

Transmittal

Date: May 11, 2015

To: Janelle Hitch, P.E.
City of Bainbridge Island

From: Kelsey Laughlin, P.E. *KL*
Browne Wheeler Engineers, Inc.

Re: BGH Sunrise Preliminary Plat Report PRE18840 – Revision 1

Enclosed is the revised Report for the Rolling Sunrise Preliminary Plat dated 5/11/2015. The plans have not been revised.

The general items that were revised in the report are the following:

1. The threshold determination discussion incorporates the Hearing Examiner's revocation of COBI's policy to allow infiltration to be taken into consideration when evaluating Minimum Requirement thresholds.
2. Minimum Requirement No. 7 thresholds.
3. Soil explorations completed, assumed infiltration rates and the additional studies required prior to plat utility design.
4. Assumption of a typical residential lot and rain garden sizing applicable to the preliminary lot layout.
5. Summary of Stormwater Minimum Requirements in Table 2.
6. Engineering Calculations including:
 - a. Breakdown of predeveloped and developed land areas and types,
 - b. WWHM3 screen shots of predeveloped and developed site areas and resulting flows, illustrating below the 0.1-cfs increase threshold,
 - c. South and north access driveways infiltration trench sizing,
 - d. Rain garden sizing for a typical residential building lot for rooftop and driveway areas.

Please contact us if you have questions.

Revision 1 May 11, 2015
March 24, 2014

Michel Girard
BGH Development, LLC
Michel@BGHdevelopment.com
206.335.1649

Re: Rolling Sunrise Subdivision - Preliminary Plat

Dear Michel:

This letter presents our preliminary drainage, utility and road design for the proposed BGH Rolling Sunrise Preliminary Plat. The proposed plat includes the subdivision of one 3.41-acre parcel into 7 single family residential parcels.

EXISTING CONDITIONS

The site is located south of the road end of Sunrise Drive, and north of Hyla Avenue. Currently the site is undeveloped with grass, brush and trees. The site is served by a gravel access driveway through a 20-ft easement from Sunrise Drive.

The soil is mapped by the United States Department of Agriculture as Harstine gravelly ashy sandy loam. The site slopes generally to the south gently to steeply across the site.

SITE ACCESS

Existing

The site currently has a gravel driveway located in an easement which provides access to the site from Sunrise Drive to the north.

Proposed

The existing access driveway to the north will be widened to meet road standards and fire access requirements and extended to serve the north 4 lots. The driveway will be widened to 12-ft with 2 and 3-ft gravel shoulders as required by the City. The length of driveway with 2-ft shoulders rather than 3-ft is 200-ft, from Sunrise Drive through the 20-ft wide access easement to provide space for a 2-ft wide infiltration trench paralleling the driveway.

A new south access is proposed off of Hyla Avenue to the southwest in which an easement through private property exists. The new access approach will be at a 90-degree turn in Hyla Avenue. Because both access roads are gravel surfacing, the road approaches are proposed to be gravel.

STORM DRAINAGE

Existing

Stormwater appears to infiltrate into the soils on-site or flows in a dispersed manner with no indications of runoff on-site.

Downstream System

The site drains south toward Hyla Avenue and two private properties (see Drainage Map). Hyla Avenue is a gravel road that does not have any stormwater management infrastructure installed. Stormwater runoff appears to flow in a dispersed manner south to a closed depression along Hyla Avenue, approximately 200-ft from the southwest of the subject property. The property owner southwest of the project indicated that water frequently ponds on both sides of Hyla Avenue on private and public property where it eventually infiltrates.

The property southeast of the project site also has an apparent closed depression along the south edge but the owners have not indicated any issues related to stormwater runoff.

Proposed

The proposed project consists of providing storm drainage facilities for two access driveways to serve the seven lots. The storm drainage system will be designed to infiltrate 100% of the stormwater runoff from the driveways on-site through the installation of infiltration trenches along the two access driveways. All new gravel access driveways will drain through a grass shoulder to an infiltration trench along the driveway to allow stormwater runoff from the driveway area to infiltrate into native soils. Check dams will be installed along the infiltration trenches as required to disperse infiltration and prevent accumulation of water in one spot.

