



Blaine Development Preliminary Storm Drainage Report

Site Location:
South of Pipeline Road and East of Yew Avenue
City of Blaine, Washington

Parcel#s:
400106 530277 0000, 400106 487260 0000, 400106 508255 0000, 400106
430178 0000, 400106 465259 0000, 400106 419225 0000, 400106 511105
0000, 400106 53273 0000, 400106 531255 0000, and 400106 531245 0000

Prepared for:
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1. PROJECT OVERVIEW

This Preliminary Storm Drainage Report is submitted in support of a General Binding Site Plan (GBSP) and Site Plan Review (SPR) for the Klein property, referred to as the Blaine Development.

The following tabulates the project site data:

Addresses:	None
Parcel Numbers:	400106 530277 0000, 400106 487260 0000, 400106 508255 0000, 400106 430178 0000, 400106 465259 0000, 400106 419225 0000, 400106 511105 0000, 400106 53273 0000, 400106 531255 0000, and 400106 531245 0000
Site Area Total	45.34 acres
Zoning:	Manufacturing (Mb)
Drainage Basin:	Drayton Harbor

This analysis is completed using the format set forth in the 2005 Department of Ecology (DOE) Stormwater Management Manual as adopted by the City of Blaine. Figure 1 – *Stormwater Facility Summary* is attached on the following page.

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Figure 1 – Stormwater Facility Summary

Stormwater Facility	
On-site Developed Area	22.8 acres
Off-site Improved Area	1.75 acres (Access Road – new ROW)
Types of storage proposed	Detention Vaults
Approximate total storage volume	336,500 cf (entire development)
Soil Types	Type C Soils
Release Rates* (On-site/Off-site)	
2-year	0.42 cfs / 0.03 cfs
10-year	0.88 cfs / 0.07 cfs
100-year	1.77 cfs / 0.13 cfs

*Release rates are from on-site developed area. Off-site flows were pro-rated from the on-site flows.

Project Description:

Please refer to *Figures 2 – Vicinity Map* and *Figure 3 – Area Calculations* to aid in the project description.

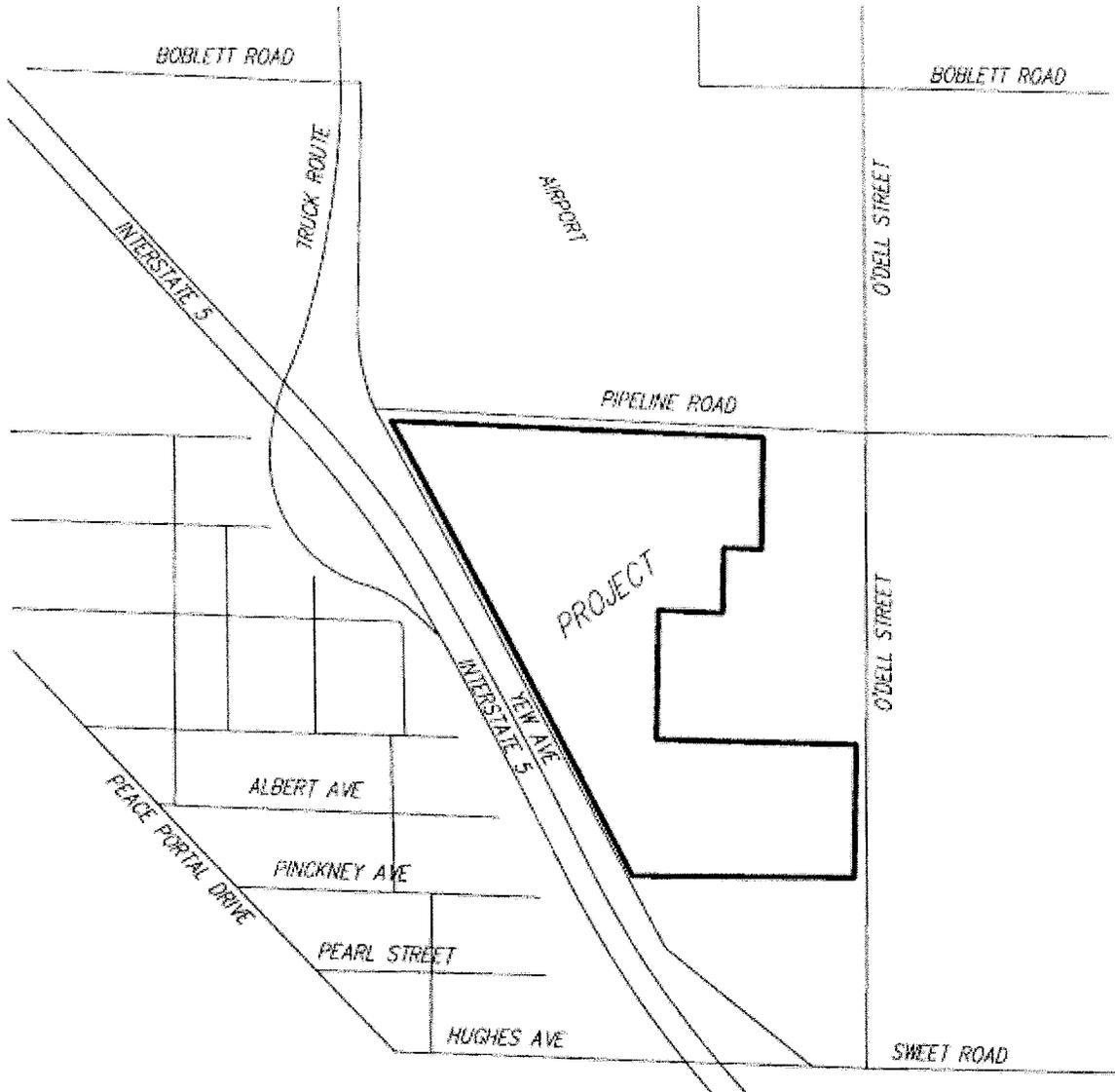
The development proposes to construct a new Industrial Park consisting of approximately five buildings totaling approximately 480,600 sq.ft.; surface parking for approximately 882 cars, truck loading and associated site development on a 45.34 acre overall site. In addition, an access road off O’Dell Road is proposed.

