PRELIMINARY STORMWATER SITE PLAN

Chehalis Industrial Park
0 Rush Road
Chehalis, WA

Prepared for:
CRG Real Estate Solutions
35 E. Wacker Drive
Chicago, Illinois 60601

June 24, 2022
Our Job No. 22323

Preliminary Stormwater Site Plan

Chehalis Industrial Park

Chehalis, Washington

Our Job No. 14030

BARGHAUSEN

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TAP 1.0

1.0 PROJECT OVERVIEW

This project is located on a 34.04-acre parcel within the Northwest quarter of Section 11, Township 13 North, Range 02 West, Willamette Meridian, City of Chehalis, Lewis County, Washington. The property address is currently listed as 0 Rush Road. The proposed development will convert approximately 68% of the parcel to impervious surfaces.

The proposed project will consist of construction of an approximately 525,000 square foot warehouse use building, with associated trailer and civilian parking, areas for loading docks, landscaping, utility connections and a detention pond. Existing ditches and low category wetlands will be filled to accommodate for the proposed development. Wetland mitigation strategies will be implemented to the greatest extent feasible onsite, and mitigation bank credits will be purchased as needed for the unavoidable wetland impacts.

A detention pond will be constructed for the purpose of stormwater flow control. Water leaving the detention pond will be discharged to the existing, natural discharge point to the western border of the parcel, flowing to the existing downstream ditch system. Prior to discharge water will be treated by a Modular Wetland Unit which has general use level designation (GULD) by the Department of Ecology (DOE) for enhanced and phosphorous treatment.

TAP 2.0

2.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

Minimum Requirement No. 1: Preparation of Stormwater Site Plan:

Response: This document hereby fulfills the requirement for a Stormwater Site Plan.

Minimum Requirement No. 2: Construction Stormwater Pollution Prevention:

Response: A SWPPP will be prepared for this project with final construction plans.

Minimum Requirement No. 3: Source Control of Pollution:

Response: All known available and reasonable Source Control BMPs will be applied to this project in accordance with those applicable to a warehouse project per the Department of Ecology's Stormwater Management Manual. Potential pollutant sources from warehouse operations include loading and unloading areas, outside storage of materials and equipment and fueling and maintenance areas. The main types of pollutants from these activities include oil and grease, as well as an increase of total suspended solids (TSS). At a minimum the parking lot will be swept on a regular basis, trash enclosures will be covered, and the owner will be educated about the proper use of pesticides and fertilizers. No storage of industrial products or chemicals will occur outside, eliminating these items as a potential source of pollution.

Minimum Requirement No. 4: Preservation of Natural Drainage System and Outfalls:

Response: Under existing conditions stormwater is collected by existing agricultural ditches and conveyed to the northwestern corner of the parcel. The proposed improvements release stormwater from detention and conveys runoff along direct discharge to connect to the existing ditch system.

Minimum Requirement No. 5: On-Site Stormwater Management:

Response: On site BMP's will be utilized to the maximum extent feasible. However, the existing site's soil is not suitable for infiltration. Additionally, a high groundwater table and seasonal fluctuations in groundwater elevations further limit the ability for subsurface soils to infiltrate. Therefore, the use of infiltration for stormwater management on this project is infeasible. For this reason detention facilities on-site will be provided.

Minimum Requirement No. 6: Runoff Treatment:

Response: Enhanced Water quality treatment will be provided for all new pollution generating surfaces. Water quality will be provided by a Modular Wetland System has general use level designations (GULD) for enhanced and phosphorous treatment as determined by the Department of Ecology (DOE).

Minimum Requirement No. 7: Flow Control:

Response: The proposed mean of flow control for this site is a detention pond on the north west side of the site, which will detain all stormwater runoff onsite. Detention facilities and their associated flow control structure have been designed to match runoff durations for half of the two-year through the 50-year storm per the DOE manual.

Minimum Requirement No. 8: Wetlands Protection:

Response: Wetland delineation and buffers are shown on plan set. For wetlands being preserved, general protection and protection from pollutants will be implemented to the greatest extent feasible.

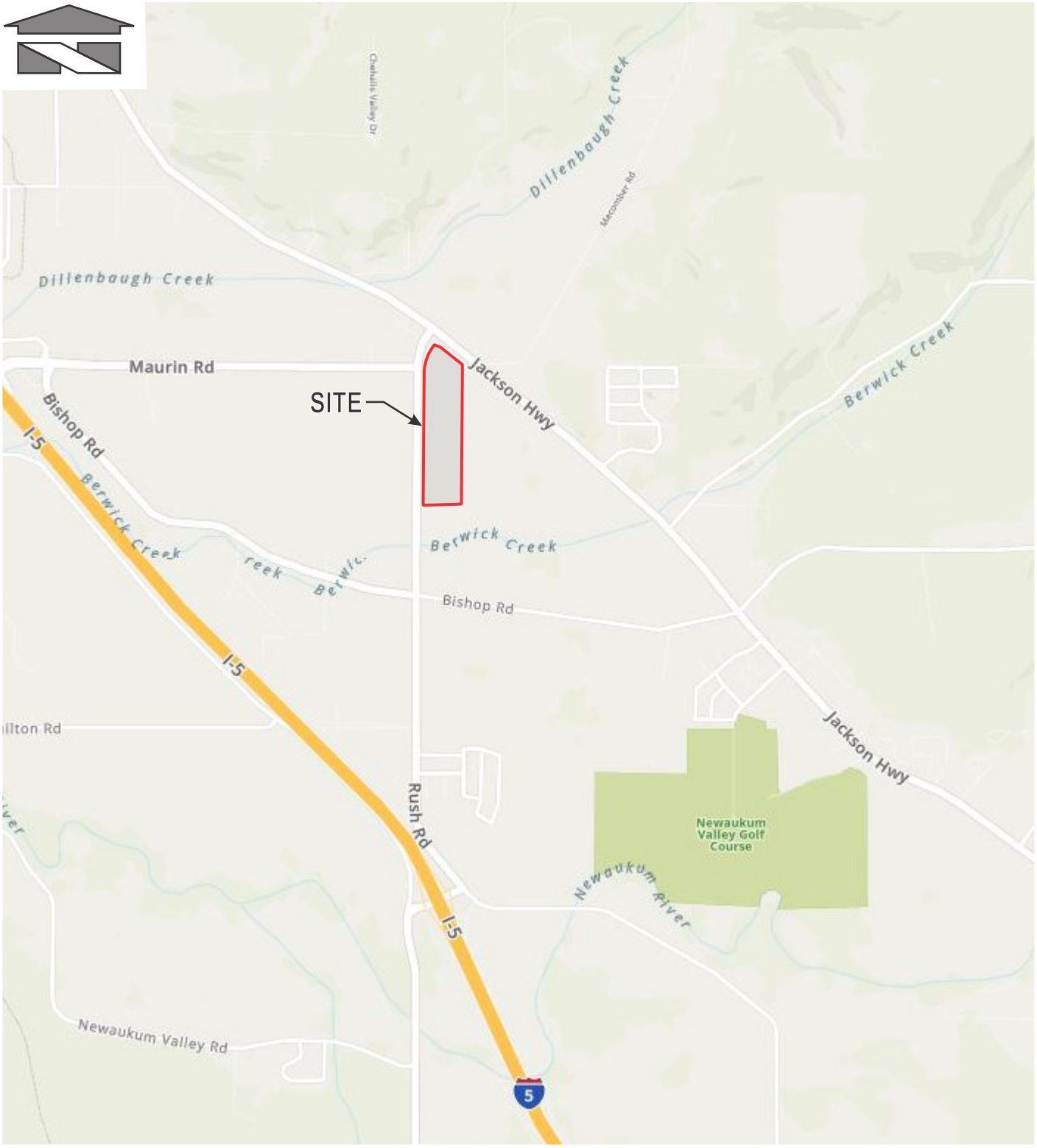
Minimum Requirement No. 9: Operation and Maintenance:

Response: A Maintenance and Source Control Manual will be provided for this site with the final engineering review documents.

Minimum Requirement No. 10: Off-Site Analysis and Mitigation

Response: The off-site analysis is provided in the following section of this report.

FIGURE 1
VICINITY MAP



REFERENCE: MapQuest (2021)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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For:
Chehalis Industrial Park
Chehalis, Washington

