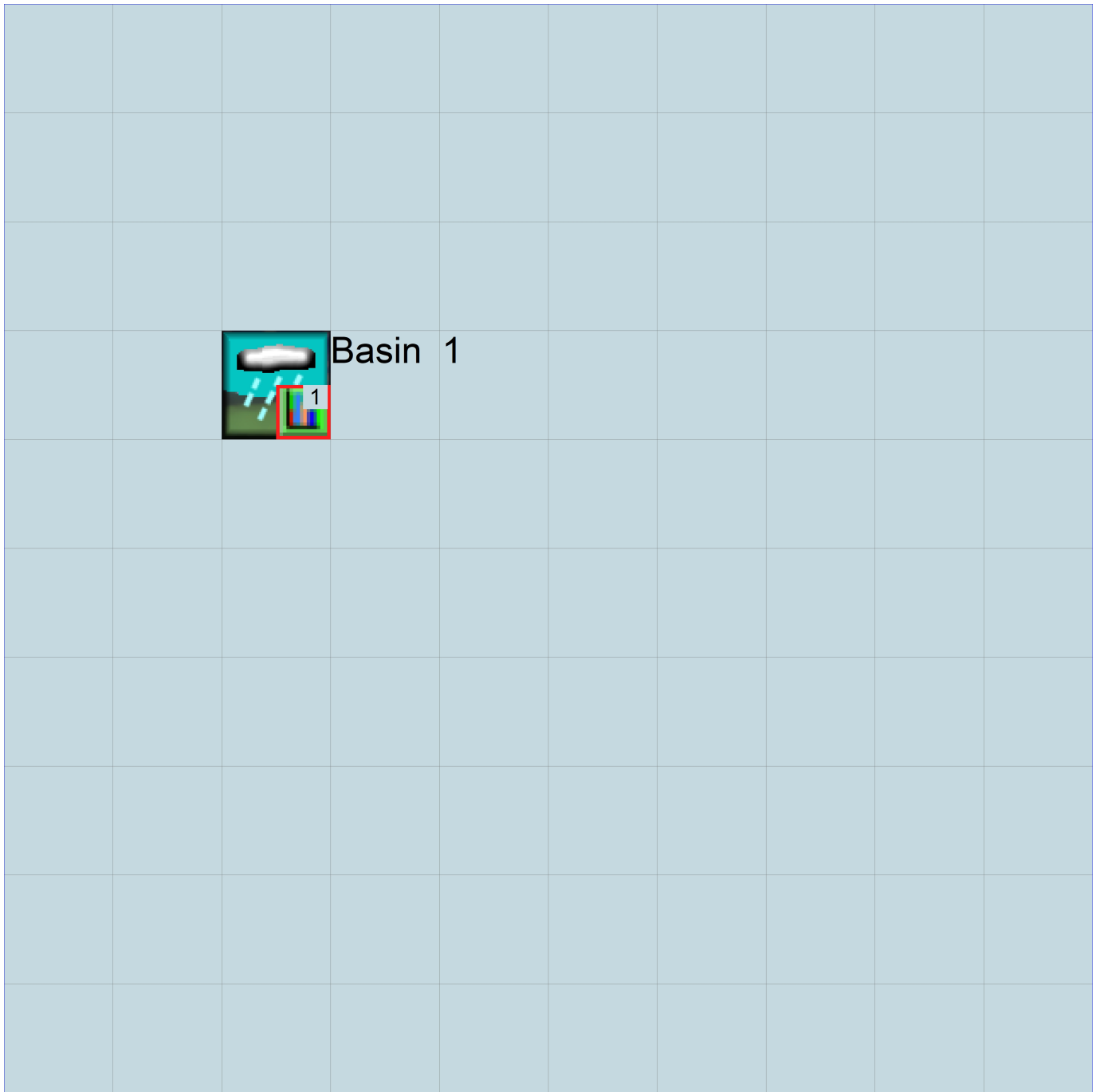
No IMPLND changes have been made.

*Appendix*  
*Predeveloped Schematic*



Basin 1

# Mitigated Schematic





*Predeveloped UCI File*

*Mitigated UCI File*

*Predeveloped HSPF Message File*

*Mitigated HSPF Message File*

## *Disclaimer*

### *Legal Notice*

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