The project site is located between Yew Avenue to the west, Pipeline Road to the north, Odell road to the east, and a cleared, undeveloped private property to the south. The Blaine Airport is located to the North of Pipeline Road. Interstate 5 is located west of Yew Road. Large industrial and commercial buildings occur in the vicinity of the site.

The overall site area is approximately 45 acres with three usable areas defined by natural topography and critical area limitations. All site runoff drain to wetlands onsite.

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Figure 2 – Vicinity Map



VICINITY MAP
1 inch = 800 ft.

More generally the site is located within the SE ¼ of Section 6, Township 40 North, Range 1 East, Willamette Meridian, City of Blaine, Washington.

2. CONDITIONS AND REQUIREMENTS SUMMARY

MINIMUM REQUIREMENT #1: Preparation of Stormwater Site Plans

A Complete set of Stormwater facilities and conveyance systems plan will be prepared for this project for engineering review. A preliminary grading and drainage plan has been prepared for the purpose of this GBSP and SPR application.

MINIMUM REQUIREMENT #2: Construction Stormwater Pollution Prevention (SWPPP)

A SWPPP will be provided for engineering review process.

MINIMUM REQUIREMENT #3: Source Control of Pollution

Source control will be provided as required for the intended uses.

MINIMUM REQUIREMENT #4: Preservation of Natural Drainage System

Stormwater from the development will detained, treated, then discharged to the existing onsite wetlands as it did in natural existing conditions.

MINIMUM REQUIREMENT #5: On-site Stormwater Management

Detention and water quality treatment facilities are proposed to control and treat stormwater runoff from each of the five proposed development parcels as well as the access road.

MINIMUM REQUIREMENT #6: Runoff Treatment

Wetvaults are proposed for water quality treatment for each of the five development parcels as well as the access road. Although wetvaults are proposed in the preliminary design, it is possible that alternative treatment systems (such as StormFilters) be used as the final stormwater design for the site. See Section 4.

MINIMUM REQUIREMENT #7: Flow Control

Detention vaults are proposed for each of the five development parcels as well as the access road. The stormwater vaults have been preliminarily sized using the Western Washington Hydrologic Modeling Version 3 (WVHM3) program. See Section 4.

MINIMUM REQUIREMENT #8: Wetlands Protection

Wetlands and its buffers have be maintained and/or mitigated for as determined by the project Wetland Biologist. Please refer to the Wetland Report and Mitigation Plan prepared by PE Consultants LLC, dated November of 2008 included as part of the submittal package.

MINIMUM REQUIREMENT #9: Basin/Watershed Planning

Not applicable.