Title:
VICINITY MAP

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DATE: 6/23/22

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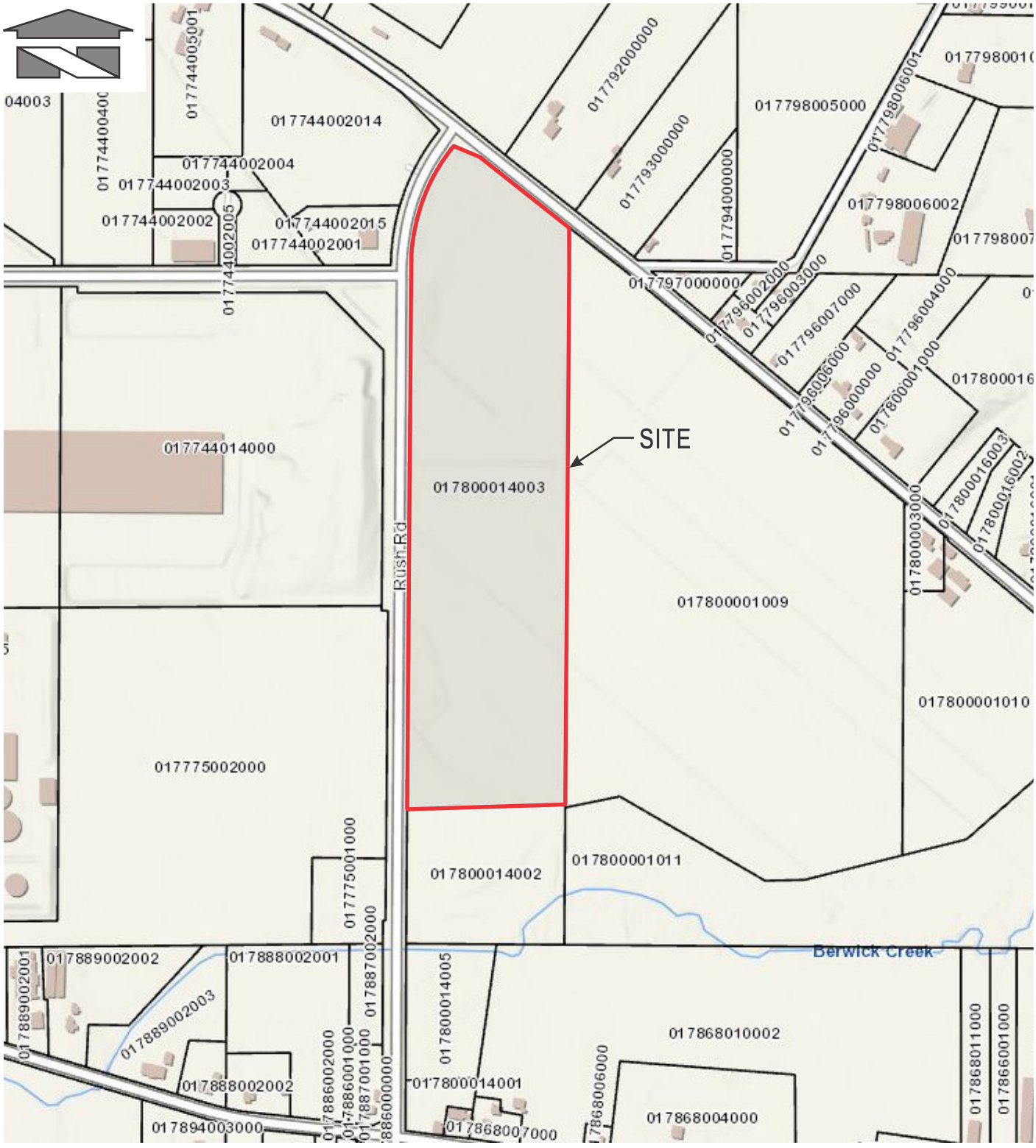
FIGURE 2
ACCESSOR'S MAP



REFERENCE: Lewis County GIS Web Map (2021)

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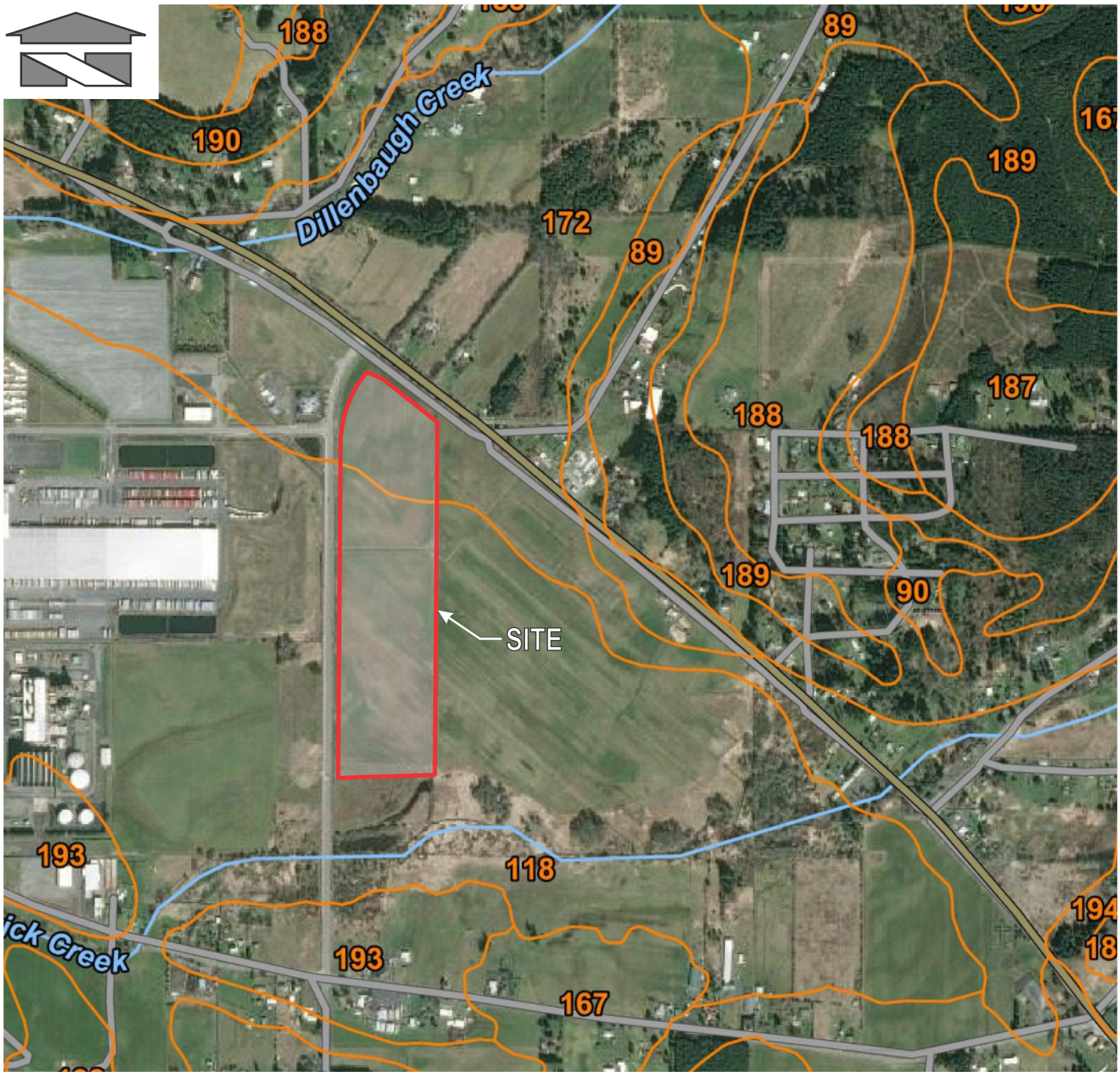
FIGURE 3
SOIL MAP



REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:		HSG
118	= Lacamas silt loam, 0-3% slopes	C/D
172	= Reed silty clay loam	D
89	= Galvin silt loam, 0-8% slopes	C/D

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SOIL SURVEY MAP

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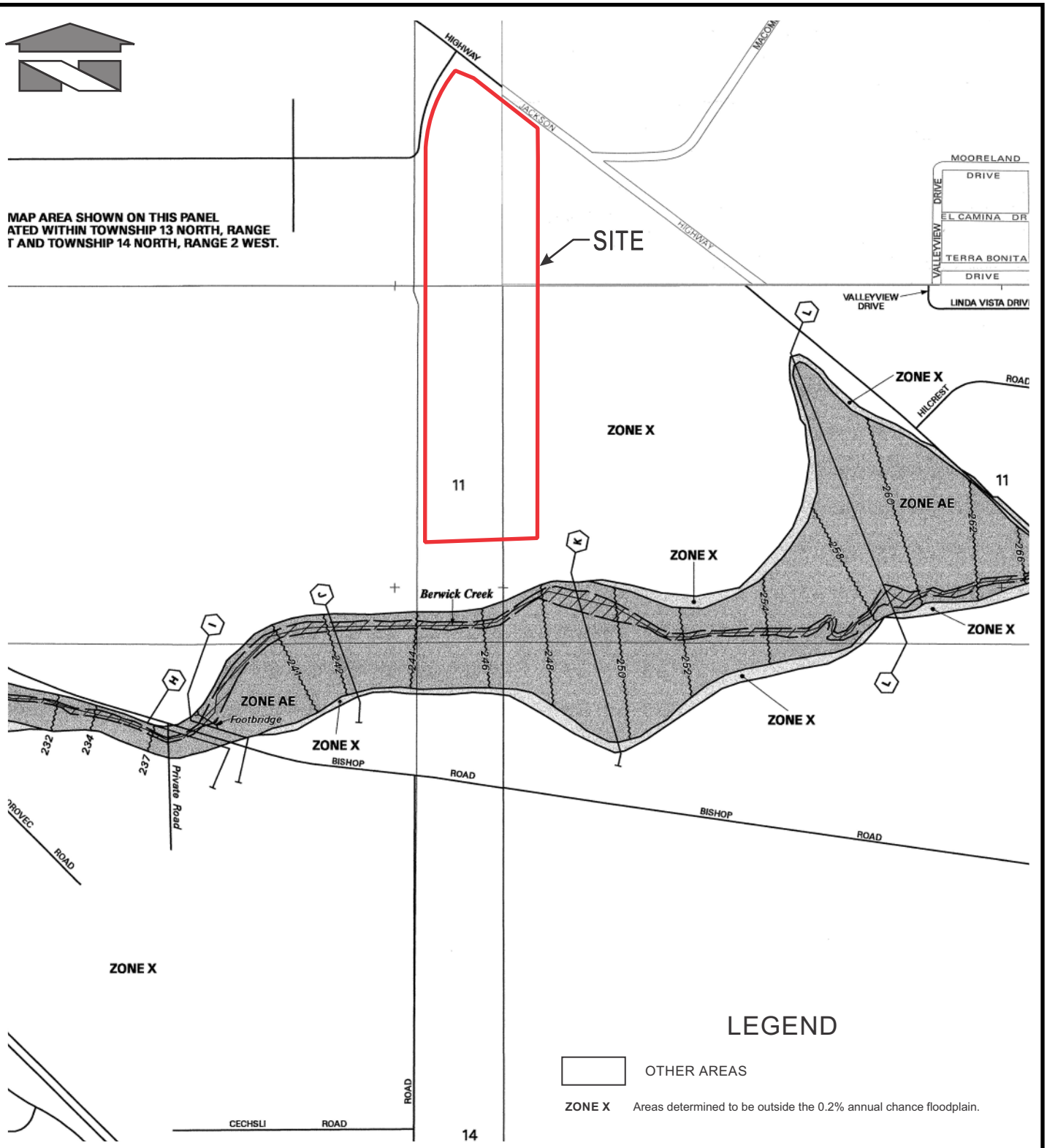
FIGURE 4
FEMA MAP