MINIMUM REQUIREMENT #10: Operation and Maintenance

An Operations and Maintenance Manual will be provided with the Final Storm Drainage Report.

OPTIONAL GUIDANCE #1: Financial Liability

The Developer or the Contractor will be responsible for any required financial guarantees.

OPTIONAL GUIDANCE #2: Offsite Analysis and Mitigation

See Section 3.

3. OFFSITE ANALYSIS

No offsite analysis was performed for this preliminary report under this GBSP and SPR application. It is assumed that since stormwater runoff from the site will be detained and treated to current standards (releasing to peaks and durations of the site in forested conditions), no drainage issues are anticipated from the development of this project. If drainage issues exist within effective reach of the downstream drainage course of the development, it is assumed that this development will not add to the cause of these problems. An offsite analysis will be provided for the engineering review process.

4. FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

Stormwater Design Concept and Intent

Due to the limited open space of each development parcel, underground vaults are proposed for detention and water quality treatment. Controlled flows from the vaults are to be discharged to the onsite wetlands via dispersion system within the wetland buffer areas as approved by the City of Blaine and the Wetland Biologist. Please refer to the *Overall Site Plan* included in Appendix A for site plan layout, delineation of parcels, and proposed location of stormwater facilities.

Below is a table of areas tabulated for the entire site. For this preliminary analysis, a single stormwater detention and water quality vault will be sized for the entire developable site and required volumes for each parcel were pro-rated accordingly.

Figure 3 – Area Calculations

Area	Parcels					Total
	A	B1	B2	C1	C2	
Total	3.99	30.17	2.61	4.3	4.27	45.34
Wetland	1.89	16.2	0.85	1.77	1.79	22.5
Developable	2.1	13.97	1.76	2.53	2.48	22.84
Impervious	1.76	11.60	1.59	2.29	2.29	19.52
Pervious	0.34	2.37	0.17	0.24	0.19	3.32
% of Total Developable	9.2%	61.2%	7.7%	11.1%	10.9%	100.0%

Detention Vault Sizing using 2005 DOE Standards:

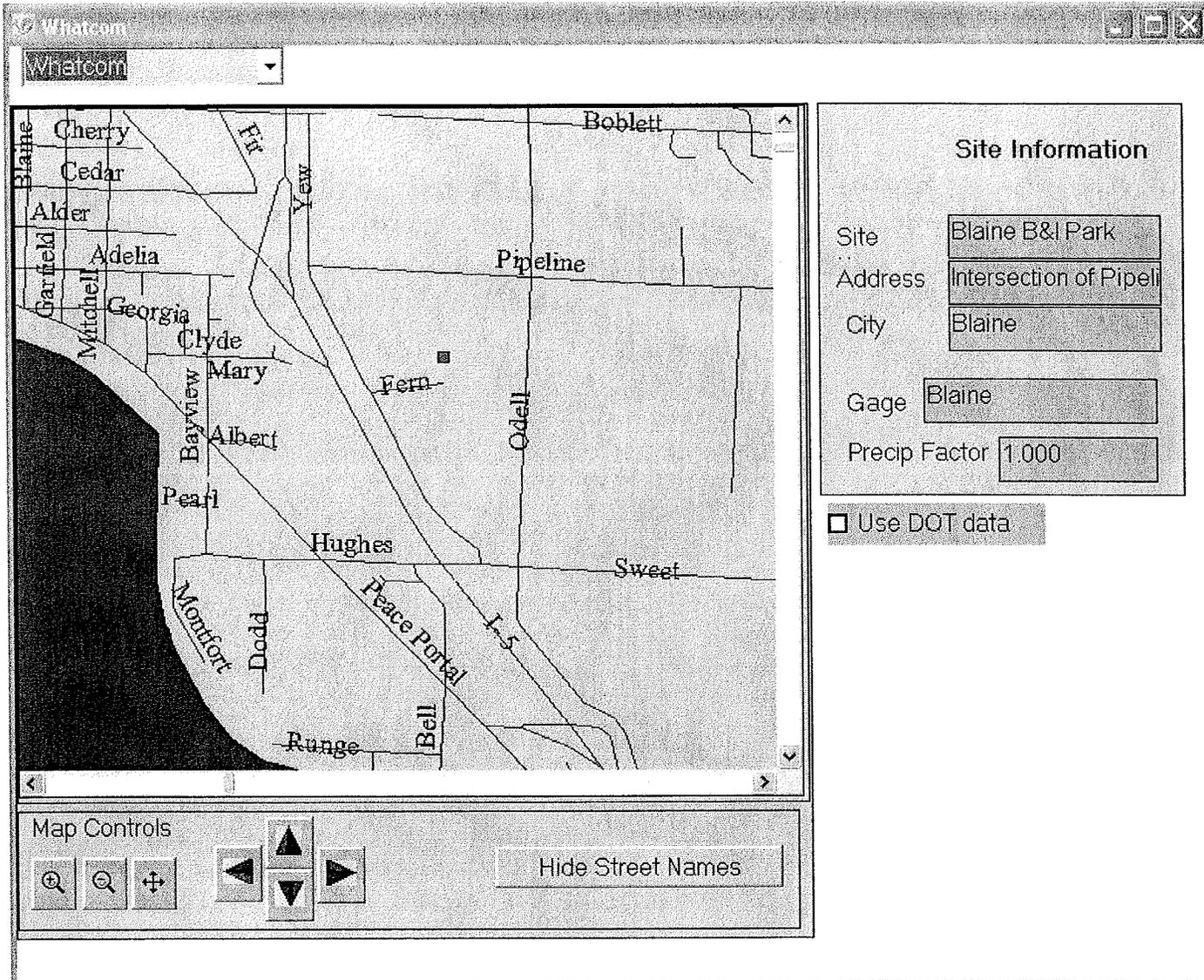
Flows generated using a continuous simulation model WWHM3.

- Match developed discharge peaks to predeveloped peaks for 2-year to 25-year storm event.
- Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

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WVHM3 Output

Continuous simulation model using Western Washington Hydrology Model (WVHM) Version 3.
Note that an abbreviated output is included with this preliminary report. A full set of output files will be provided with the final report.



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Basin 1 (Predeveloped)

Subbasin Name: Basin 1

Flows To : Surface Interflow Groundwater

Area in Basin Show Only Selected

Available Pervious		Available Impervious	
<input type="checkbox"/> A/B, Forest, Flat	0	<input type="checkbox"/> ROADS/FLAT	0
<input type="checkbox"/> A/B, Forest, Mod	0	<input type="checkbox"/> ROADS/MOD	0
<input type="checkbox"/> A/B, Forest, Steep	0	<input type="checkbox"/> ROADS/STEEP	0
<input type="checkbox"/> A/B, Pasture, Flat	0	<input checked="" type="checkbox"/> ROOF TOPS FLAT	0
<input type="checkbox"/> A/B, Pasture, Mod	0	<input type="checkbox"/> DRIVEWAYS/FLAT	0
<input type="checkbox"/> A/B, Pasture, Steep	0	<input type="checkbox"/> DRIVEWAYS/MOD	0
<input type="checkbox"/> A/B, Lawn, Flat	0	<input type="checkbox"/> DRIVEWAYS/STEEP	0
<input type="checkbox"/> A/B, Lawn, Mod	0	<input type="checkbox"/> SIDEWALKS/FLAT	0
<input type="checkbox"/> A/B, Lawn, Steep	0	<input type="checkbox"/> SIDEWALKS/MOD	0
<input checked="" type="checkbox"/> C, Forest, Flat	22.8	<input type="checkbox"/> SIDEWALKS/STEEP	0
<input type="checkbox"/> C, Forest, Mod	0	<input checked="" type="checkbox"/> PARKING FLAT	0
<input type="checkbox"/> C, Forest, Steep	0	<input type="checkbox"/> PARKING/MOD	0
<input type="checkbox"/> C, Pasture, Flat	0	<input type="checkbox"/> PARKING/STEEP	0
<input type="checkbox"/> C, Pasture, Mod	0	<input type="checkbox"/> POND	0
<input type="checkbox"/> C, Pasture, Steep	0		
<input checked="" type="checkbox"/> C, Lawn, Flat	0		
<input type="checkbox"/> C, Lawn, Mod	0		
<input type="checkbox"/> C, Lawn, Steep	0		