REFERENCE: Federal Emergency Management Agency (Portion of Map 5301021782C, July 2006)

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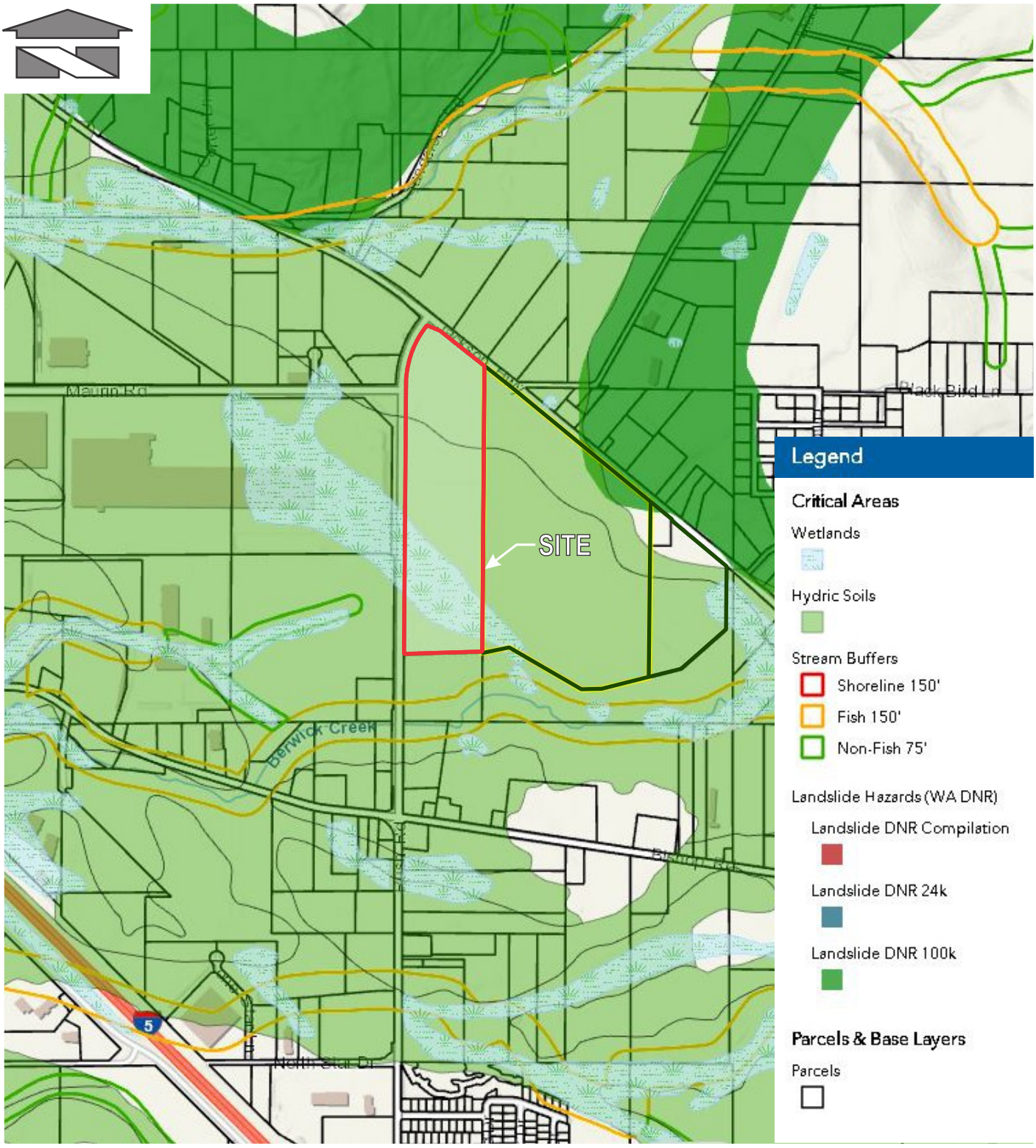
FIGURE 5
ENVIRONMENAL CRITICAL AREA MAP



REFERENCE: Lewis County GIS Web Map (2021)

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SENSITIVE AREAS MAP

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TAP 3.0

3.0 EXISTING CONDITIONS SUMMARY

This project is located on 34.06-acre parcel within the Northwest quarter of Section 11, Township 13 North, Range 02 West, Willamette Meridian, City of Chehalis, Lewis County, Washington. The property address is currently listed as 0 Rush Road. The site is mostly flat with grades ranging from around 237 to 255. The onsite soil is mapped by the U.S. Department of agriculture Soil Conservation Services Soils Maps as Lacamas silt loam, which is a hydrological soils group Type C and is highly conducive to runoff with little to no infiltration. All stormwater runoff is currently captured by existing conveyance ditches onsite which connects into an existing ditch at the northwest corner of property.

TAP 4.0

4.0 OFF-SITE ANALYSIS REPORT

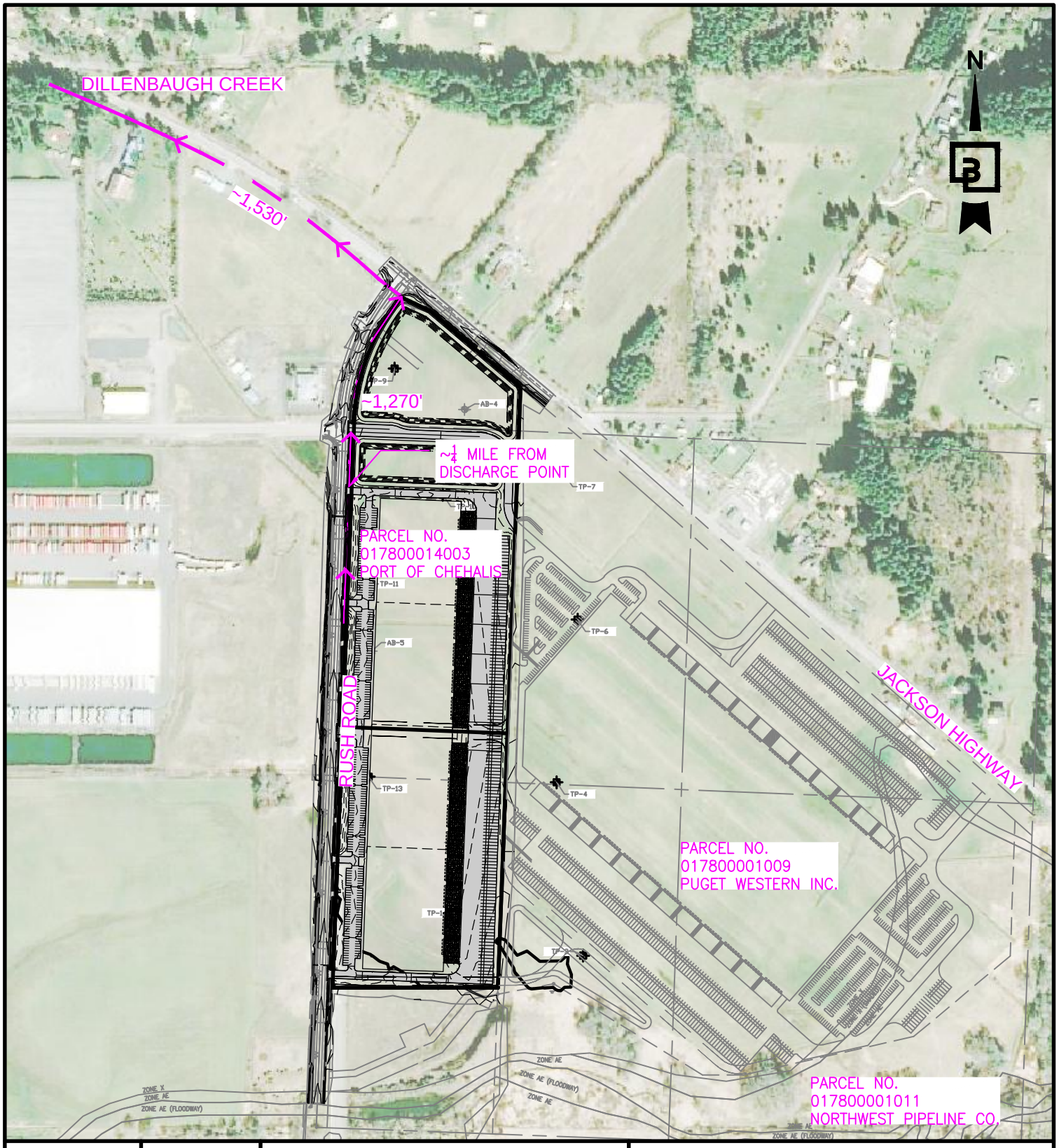
4.1 Define and map the study area

The existing topography of the site is relatively flat with slopes that are relatively between 0 and 8 percent of undeveloped agricultural area. Five existing conveyance ditches run across the entire site, providing drainage for previous agricultural performance. There also exists 5 identified wetlands onsite, labeled A-D. The proposed mitigation plan compensates for the loss of these wetlands by providing additional wetland functions elsewhere on the site and by supplying an overall net improvement of water quality, hydrologic functions, and native habitat conditions. The site's natural discharge location is toward the northwest corner of the property to an existing ditch. No existing or potential drainage issues were found onsite or along the downstream path.

Based on the available information, there appears to be some contributing upstream tributary area to the project site. The site slopes gradually to the northwest corner, with some offsite, undeveloped area being collected by the existing ditch system. Berwick Creek borders the site to the southeast and collects upstream runoff prior to reaching the site. Areas to the northwest slope toward Jackson Highway and are collected in existing ditch systems which convey storm water runoff further downstream, with the south ditch line converging with the natural discharge point.