Pervious Total: 22.8 Acres Impervious Total: 0 Acres

Basin Total: 22.8 Acres

Deselect Zero Select By: GO

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Basin 1 Mitigated

Subbasin Name: Designate as Bypass for POC

Flows To: **Surface** **Interflow** **Groundwater**

Area in Basin Show Only Selected

Available Pervious		Available Impervious	
<input type="checkbox"/> A/B, Forest, Flat	0	<input type="checkbox"/> ROADS/FLAT	0
<input type="checkbox"/> A/B, Forest, Mod	0	<input type="checkbox"/> ROADS/MOD	0
<input type="checkbox"/> A/B, Forest, Steep	0	<input type="checkbox"/> ROADS/STEEP	0
<input type="checkbox"/> A/B, Pasture, Flat	0	<input checked="" type="checkbox"/> ROOF TOPS FLAT	10.9
<input type="checkbox"/> A/B, Pasture, Mod	0	<input type="checkbox"/> DRIVEWAYS/FLAT	0
<input type="checkbox"/> A/B, Pasture, Steep	0	<input type="checkbox"/> DRIVEWAYS/MOD	0
<input type="checkbox"/> A/B, Lawn, Flat	0	<input type="checkbox"/> DRIVEWAYS/STEEP	0
<input type="checkbox"/> A/B, Lawn, Mod	0	<input type="checkbox"/> SIDEWALKS/FLAT	0
<input type="checkbox"/> A/B, Lawn, Steep	0	<input type="checkbox"/> SIDEWALKS/MOD	0
<input checked="" type="checkbox"/> C, Forest, Flat	0	<input type="checkbox"/> SIDEWALKS/STEEP	0
<input type="checkbox"/> C, Forest, Mod	0	<input checked="" type="checkbox"/> PARKING FLAT	8.6
<input type="checkbox"/> C, Forest, Steep	0	<input type="checkbox"/> PARKING/MOD	0
<input type="checkbox"/> C, Pasture, Flat	0	<input type="checkbox"/> PARKING/STEEP	0
<input type="checkbox"/> C, Pasture, Mod	0	<input type="checkbox"/> POND	0
<input type="checkbox"/> C, Pasture, Steep	0		
<input checked="" type="checkbox"/> C, Lawn, Flat	3.3		
<input type="checkbox"/> C, Lawn, Mod	0		
<input type="checkbox"/> C, Lawn, Steep	0		

Pervious Total Acres Impervious Total Acres

Basin Total Acres

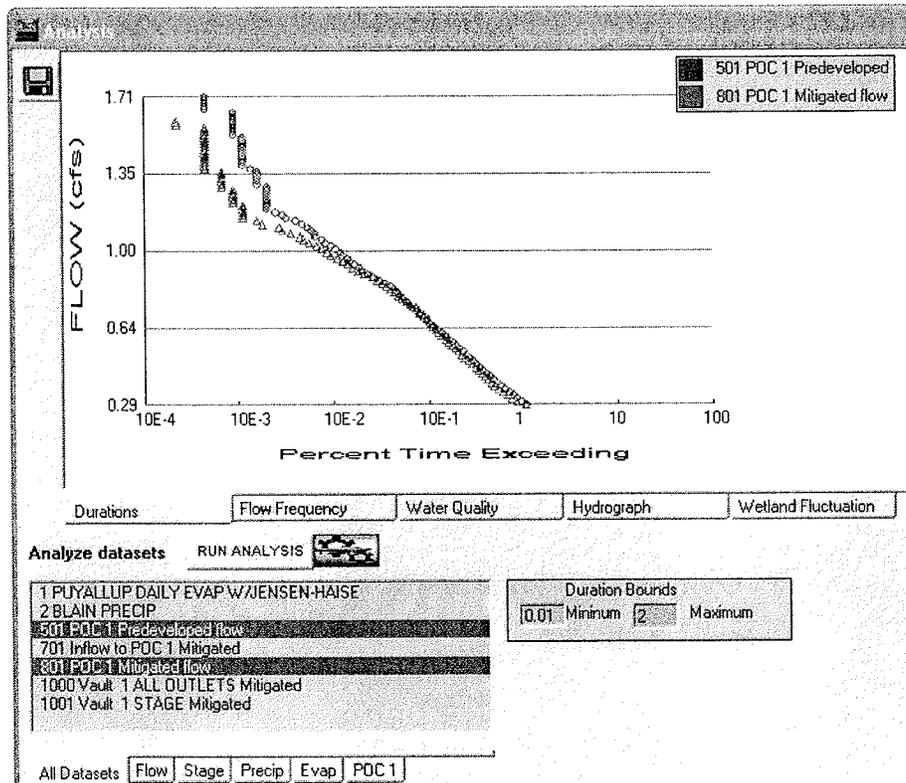
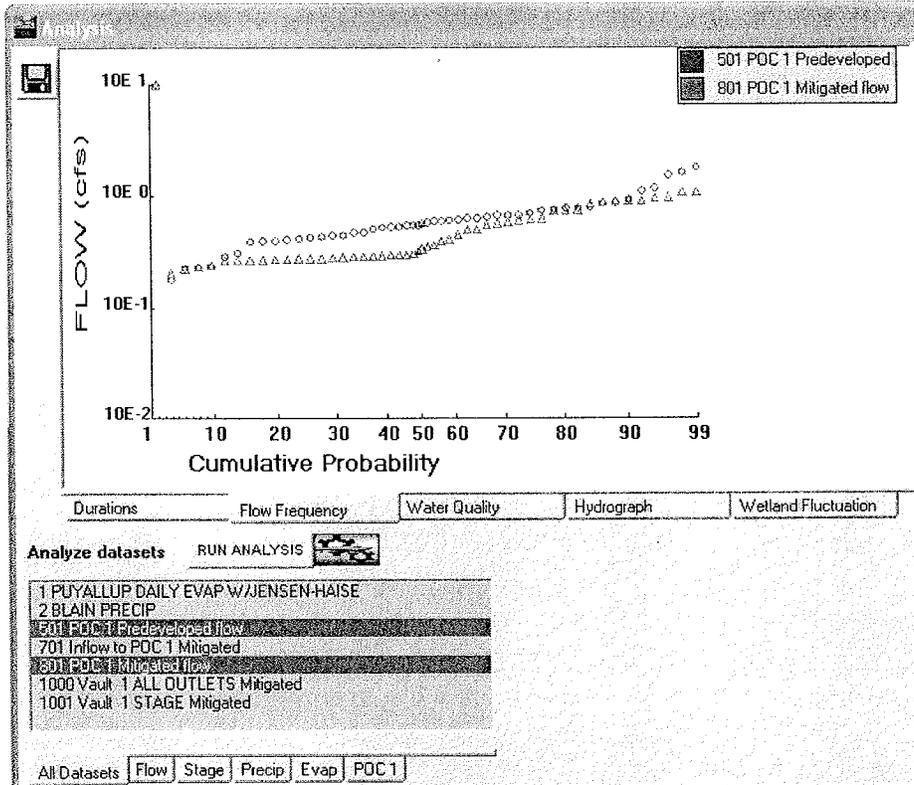
Deselect Zero **Select By:**