See the Downstream Exhibit on the following page for a map delineating the downstream path.

FIGURE 6
DOWNSTREAM EXHIBIT MAP



Job Number 22323	Designed SG	Scale: Horizontal NTS Vertical NTS	For: CHEHALIS INDUSTRIAL PARK
Sheet 1 of 1	Drawn SG Checked BHE Approved BHE Date 6/20/22	BARGHAUSEN CONSULTING ENGINEERS, INC. 18215 72ND AVENUE SOUTH KENT, WA 98032 425.251.6222 BARGHAUSEN.COM	Title: DOWNSTREAM CONVEYANCE MAP

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4.2 Review all available information

- *Adopted Basin Plans*: The project is within the Upper Chehalis River Basin of the Upper Chehalis (Water Resource Inventory Area 23) watershed.

- *Finalized Drainage Studies:* No drainage studies were found for the site or surrounding drainage system.

- *Groundwater Management Area Plans:* Refer to USGS published, "Hydrogeologic Framework and Groundwater/Surface-Water Interactions of the Chehalis River Basin, Southwestern Washington" (Scientific Investigations Report 2011-5160) for more information regarding groundwater management.

- *Critical Drainage Area Maps*: Critical areas such as wetland conditions, construction setbacks and stream habitats were based on the attached report provided by Soundview Consultants.

- *Floodplain and Floodway FEMA Maps*: The southeast portion of the site is located within the 100-year floodplain. Refer FEMA map for additional information.

- *Other Off-Site Analysis Reports*: No other Off-Site Analysis Reports were reviewed for this project.

4.3 Field inspects the study area

The field reconnaissance for the off-site drainage analysis was conducted on December 29th, 2020. On the day of the site visit, conditions were overcast.

Upstream Drainage Basin

A portion of the adjacent parcel to the east of the site (Parcel no. 017800001011) appears to slope toward the site and has been modeled as offsite tributary area. The conditions of the upstream drainage basin are undeveloped, and have been modeled as forested.

On-site Drainage Basin

The on-site stormwater runoff typically drains to the northwest portion of the site. Existing irrigation ditches convey stormwater runoff in directed paths toward the existing, offsite ditch running north parallel with Rush Road. Upon reaching the intersection of Rush Road and Jackson Highway, a culvert conveys stormwater runoff along the existing ditch line west, eventually converging with Dillenbaugh Creek.

A series of photos for the on-site area follows:

On the northwest corner of the parcel, facing east.

Existing irrigation ditch running east-west on the northern portion of the site.

Irrigation ditches converging on the northern portion of the site. .

Downstream Drainage Path

Refer to the Downstream Exhibit in Section 4.1. Stormwater runoff typically sheet flows to the northwest corner of the site, following the natural topography. Five existing irrigation ditches collect stormwater runoff and convey runoff to a concentrated point along the western boundary. Upon reaching the western boundary, stormwater is collected by an existing ditch line running parallel with Rush Road, and is conveyed north for approximately 1,270 feet. Along this ditch line, stormwater runoff has traveled over ¼ mile from the site's discharge point. Through existing concrete culvert lines, stormwater is conveyed further west, crossing Rush Road, and travels along existing ditch lines for approximately 1,530 feet until runoff converges with Dillenbaugh Creek. This convergence point is approximately ½ mile from the site's discharge location.

Stormwater runoff for the developed site will be detained and treated on site. After proper treatment, stormwater will be conveyed to the same existing discharge location along the western property line, maintaining the existing downstream path. Detention release rates will match preexisting conditions up to the 50-year storm event, therefore not increasing the risk of erosion or flooding. No signs of erosion or flooding were found along the downstream path.

A series of photos for the downstream path follows:

Irrigation ditch leaving site along the western property line.

Irrigation ditch continuing west across adjacent parcel.

Existing ditch parallel with Rush Road, facing north.

Concrete culvert near intersection of Rush Road and Jackson Highway.

Stormwater runoff converging with Dillenbaugh Creek.

TAP 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

A. EXISTING SITE HYDROLOGY

The existing site is relatively flat with slopes that are relatively between 0 and 8 percent and with soils consisting of topsoil/agricultural soil, silt, and silty clay loam. The site is not conducive to infiltration due to the high percentage of fines. Five existing conveyance ditches run across the entire site, providing drainage for previous agricultural performance. There also exists 5 identified wetlands onsite, labeled A-D. The site's natural discharge location is toward the northwest corner of the property to an existing ditch. No existing or potential drainage issues were found onsite or along the downstream path.

For all stormwater calculations the predeveloped condition of the site was modeled as a flat forest with type 'C' soil. Therefore, the detention facilities for this development were sized to match runoff durations for pre-developed conditions.

Pre-Developed Peak Runoff Rates

RETURN PERIOD	FLOW (cfs)
2 year	1.069
5 year	1.635
10 year	1.982
25 year	2.383
50 year	2.654
100 year	2.903

B. DEVELOPED SITE HYDROLOGY

Under developed conditions the site was modeled in WWHM as 68% impervious, totaling 23.01 acres of impervious surfaces and 11.01 acres of landscaped areas. Detention facilities were sized to match flow durations for 50% of the 2-year through the 50-year storm per the DOE manual. Under developed conditions all stormwater runoff will be captured and routed to the proposed detention facilities. Water will then be released via a flow control structure into the site's existing natural discharge location is toward the northwest corner of the property to an existing ditch.

C. PERFORMANCE STANDARDS AND GOALS

Detention facilities were sized to match flow durations for 50% of the two-year through the 50-year storm per the DOE manual in accordance with City of Chehalis standards. All flow control and water quality sizing calculations were performed using the 2012 Western Washington Hydrology Model. As this is a commercial site enhanced water quality treatment is being provided for all pollution generating surfaces. The Modified Rational Method will be used for pipe conveyance sizing calculations in order to ensure that the

proposed storm system is adequately sized to convey the 25-year storm event. Calculations will be included with the final storm drainage report.

D. LOW IMPACT DEVELOPMENT FEATURES

All LID options listed in the DOE manual have been considered for this site. However, slow draining soils onsite make the use of any infiltration facilities infeasible. In addition, dispersion is not possible due to a lack of native vegetation onsite. Therefore, all flow control will be provided via stormwater detention.

E. FLOW CONTROL SYSTEM

Flow control is required for all new impervious surfaces on this site. For stormwater modeling purposes new impervious surfaces include 12.05 acres of new building, 10.96 acres of new pavement, and 4.12 acres of detention pond area. All stormwater runoff will be routed to the proposed detention facilities via a system of new catch basins and piping.

The proposed detention system will be consisting of a detention pond located in the northwest corner of the site. Water will be released from detention via a flow control structure into the existing into the site's existing natural discharge location is toward the northwest corner of the property to an existing ditch. These facilities were sized using Western Washington Hydrology Model 2012 software to match predeveloped flow durations for 50% of the two-year through the 50-year storm. Please see the attached WWHM printout for all calculations related to the sizing of these facilities.

Mitigated Peak Runoff Rates

RETURN PERIOD	FLOW (cfs)
2 year	0.536
5 year	1.003
10 year	1.440
25 year	2.175
50 year	2.882
100 year	3.750

FIGURE 7
PREDEVELOPED BASIN MAP

BASIN 1 – FORESTED

BASIN 2 – WETLAND

EXISTING BASIN		
SURFACE NAME	AREA (SF)	AREA (AC)
EX WETLAND	131050	3.01
VEGETATION/FORESTED	1,352,699	31.05
TOTAL SITE	1,483,749	34.06

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Approved BE
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For:
CRG REAL ESTATE SOLUTIONS
35 E. WACKER DRIVE
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Title:
EXISTING BASIN MAP

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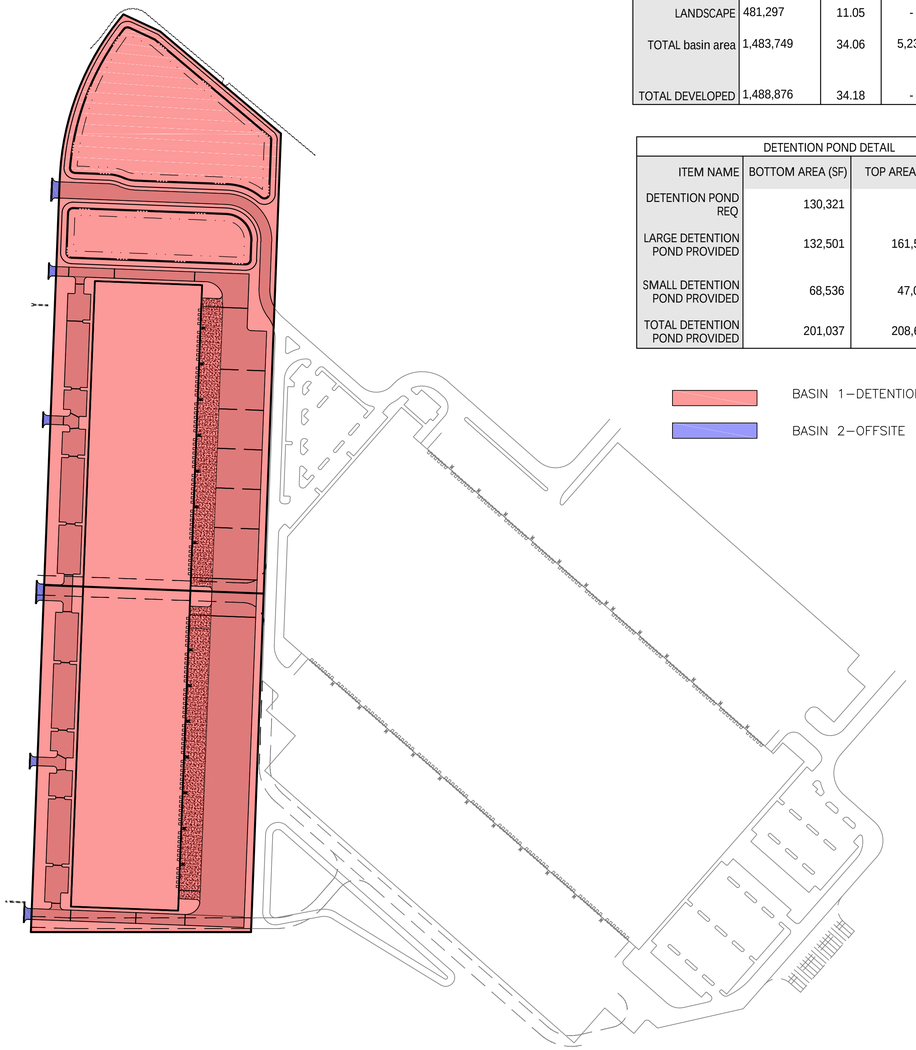
FIGURE 8
DEVELOPED BASIN MAP