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Detention Vault Sizing

Vault: 1 Mitigated			
Facility Name	<input style="width: 100%;" type="text" value="Vault 1"/>		
	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	<input style="width: 100%;" type="text" value="0"/>	<input style="width: 100%;" type="text" value="0"/>	<input style="width: 100%;" type="text" value="0"/>
Facility Type	<input style="width: 100%;" type="text"/>		
<input type="checkbox"/> Precipitation Applied to Facility	<input type="checkbox"/> Auto Vault		<input type="checkbox"/> Quick Vault
<input type="checkbox"/> Evaporation Applied to Facility	<input type="checkbox"/> Fixed Width For Auto Vault		
Facility Bottom Elevation (ft)	<input style="width: 100%;" type="text" value="0"/>		
Facility Dimensions			
Length	<input style="width: 100%;" type="text" value="236.7785026"/>		
Width	<input style="width: 100%;" type="text" value="236.7785026"/>		
Effective Depth	<input style="width: 100%;" type="text" value="7"/>		
Outlet Structure			
Riser Height (ft)	<input style="width: 100%;" type="text" value="6"/>		
Riser Diameter(in)	<input style="width: 100%;" type="text" value="18"/>		
Riser Type	<input style="width: 100%;" type="text" value="Notched"/>		
Notch Type	<input style="width: 100%;" type="text" value="Rectangular"/>		
Notch Height (ft)	<input style="width: 100%;" type="text" value="2.3833"/>		
Notch Width (ft)	<input style="width: 100%;" type="text" value="0.0823"/>		
Infiltration	<input style="width: 100%;" type="text" value="NO"/>		
Orifice			
Number	Diameter (In)	Height (Ft)	QMax (cfs)
1	<input style="width: 100%;" type="text" value="2.407"/>	<input style="width: 100%;" type="text" value="0"/>	0.40259
2	<input style="width: 100%;" type="text" value="0"/>	<input style="width: 100%;" type="text" value="0"/>	0
3	<input style="width: 100%;" type="text" value="0"/>	<input style="width: 100%;" type="text" value="0"/>	0
Pond Volume at Riser Head (acre-ft)			9.009
Pond Increment			<input style="width: 100%;" type="text" value="0.10"/>
Show Pond Table			<input style="width: 100%;" type="text" value="Open Table"/>