	DETENTION POND BASIN		OFFSITE BASIN	
SURFACE NAME	AREA (SF)	AREA (AC)	AREA (SF)	AREA (AC)
ASPHALT	379,992	8.72	4,726	0.11
CONC	97,460	2.24	513	0.01
BLDG	525,000	12.05	-	-
LANDSCAPE	481,297	11.05	-	-
TOTAL basin area	1,483,749	34.06	5,239	0.12
TOTAL DEVELOPED	1,488,876	34.18	-	-

DETENTION POND DETAIL			
ITEM NAME	BOTTOM AREA (SF)	TOP AREA (SF)	VOLUME (CF)
DETENTION POND REQ	130,321	-	873,030
LARGE DETENTION POND PROVIDED	132,501	161,569	882,209
SMALL DETENTION POND PROVIDED	68,536	47,087	346,867
TOTAL DETENTION POND PROVIDED	201,037	208,655	1,229,076



BASIN 1—DETENTION POND

BASIN 2—OFFSITE

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Sheet 1 of 1

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WWHM2012

PROJECT REPORT

General Model Information

Project Name:	22323-flow control
Site Name:	BCE 22323-CHEHALS
Site Address:	0 Rush Road
City:	chehalis
Report Date:	6/15/2022
Gage:	Olympia
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1-Detention Pond

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	34.06
Pervious Total	34.06
Impervious Land Use	acre
Impervious Total	0
Basin Total	34.06

Element Flows To:

Surface	Interflow	Groundwater

Basin 2- offsite area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.12
Pervious Total	0.12
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.12

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1-Detention Pond

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	11.05
Pervious Total	11.05

Impervious Land Use	acre
ROADS FLAT	8.72
ROOF TOPS FLAT	12.05
DRIVEWAYS FLAT	2.24
Impervious Total	23.01
Basin Total	34.06

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Basin 2- offsite area

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.11
DRIVEWAYS FLAT	0.01
Impervious Total	0.12
Basin Total	0.12

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	361.00 ft.	
Bottom Width:	361.00 ft.	
Depth:	7 ft.	
Volume at riser head:	20.0416 acre-feet.	
Side slope 1:	3 To 1	
Side slope 2:	3 To 1	
Side slope 3:	3 To 1	
Side slope 4:	3 To 1	
Discharge Structure		
Riser Height:	6 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	2.55 in.	Elevation:0 ft.
Orifice 2 Diameter:	3.9 in.	Elevation:4.85 ft.
Orifice 3 Diameter:	7.26 in.	Elevation:5.3 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

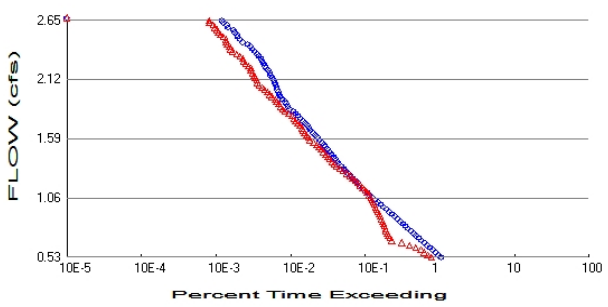
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	2.991	0.000	0.000	0.000
0.0778	2.999	0.233	0.049	0.000
0.1556	3.007	0.466	0.069	0.000
0.2333	3.015	0.700	0.085	0.000
0.3111	3.022	0.935	0.098	0.000
0.3889	3.030	1.171	0.110	0.000
0.4667	3.038	1.407	0.120	0.000
0.5444	3.046	1.643	0.130	0.000
0.6222	3.054	1.880	0.139	0.000
0.7000	3.061	2.118	0.147	0.000
0.7778	3.069	2.357	0.155	0.000
0.8556	3.077	2.596	0.163	0.000
0.9333	3.085	2.835	0.170	0.000
1.0111	3.093	3.076	0.177	0.000
1.0889	3.101	3.317	0.184	0.000
1.1667	3.108	3.558	0.190	0.000
1.2444	3.116	3.800	0.196	0.000
1.3222	3.124	4.043	0.202	0.000
1.4000	3.132	4.286	0.208	0.000
1.4778	3.140	4.530	0.214	0.000
1.5556	3.148	4.775	0.220	0.000
1.6333	3.156	5.020	0.225	0.000
1.7111	3.164	5.266	0.230	0.000
1.7889	3.172	5.512	0.236	0.000
1.8667	3.180	5.759	0.241	0.000
1.9444	3.188	6.007	0.246	0.000
2.0222	3.196	6.255	0.250	0.000
2.1000	3.204	6.504	0.255	0.000
2.1778	3.212	6.754	0.260	0.000
2.2556	3.220	7.004	0.265	0.000
2.3333	3.228	7.255	0.269	0.000
2.4111	3.236	7.506	0.274	0.000
2.4889	3.244	7.758	0.278	0.000

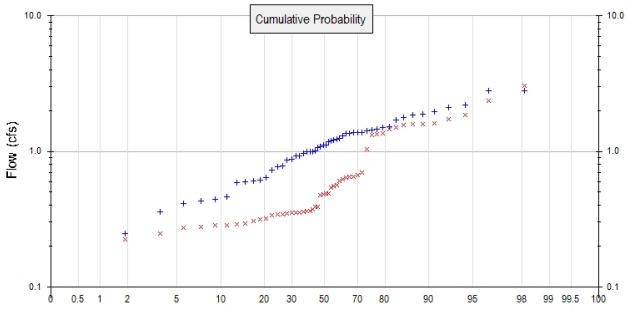
2.5667	3.252	8.011	0.282	0.000
2.6444	3.260	8.264	0.287	0.000
2.7222	3.268	8.518	0.291	0.000
2.8000	3.276	8.772	0.295	0.000
2.8778	3.284	9.028	0.299	0.000
2.9556	3.292	9.283	0.303	0.000
3.0333	3.301	9.540	0.307	0.000
3.1111	3.309	9.797	0.311	0.000
3.1889	3.317	10.05	0.315	0.000
3.2667	3.325	10.31	0.318	0.000
3.3444	3.333	10.57	0.322	0.000
3.4222	3.341	10.83	0.326	0.000
3.5000	3.350	11.09	0.330	0.000
3.5778	3.358	11.35	0.333	0.000
3.6556	3.366	11.61	0.337	0.000
3.7333	3.374	11.87	0.340	0.000
3.8111	3.382	12.13	0.344	0.000
3.8889	3.391	12.40	0.348	0.000
3.9667	3.399	12.66	0.351	0.000
4.0444	3.407	12.93	0.354	0.000
4.1222	3.415	13.19	0.358	0.000
4.2000	3.424	13.46	0.361	0.000
4.2778	3.432	13.73	0.365	0.000
4.3556	3.440	13.99	0.368	0.000
4.4333	3.448	14.26	0.371	0.000
4.5111	3.457	14.53	0.374	0.000
4.5889	3.465	14.80	0.378	0.000
4.6667	3.473	15.07	0.381	0.000
4.7444	3.482	15.34	0.384	0.000
4.8222	3.490	15.61	0.387	0.000
4.9000	3.498	15.88	0.482	0.000
4.9778	3.507	16.15	0.541	0.000
5.0556	3.515	16.43	0.583	0.000
5.1333	3.524	16.70	0.619	0.000
5.2111	3.532	16.98	0.650	0.000
5.2889	3.540	17.25	0.679	0.000
5.3667	3.549	17.53	1.074	0.000
5.4444	3.557	17.80	1.273	0.000
5.5222	3.566	18.08	1.427	0.000
5.6000	3.574	18.36	1.558	0.000
5.6778	3.583	18.64	1.675	0.000
5.7556	3.591	18.91	1.781	0.000
5.8333	3.600	19.19	1.880	0.000
5.9111	3.608	19.47	1.972	0.000
5.9889	3.617	19.76	2.059	0.000
6.0667	3.625	20.04	2.416	0.000
6.1444	3.634	20.32	3.090	0.000
6.2222	3.642	20.60	3.934	0.000
6.3000	3.651	20.89	4.871	0.000
6.3778	3.659	21.17	5.827	0.000
6.4556	3.668	21.46	6.725	0.000
6.5333	3.676	21.74	7.499	0.000
6.6111	3.685	22.03	8.107	0.000
6.6889	3.693	22.31	8.550	0.000
6.7667	3.702	22.60	8.967	0.000
6.8444	3.711	22.89	9.334	0.000
6.9222	3.719	23.18	9.685	0.000
7.0000	3.728	23.47	10.02	0.000

7.0778	3.737	23.76	10.35	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 34.18
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 11.05
Total Impervious Area: 23.13

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.069323
5 year	1.63566
10 year	1.982772
25 year	2.383302
50 year	2.654348
100 year	2.903517

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.536645
5 year	1.003456
10 year	1.440423
25 year	2.175401
50 year	2.882114
100 year	3.750018

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	1.306	1.867
1957	1.789	0.354
1958	0.602	0.294
1959	0.771	0.388
1960	1.430	0.553
1961	1.077	0.664
1962	0.358	0.305
1963	1.516	1.358
1964	1.115	0.653
1965	0.923	0.360

1966	0.594	0.343
1967	1.202	0.559
1968	0.876	0.336
1969	0.463	0.353
1970	0.993	0.488
1971	1.250	1.739
1972	1.851	3.053
1973	1.006	0.604
1974	0.730	0.639
1975	1.696	0.363
1976	1.366	0.645
1977	0.248	0.225
1978	1.065	1.493
1979	1.369	0.287
1980	0.994	0.476
1981	1.407	0.375
1982	0.929	0.489
1983	1.505	0.538
1984	1.206	0.349
1985	0.411	0.316
1986	1.882	0.364
1987	2.120	0.620
1988	0.609	0.351
1989	0.781	0.278
1990	2.211	1.564
1991	2.781	1.452
1992	0.639	0.341
1993	0.445	0.246
1994	0.428	0.273
1995	1.224	0.700
1996	1.959	0.480
1997	1.110	1.345
1998	0.967	0.286
1999	1.351	1.618
2000	1.377	1.043
2001	0.212	0.210
2002	1.380	2.361
2003	0.589	0.318
2004	0.866	0.390
2005	0.998	0.288
2006	1.464	1.579
2007	1.172	1.577
2008	2.815	1.318

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	2.8149	3.0533
2	2.7809	2.3612
3	2.2114	1.8669
4	2.1197	1.7386
5	1.9591	1.6178
6	1.8818	1.5789
7	1.8514	1.5775
8	1.7891	1.5644
9	1.6961	1.4930
10	1.5162	1.4521
11	1.5046	1.3577

12	1.4641	1.3446
13	1.4298	1.3176
14	1.4068	1.0428
15	1.3801	0.6996
16	1.3769	0.6640
17	1.3693	0.6531
18	1.3659	0.6448
19	1.3510	0.6390
20	1.3058	0.6200
21	1.2502	0.6043
22	1.2236	0.5593
23	1.2061	0.5527
24	1.2020	0.5384
25	1.1718	0.4892
26	1.1154	0.4878
27	1.1102	0.4802
28	1.0775	0.4757
29	1.0651	0.3902
30	1.0061	0.3878
31	0.9977	0.3746
32	0.9937	0.3637
33	0.9926	0.3626
34	0.9666	0.3600
35	0.9291	0.3537
36	0.9230	0.3531
37	0.8761	0.3508
38	0.8663	0.3491
39	0.7810	0.3433
40	0.7707	0.3407
41	0.7299	0.3363
42	0.6390	0.3176
43	0.6095	0.3165
44	0.6021	0.3050
45	0.5942	0.2935
46	0.5890	0.2884
47	0.4630	0.2866
48	0.4455	0.2860
49	0.4283	0.2775
50	0.4111	0.2732
51	0.3585	0.2461
52	0.2483	0.2249
53	0.2115	0.2104

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5347	19254	14269	74	Pass
0.5561	17698	12717	71	Pass
0.5775	16193	11456	70	Pass
0.5989	14918	10294	69	Pass
0.6203	13650	8755	64	Pass
0.6417	12537	7205	57	Pass
0.6631	11465	5717	49	Pass
0.6845	10484	4196	40	Pass
0.7059	9619	3959	41	Pass
0.7274	8869	3801	42	Pass
0.7488	8181	3678	44	Pass
0.7702	7534	3555	47	Pass
0.7916	6951	3462	49	Pass
0.8130	6397	3353	52	Pass
0.8344	5917	3263	55	Pass
0.8558	5468	3167	57	Pass
0.8772	5005	3052	60	Pass
0.8986	4568	2940	64	Pass
0.9201	4193	2836	67	Pass
0.9415	3871	2723	70	Pass
0.9629	3578	2632	73	Pass
0.9843	3263	2531	77	Pass
1.0057	2979	2442	81	Pass
1.0271	2730	2355	86	Pass
1.0485	2511	2286	91	Pass
1.0699	2318	2213	95	Pass
1.0913	2119	2096	98	Pass
1.1128	1961	1977	100	Pass
1.1342	1802	1853	102	Pass
1.1556	1674	1719	102	Pass
1.1770	1563	1579	101	Pass
1.1984	1451	1467	101	Pass
1.2198	1350	1369	101	Pass
1.2412	1258	1238	98	Pass
1.2626	1170	1158	98	Pass
1.2840	1096	1058	96	Pass
1.3055	1013	933	92	Pass
1.3269	953	842	88	Pass
1.3483	887	759	85	Pass
1.3697	825	713	86	Pass
1.3911	785	656	83	Pass
1.4125	740	617	83	Pass
1.4339	695	585	84	Pass
1.4553	653	540	82	Pass
1.4767	612	507	82	Pass
1.4982	577	473	81	Pass
1.5196	544	445	81	Pass
1.5410	519	412	79	Pass
1.5624	491	376	76	Pass
1.5838	453	336	74	Pass
1.6052	422	320	75	Pass
1.6266	395	300	75	Pass
1.6480	367	286	77	Pass

1.6694	347	274	78	Pass
1.6909	326	262	80	Pass
1.7123	309	246	79	Pass
1.7337	289	230	79	Pass
1.7551	269	213	79	Pass
1.7765	252	204	80	Pass
1.7979	232	193	83	Pass
1.8193	215	174	80	Pass
1.8407	201	155	77	Pass
1.8621	179	144	80	Pass
1.8836	170	134	78	Pass
1.9050	160	128	80	Pass
1.9264	154	120	77	Pass
1.9478	142	114	80	Pass
1.9692	135	105	77	Pass
1.9906	132	98	74	Pass
2.0120	126	90	71	Pass
2.0334	122	83	68	Pass
2.0548	120	77	64	Pass
2.0763	116	70	60	Pass
2.0977	113	67	59	Pass
2.1191	109	65	59	Pass
2.1405	104	62	59	Pass
2.1619	100	60	60	Pass
2.1833	97	57	58	Pass
2.2047	93	54	58	Pass
2.2261	87	54	62	Pass
2.2475	84	50	59	Pass
2.2690	81	46	56	Pass
2.2904	77	43	55	Pass
2.3118	74	42	56	Pass
2.3332	69	39	56	Pass
2.3546	66	35	53	Pass
2.3760	61	31	50	Pass
2.3974	57	29	50	Pass
2.4188	53	28	52	Pass
2.4402	49	26	53	Pass
2.4616	42	25	59	Pass
2.4831	39	25	64	Pass
2.5045	36	23	63	Pass
2.5259	35	21	60	Pass
2.5473	33	20	60	Pass
2.5687	32	19	59	Pass
2.5901	27	18	66	Pass
2.6115	26	17	65	Pass
2.6329	23	15	65	Pass
2.6543	22	15	68	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	4178.88			☐	0.00			
Total Volume Infiltrated		4178.88	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

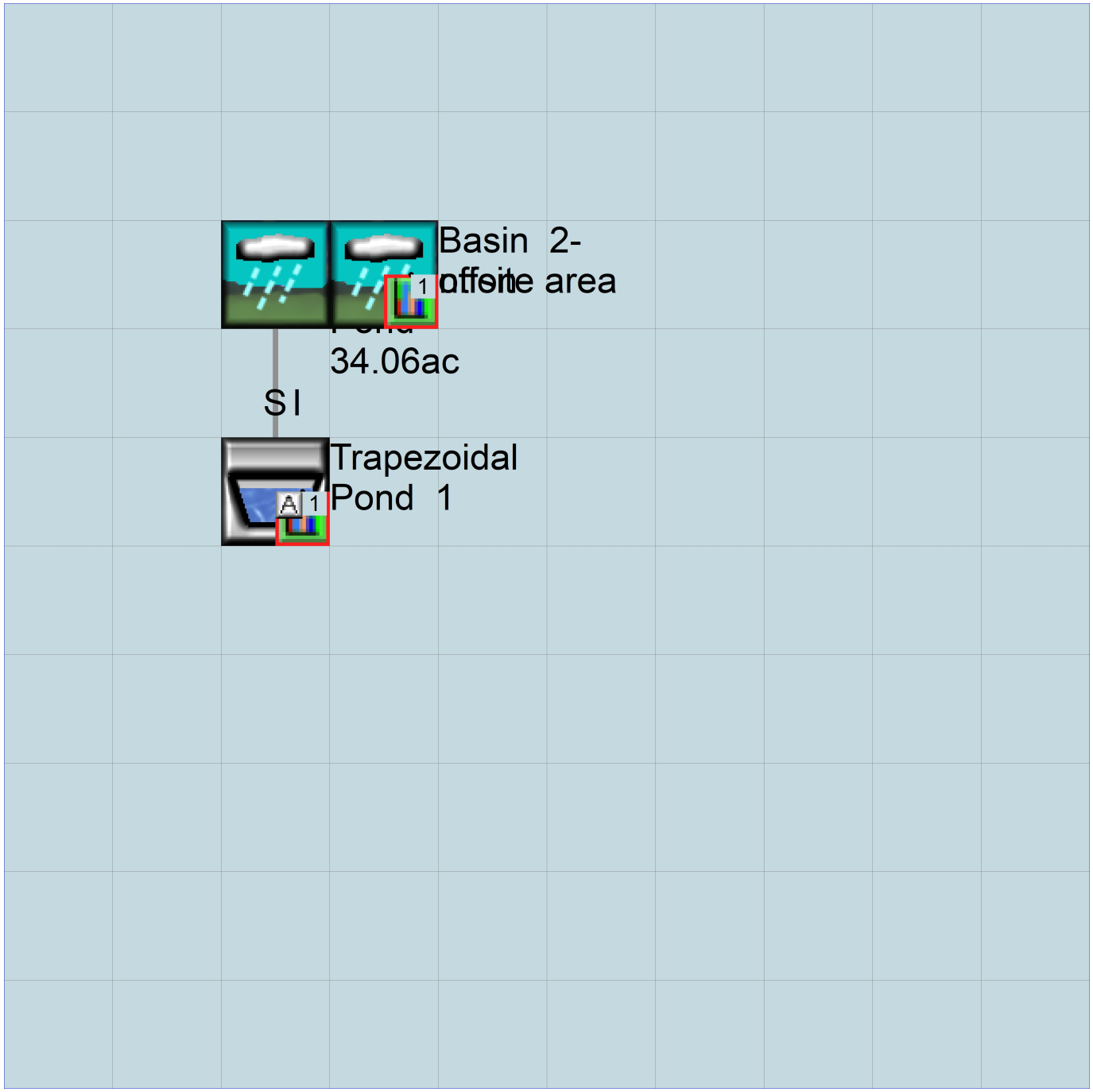
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2008 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   22323-flow control.wdm
MESSU       25   Pre22323-flow control.MES
            27   Pre22323-flow control.L61
            28   Pre22323-flow control.L62
            30   POC22323-flow control1.dat
END FILES