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**Detention Volume Required for Developable Areas of All Parcels:
Required Volume = 336,500 cf**

Water Quality Treatment

Water Quality

On-Line BMP	Off-Line BMP
24 hour Volume (acre feet) 2.4126	
Standard Flow Rate (cfs) 2.9346	Standard Flow Rate (cfs) 1.6796
15 Minute Flow Rate 3.2608	15 Minute Flow rate 1.8663

Durations | Flow Frequency | **Water Quality** | Hydrograph | Wetland Fluctuation

Analyze datasets **RUN ANALYSIS**

- 1 PUYALLUP DAILY EVAP W/JENSEN-HAISE
- 2 BLAIN PRECIP
- 501 POC 1 Predeveloped flow
- 701 Inflow to POC 1 Mitigated**
- 801 POC 1 Mitigated flow
- 1000 Vault 1 ALL OUTLETS Mitigated
- 1001 Vault 1 STAGE Mitigated

All Datasets | Flow | Stage | Precip | Evap | POC 1

**Water Quality Volume Required for Developable Areas of All Parcels:
WQ Volume = 105,000 cf**

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Stormwater Facilities Sizing Summary

Preliminary Detention Sizing			
As Modeled in WWHM3	Total Area	22.8	ac
	Required Detention Volume	336,500	cf
Detention Volume/Area	Calculated	14,733	cf/ac

Preliminary WQ Sizing			
As Modeled in WWHM3	Total Area	22.8	ac
	WQ Volume	105,000	cf
WQ Volume/Area	Calculated	4,597	cf/ac

Area	Parcels					
	A	B1*	B2	C1	C2	Total
Percentage of Developable	9.2%	61.2%	7.7%	11.1%	10.9%	100.0%
Detention Volume (cf)	30,939	205,819	25,930	37,274	36,538	336,500
WQ Volume (cf)	9,654	64,223	8,091	11,631	11,401	105,000

*Note that due to configuration of the site, two vaults are proposed for Parcel B1.

Off-site (Access Road)		
Area (ac)	Volume* (cf)	
	Detention	WQ
1.75	25,783	8,045

*Volume determined based on calculated cf/ac for on-site areas.

5. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Conveyance system sizing will be provided for engineering review process.

6. SPECIAL REPORTS AND STUDIES

- A *Wetland Report & Mitigation Plan* prepared by PE Consultants LLC, dated November 23, 2008. Included with this submittal.
- A *Bald Eagle Management Plan* prepared by PE Consultants LLC, dated December 9, 2008. Included with this submittal.
- A *Traffic Impact Study* prepared by Gibson Traffic Consultants, Inc., dated January, 2008. Included with this submittal.

7. OTHER PERMITS

- Washington State Department of Ecology.
- U.S. Army Corps of Engineers Permit under Section 404 of the Clean Water Act for Wetland Fill
- Washington Department of Fish and Wildlife HPA (for Wetland Fill)
- City of Blaine General Binding Site Plan
- City of Blaine Site Plan Review
- City of Blaine Right-of-Way Vacation Request

8. TEMPORARY EROSION AND SEDIMENT CONTROL ANALYSIS AND DESIGN

A detailed Erosion and Sediment Control Plan will be provided for engineering review process.

9. BOND QUANTITIES, FACILITY SUMMARIES AND DECLARATION OF COVENANT

Bond and liability assurances will be provided at the time of final engineering.