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

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

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

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1-Detention Pond ***
PERLND  10                       34.06     COPY   501     12
PERLND  10                       34.06     COPY   501     13
Basin  2- offsite area***
PERLND  10                        0.12     COPY   501     12
PERLND  10                        0.12     COPY   501     13

******Routing******
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                    ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2008 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   22323-flow control.wdm
MESSU       25   Mit22323-flow control.MES
            27   Mit22323-flow control.L61
            28   Mit22323-flow control.L62
            30   POC22323-flow control1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       4
      IMPLND       5
      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        Trapezoidal Pond  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            ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         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  *********
   16         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 ***
   16         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
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            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
   16              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           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
```

```
    4         0    0    0    0    0
    5         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    5              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    5              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1-Detention Pond ***
PERLND  16                      11.05     RCHRES   1      2
PERLND  16                      11.05     RCHRES   1      3
IMPLND   1                       8.72     RCHRES   1      5
IMPLND   4                      12.05     RCHRES   1      5
IMPLND   5                       2.24     RCHRES   1      5
Basin  2- offsite area***
IMPLND   1                       0.11     COPY   501     15
IMPLND   1                       0.11     COPY   601     15
IMPLND   5                       0.01     COPY   501     15
IMPLND   5                       0.01     COPY   601     15

******Routing******
PERLND  16                      11.05     COPY     1     12
IMPLND   1                       8.72     COPY     1     15
IMPLND   4                      12.05     COPY     1     15
IMPLND   5                       2.24     COPY     1     15
PERLND  16                      11.05     COPY     1     13
RCHRES   1                          1     COPY   501     16
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
```

```
    1     Trapezoidal Pond-009    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
    1             1      0.07       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  2.991758  0.000000  0.000000
  0.077778  2.999498  0.232993  0.049212
  0.155556  3.007248  0.466589  0.069596
  0.233333  3.015008  0.700788  0.085237
  0.311111  3.022778  0.935591  0.098423
  0.388889  3.030558  1.170998  0.110040
  0.466667  3.038348  1.407011  0.120543
  0.544444  3.046148  1.643631  0.130201
  0.622222  3.053958  1.880857  0.139191
  0.700000  3.061778  2.118691  0.147635
  0.777778  3.069608  2.357134  0.155621
  0.855556  3.077448  2.596186  0.163216
  0.933333  3.085298  2.835848  0.170474
  1.011111  3.093157  3.076122  0.177435
  1.088889  3.101027  3.317006  0.184133
  1.166667  3.108907  3.558504  0.190595
  1.244444  3.116797  3.800615  0.196846
  1.322222  3.124697  4.043339  0.202904
  1.400000  3.132607  4.286679  0.208787
  1.477778  3.140527  4.530634  0.214508
  1.555556  3.148457  4.775206  0.220081
  1.633333  3.156397  5.020395  0.225516
  1.711111  3.164347  5.266201  0.230823
  1.788889  3.172306  5.512627  0.236010
  1.866667  3.180276  5.759672  0.241086
```

```
  1.944444  3.188256  6.007337  0.246058
  2.022222  3.196246  6.255623  0.250931
  2.100000  3.204246  6.504531  0.255711
  2.177778  3.212256  6.754062  0.260403
  2.255556  3.220276  7.004216  0.265012
  2.333333  3.228306  7.254994  0.269543
  2.411111  3.236346  7.506397  0.273998
  2.488889  3.244396  7.758426  0.278382
  2.566667  3.252455  8.011081  0.282699
  2.644444  3.260525  8.264364  0.286950
  2.722222  3.268605  8.518274  0.291139
  2.800000  3.276695  8.772814  0.295269
  2.877778  3.284795  9.027983  0.299342
  2.955556  3.292905  9.283782  0.303360
  3.033333  3.301025  9.540213  0.307326
  3.111111  3.309155  9.797275  0.311241
  3.188889  3.317295  10.05497  0.315108
  3.266667  3.325444  10.31330  0.318927
  3.344444  3.333604  10.57226  0.322702
  3.422222  3.341774  10.83186  0.326432
  3.500000  3.349954  11.09209  0.330121
  3.577778  3.358144  11.35296  0.333769
  3.655556  3.366344  11.61447  0.337377
  3.733333  3.374554  11.87662  0.340947
  3.811111  3.382774  12.13940  0.344481
  3.888889  3.391003  12.40283  0.347978
  3.966667  3.399243  12.66689  0.351441
  4.044444  3.407493  12.93160  0.354869
  4.122222  3.415753  13.19695  0.358265
  4.200000  3.424023  13.46294  0.361629
  4.277778  3.432303  13.72957  0.364962
  4.355556  3.440593  13.99685  0.368265
  4.433333  3.448893  14.26478  0.371539
  4.511111  3.457202  14.53335  0.374784
  4.588889  3.465522  14.80257  0.378001
  4.666667  3.473852  15.07243  0.381191
  4.744444  3.482192  15.34294  0.384354
  4.822222  3.490542  15.61410  0.387492
  4.900000  3.498902  15.88592  0.482898
  4.977778  3.507272  16.15838  0.541234
  5.055556  3.515651  16.43149  0.583890
  5.133333  3.524041  16.70526  0.619500
  5.211111  3.532441  16.97968  0.650846
  5.288889  3.540851  17.25475  0.679251
  5.366667  3.549271  17.53048  1.074771
  5.444444  3.557701  17.80686  1.273569
  5.522222  3.566141  18.08390  1.427332
  5.600000  3.574590  18.36159  1.558443
  5.677778  3.583050  18.63994  1.675118
  5.755556  3.591520  18.91896  1.781500
  5.833333  3.600000  19.19863  1.880036
  5.911111  3.608490  19.47896  1.972321
  5.988889  3.616990  19.75995  2.059464
  6.066667  3.625500  20.04160  2.415972
  6.144444  3.634019  20.32391  3.090364
  6.222222  3.642549  20.60689  3.934177
  6.300000  3.651089  20.89053  4.871499
  6.377778  3.659639  21.17484  5.826984
  6.455556  3.668199  21.45981  6.724972
  6.533333  3.676769  21.74545  7.499190
  6.611111  3.685348  22.03175  8.107564
  6.688889  3.693938  22.31873  8.550520
  6.766667  3.702538  22.60637  8.967692
  6.844444  3.711148  22.89468  9.334284
  6.922222  3.719768  23.18366  9.685665
  7.000000  3.728398  23.47331  10.02364
  END FTABLE  1
END FTABLES

EXT SOURCES
```

```
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    0.8            RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           RCHRES   1     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
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   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 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       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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F. WATER QUALITY SYSTEM

Water quality is required for this development. All stormwater runoff from pollution generating surface will receive enhanced water quality treatment by a Modular Wetland System prior to entering the detention pond

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	22323-WQ
Site Name:	BCE 22323-CHEHALS
Site Address:	0 Rush Road
City:	chehalis
Report Date:	6/20/2022
Gage:	Olympia
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1-Detention Pond

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	22.01
Pervious Total	22.01
Impervious Land Use	acre
Impervious Total	0
Basin Total	22.01

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1-Detention Pond

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	11.05
Pervious Total	11.05

Impervious Land Use	acre
ROADS FLAT	8.72
DRIVEWAYS FLAT	2.24
Impervious Total	10.96
Basin Total	22.01

Element Flows To:

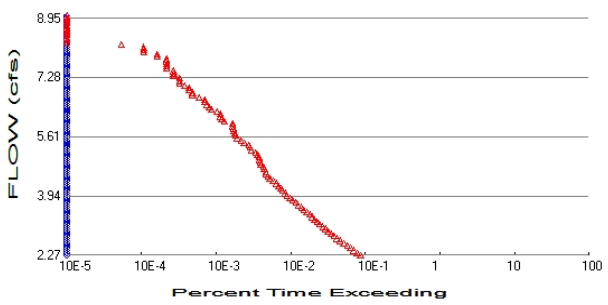
Surface	Interflow	Groundwater

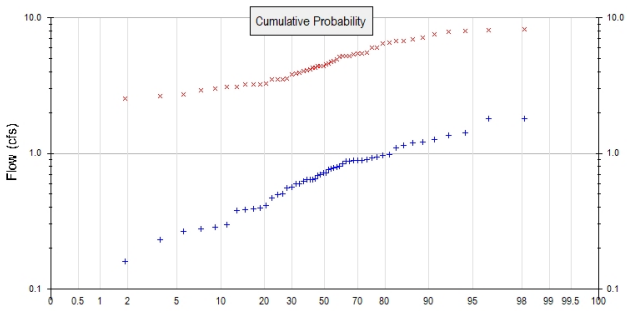
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 22.01
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 11.05
Total Impervious Area: 10.96

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.688584
5 year	1.053273
10 year	1.276793
25 year	1.534711
50 year	1.709249
100 year	1.8697

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	4.538105
5 year	5.995513
10 year	6.935057
25 year	8.099749
50 year	8.954168
100 year	9.799444

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.841	4.185
1957	1.152	7.126
1958	0.388	3.503
1959	0.496	4.273
1960	0.921	5.443
1961	0.694	4.045
1962	0.231	3.089
1963	0.976	8.146
1964	0.718	4.804
1965	0.594	4.271

1966	0.383	3.104
1967	0.774	3.534
1968	0.564	2.929
1969	0.298	3.025
1970	0.639	3.277
1971	0.805	3.526
1972	1.192	5.413
1973	0.648	3.234
1974	0.470	5.199
1975	1.092	6.494
1976	0.880	5.237
1977	0.160	5.998
1978	0.686	5.543
1979	0.882	6.715
1980	0.640	3.939
1981	0.906	6.545
1982	0.598	5.381
1983	0.969	6.702
1984	0.777	3.883
1985	0.265	3.217
1986	1.212	4.563
1987	1.365	8.259
1988	0.392	2.708
1989	0.503	4.428
1990	1.424	7.525
1991	1.791	7.962
1992	0.412	3.560
1993	0.287	2.522
1994	0.276	2.632
1995	0.788	4.076
1996	1.262	5.166
1997	0.715	4.377
1998	0.622	6.033
1999	0.870	4.961
2000	0.887	5.255
2001	0.136	3.224
2002	0.889	4.406
2003	0.379	2.401
2004	0.558	4.604
2005	0.642	3.810
2006	0.943	4.720
2007	0.755	6.924
2008	1.813	7.866

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.8127	8.2590
2	1.7907	8.1457
3	1.4240	7.9618
4	1.3650	7.8658
5	1.2616	7.5246
6	1.2118	7.1259
7	1.1922	6.9239
8	1.1521	6.7152
9	1.0922	6.7016
10	0.9763	6.5448
11	0.9689	6.4937

12	0.9428	6.0333
13	0.9207	5.9983
14	0.9059	5.5432
15	0.8887	5.4432
16	0.8866	5.4131
17	0.8817	5.3810
18	0.8796	5.2554
19	0.8699	5.2365
20	0.8408	5.1989
21	0.8051	5.1660
22	0.7879	4.9612
23	0.7766	4.8044
24	0.7740	4.7199
25	0.7546	4.6035
26	0.7182	4.5635
27	0.7149	4.4278
28	0.6938	4.4060
29	0.6858	4.3770
30	0.6478	4.2726
31	0.6425	4.2711
32	0.6399	4.1848
33	0.6392	4.0758
34	0.6224	4.0454
35	0.5983	3.9393
36	0.5944	3.8826
37	0.5642	3.8099
38	0.5578	3.5596
39	0.5029	3.5336
40	0.4963	3.5257
41	0.4700	3.5032
42	0.4115	3.2771
43	0.3925	3.2336
44	0.3877	3.2244
45	0.3827	3.2169
46	0.3793	3.1043
47	0.2982	3.0892
48	0.2869	3.0251
49	0.2758	2.9290
50	0.2647	2.7085
51	0.2308	2.6316
52	0.1599	2.5223
53	0.1362	2.4009

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3443	0	1602	n/a	Fail
0.3581	0	1436	n/a	Fail
0.3719	0	1300	n/a	Fail
0.3857	0	1177	n/a	Fail
0.3994	0	1065	n/a	Fail
0.4132	0	954	n/a	Fail
0.4270	0	845	n/a	Fail
0.4408	0	779	n/a	Fail
0.4546	0	704	n/a	Fail
0.4684	0	644	n/a	Fail
0.4822	0	590	n/a	Fail
0.4960	0	547	n/a	Fail
0.5097	0	498	n/a	Fail
0.5235	0	453	n/a	Fail
0.5373	0	422	n/a	Fail
0.5511	0	386	n/a	Fail
0.5649	0	359	n/a	Fail
0.5787	0	334	n/a	Fail
0.5925	0	306	n/a	Fail
0.6063	0	279	n/a	Fail
0.6200	0	260	n/a	Fail
0.6338	0	233	n/a	Fail
0.6476	0	218	n/a	Fail
0.6614	0	197	n/a	Fail
0.6752	0	182	n/a	Fail
0.6890	0	165	n/a	Fail
0.7028	0	157	n/a	Fail
0.7166	0	145	n/a	Fail
0.7303	0	137	n/a	Fail
0.7441	0	127	n/a	Fail
0.7579	0	118	n/a	Fail
0.7717	0	108	n/a	Fail
0.7855	0	98	n/a	Fail
0.7993	0	92	n/a	Fail
0.8131	0	88	n/a	Fail
0.8269	0	86	n/a	Fail
0.8406	0	82	n/a	Fail
0.8544	0	80	n/a	Fail
0.8682	0	74	n/a	Fail
0.8820	0	73	n/a	Fail
0.8958	0	70	n/a	Fail
0.9096	0	70	n/a	Fail
0.9234	0	67	n/a	Fail
0.9372	0	63	n/a	Fail
0.9509	0	55	n/a	Fail
0.9647	0	53	n/a	Fail
0.9785	0	51	n/a	Fail
0.9923	0	44	n/a	Fail
1.0061	0	40	n/a	Fail
1.0199	0	36	n/a	Fail
1.0337	0	34	n/a	Fail
1.0475	0	33	n/a	Fail
1.0612	0	32	n/a	Fail

1.0750	0	32	n/a	Fail
1.0888	0	31	n/a	Fail
1.1026	0	31	n/a	Fail
1.1164	0	24	n/a	Fail
1.1302	0	22	n/a	Fail
1.1440	0	21	n/a	Fail
1.1578	0	21	n/a	Fail
1.1715	0	19	n/a	Fail
1.1853	0	16	n/a	Fail
1.1991	0	15	n/a	Fail
1.2129	0	14	n/a	Fail
1.2267	0	13	n/a	Fail
1.2405	0	13	n/a	Fail
1.2543	0	11	n/a	Fail
1.2681	0	9	n/a	Fail
1.2818	0	9	n/a	Fail
1.2956	0	8	n/a	Fail
1.3094	0	8	n/a	Fail
1.3232	0	7	n/a	Fail
1.3370	0	6	n/a	Fail
1.3508	0	6	n/a	Fail
1.3646	0	6	n/a	Fail
1.3784	0	5	n/a	Fail
1.3921	0	5	n/a	Fail
1.4059	0	5	n/a	Fail
1.4197	0	4	n/a	Fail
1.4335	0	4	n/a	Fail
1.4473	0	4	n/a	Fail
1.4611	0	4	n/a	Fail
1.4749	0	4	n/a	Fail
1.4886	0	3	n/a	Fail
1.5024	0	3	n/a	Fail
1.5162	0	2	n/a	Fail
1.5300	0	2	n/a	Fail
1.5438	0	2	n/a	Fail
1.5576	0	1	n/a	Fail
1.5714	0	0	n/a	Pass
1.5852	0	0	0	Pass
1.5989	0	0	0	Pass
1.6127	0	0	0	Pass
1.6265	0	0	0	Pass
1.6403	0	0	0	Pass
1.6541	0	0	0	Pass
1.6679	0	0	0	Pass
1.6817	0	0	0	Pass
1.6955	0	0	0	Pass
1.7092	0	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:	1.804 acre-feet
On-line facility target flow:	1.667 cfs.
Adjusted for 15 min:	1.667 cfs.
Off-line facility target flow:	0.9319 cfs.
Adjusted for 15 min:	0.9319 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.

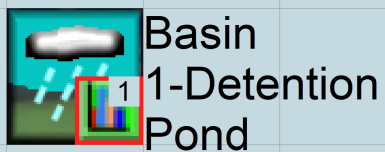
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2008 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   22323-WQ.wdm
MESSU       25   Pre22323-WQ.MES
            27   Pre22323-WQ.L61
            28   Pre22323-WQ.L62
            30   POC22323-WQ1.dat
END FILES

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

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

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

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1-Detention Pond ***
PERLND  10                      22.01     COPY   501     12
PERLND  10                      22.01     COPY   501     13

******Routing******
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><---><---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2008 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   22323-WQ.wdm
MESSU       25   Mit22323-WQ.MES
            27   Mit22323-WQ.L61
            28   Mit22323-WQ.L62
            30   POC22323-WQ1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       5
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1-Detention Pond     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           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         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  *********
   16         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 ***
   16         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
   16             0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16           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
   16             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           ***
    1      ROADS/FLAT             1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    5         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
```

```
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    5              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    5              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1-Detention Pond ***
PERLND  16                       11.05     COPY   501     12
PERLND  16                       11.05     COPY   501     13
IMPLND   1                        8.72     COPY   501     15
IMPLND   5                        2.24     COPY   501     15

******Routing******
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            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

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G. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The conveyance system will be sized using the Modified Rational Method with 25-year precipitation event using a minimum 6.3-minute initial time of concentration and Manning's 'n' value of 0.012 for pipes. Conveyance system sizing calculations will be provided with documents for final engineering review.

FIGURE 9
CONVEYANCE CALCULATIONS

TAP 6.0

6.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

SWPPP shall be provided with final engineering review.

TAP 7.0

7.0 SPECIAL REPORT AND STUDY.

Biological Evaluation

SEPA Check list

TAP 8.0

8.0 OTHER PERMITS

Other permits for this project include:

- Site Development Permit
- Building Permit
- Water Main Extension Permit
- Right-of-Way Use Permit

TAP 9.0

9.0 OPERATION AND MAINTENANCE MANUAL

Operation and Maintenance Manual will be provided at final engineering review.

TAP 10.0

10.0 BOND QUANTITIES WORKSHEET

Bond quantities will be provided as required by the City of Chehalis at final engineering review.