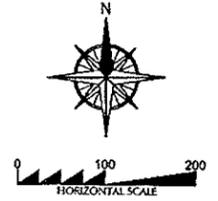
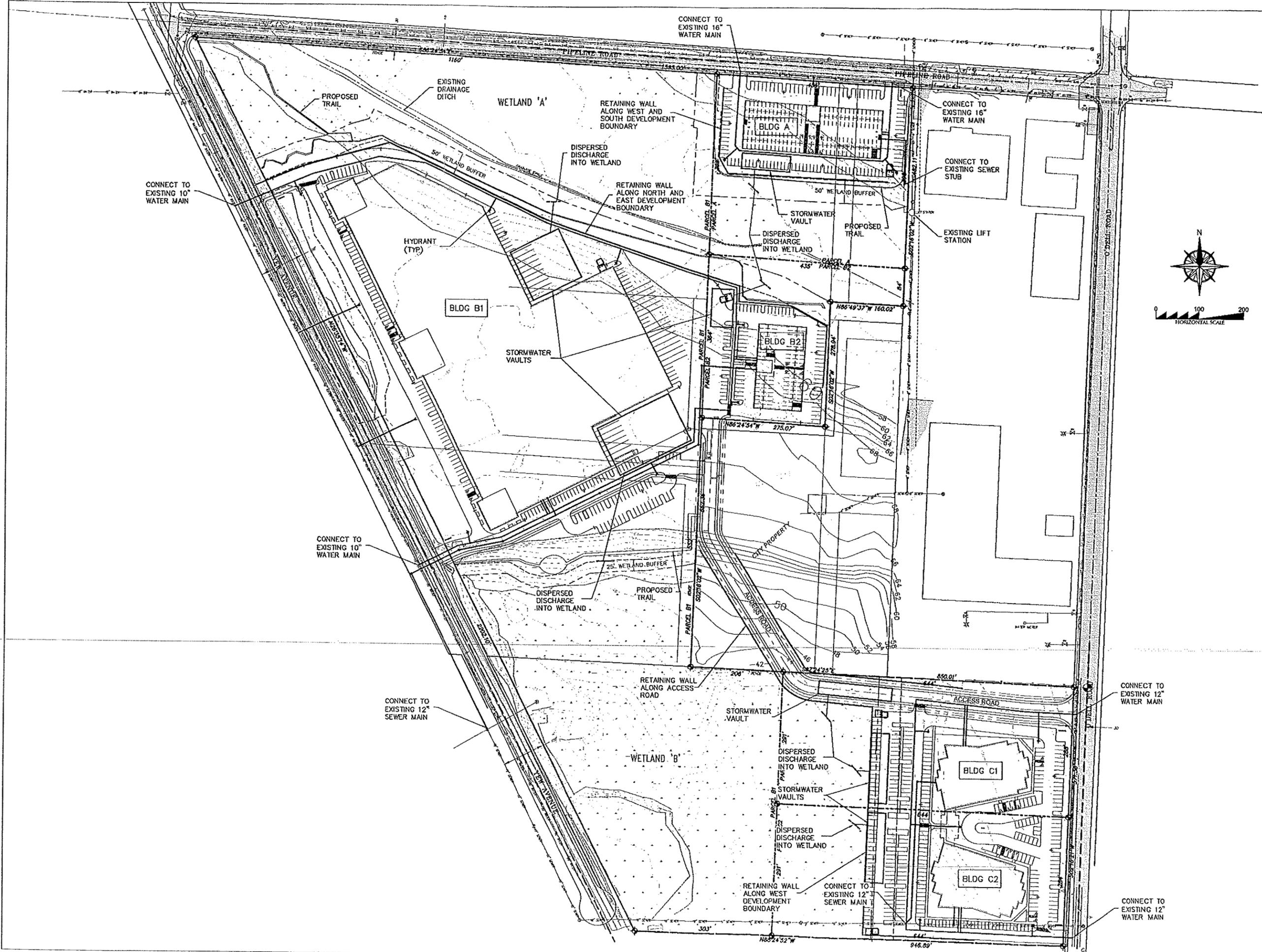
10. OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual will be provided with the Final Storm Drainage Report.

Appendix A

Overall Site Plan

P:\2008\08120A Blaine - P\Drawing\Working\08120-680.dwg, 10/11/2010 6:33:27 PM, HP LaserJet 5000 Series PCL 5e



SUBMISSION NO. 1
 SITE PLAN REVIEW
BLAINE DEVELOPMENT
 YEWE AVE. & PIPELINE RD.
 BLAINE, WA 98230

PATRICK HARRON & ASSOCIATES, LLC
 Civil Engineering & Planning
 14800 International Ave. S. Suite 270, Seattle, WA 98148
 Phone: 206.674.4659 / Fax: 206.674.4660
 Web: patrickharron.com

Freiheit & Ho
 architects
 10230 NE Pointe Drive | Ste 300 | Kirkland, WA 98033 www.FHOARCH.COM | T: 425.827.2100

**OVERALL DEVELOPMENT
 CONCEPTUAL DRAINAGE
 AND UTILITY PLAN**



REV	DESCRIPTION	DATE

OVERALL SITE PLAN

C1

PROJECT NUMBER: 1011110
 FREIHEIT & HO ARCHITECTS, INC., P.S.