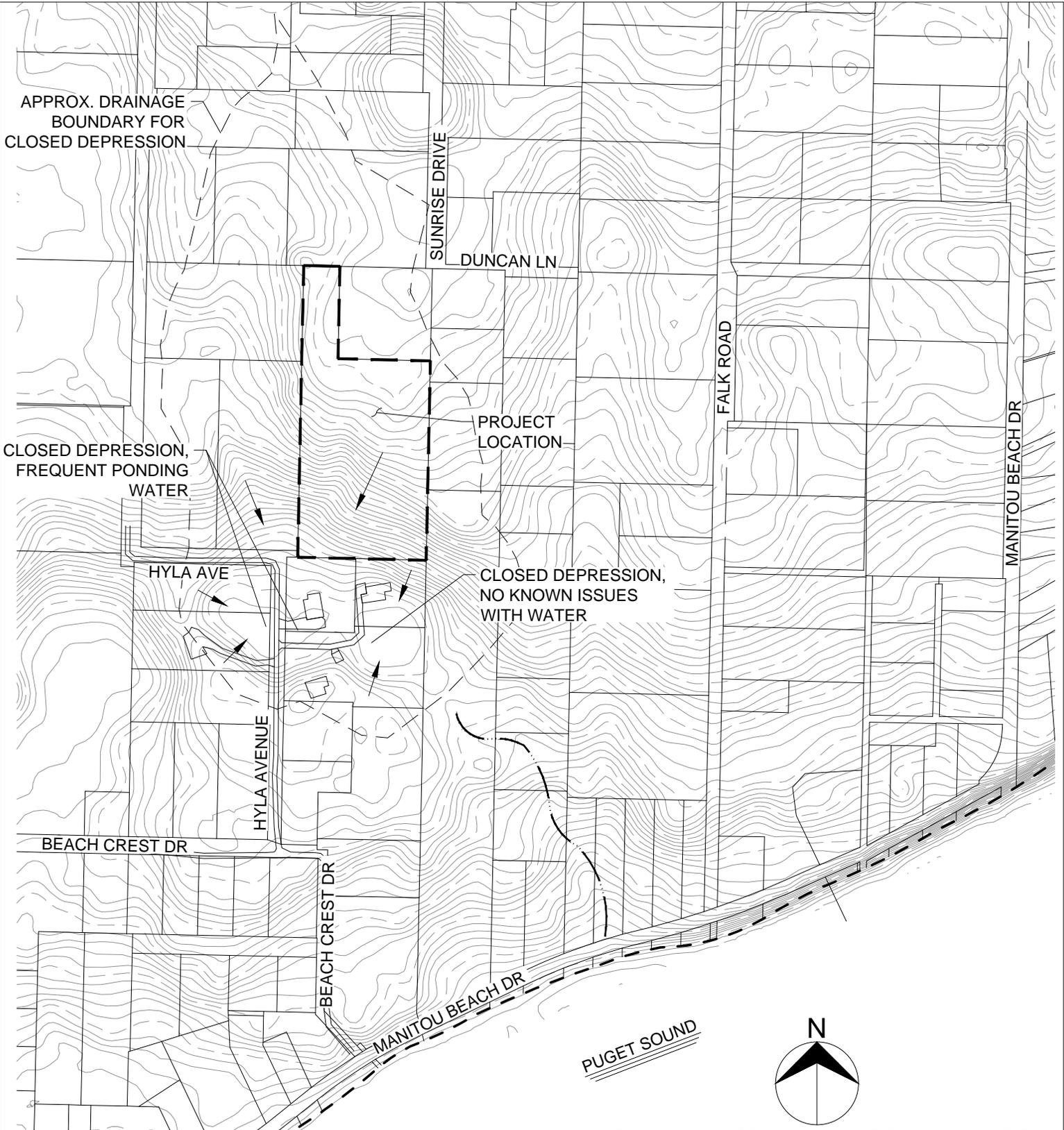
Threshold Determination

The impervious areas for the proposed access driveways were used to evaluate the Minimum Requirements, as summarized in Table 1.

Table 1 - Impervious Areas

	Proposed Total Impervious Area (sf)	Existing Impervious Area (sf)	New Impervious Area (sf)
North Driveway	6,450	1,970	4,480
South Driveway	4,350	0	4,350
Total	10,800	1,970	8,830

A portion of the north access driveway overlaps the existing gravel driveway, about 9-ft wide, and will be widened to meet the City road standard. The driveway overlap reduces the new impervious area of the north driveway to 4,480-square feet (sf). A total of 8,830-sf new impervious area will be created by the north and south driveways; therefore Minimum Requirements No.'s 1-10 apply to the project as outlined by DOE in the *Stormwater Management Manual for Western Washington*



TOPOGRAPHIC INFORMATION BASED UPON
 KITSAP COUNTY LIDAR AERIAL SURVEY, 2-FT
 CONTOURS. ELEVATION DATUM: NAVD88.

PUGET SOUND



SCALE: 1" = 300'

DRAINAGE MAP
BGH - SUNRISE

BROWNE • WHEELER
 ENGINEERS, INC
 241 ERICKSEN AVENUE NE
 BAINBRIDGE ISLAND, WA 98110
 P 206.842.0605 INFO@BrowneWheeler.COM

(*SWMMWW*), 2005 edition (Figure 2.2). Table 2 describes how each of Minimum Requirements No.'s 1-10 will be met.

Minimum Requirement No. 7, Flow Control requires construction of flow control facilities if any of the following thresholds are exceeded:

1. If the project will have a total of 10,000-sf or more of "effective" impervious surfaces. Table 1, above, shows the project will result in greater than 10,000-sf. However this area is not "effective" because the runoff will be fully infiltrated and not discharged off-site.
2. If the project converts $\frac{3}{4}$ -acres or more of native vegetation to lawn or landscape, or converts 2.5-acres or more native vegetation to pasture. We assumed 4,000-sf of landscape per lot which results in approximately 0.64-acres, which is below the $\frac{3}{4}$ -acres threshold. There will be no conversion of native vegetation to pasture.
3. If the project will result in an increase in the 100-yr frequency peak flow of 0.1-cubic foot per second (cfs) or greater, as estimated by Western Washington Hydrology Model Version 3 (WWHM3). WWHM3 was used to model the entire site, including the access driveways and projected rooftop, driveway and landscaped areas for each of the seven lots. The model predicted an increase of 0.05-cfs, which is below the 0.1-cfs threshold.

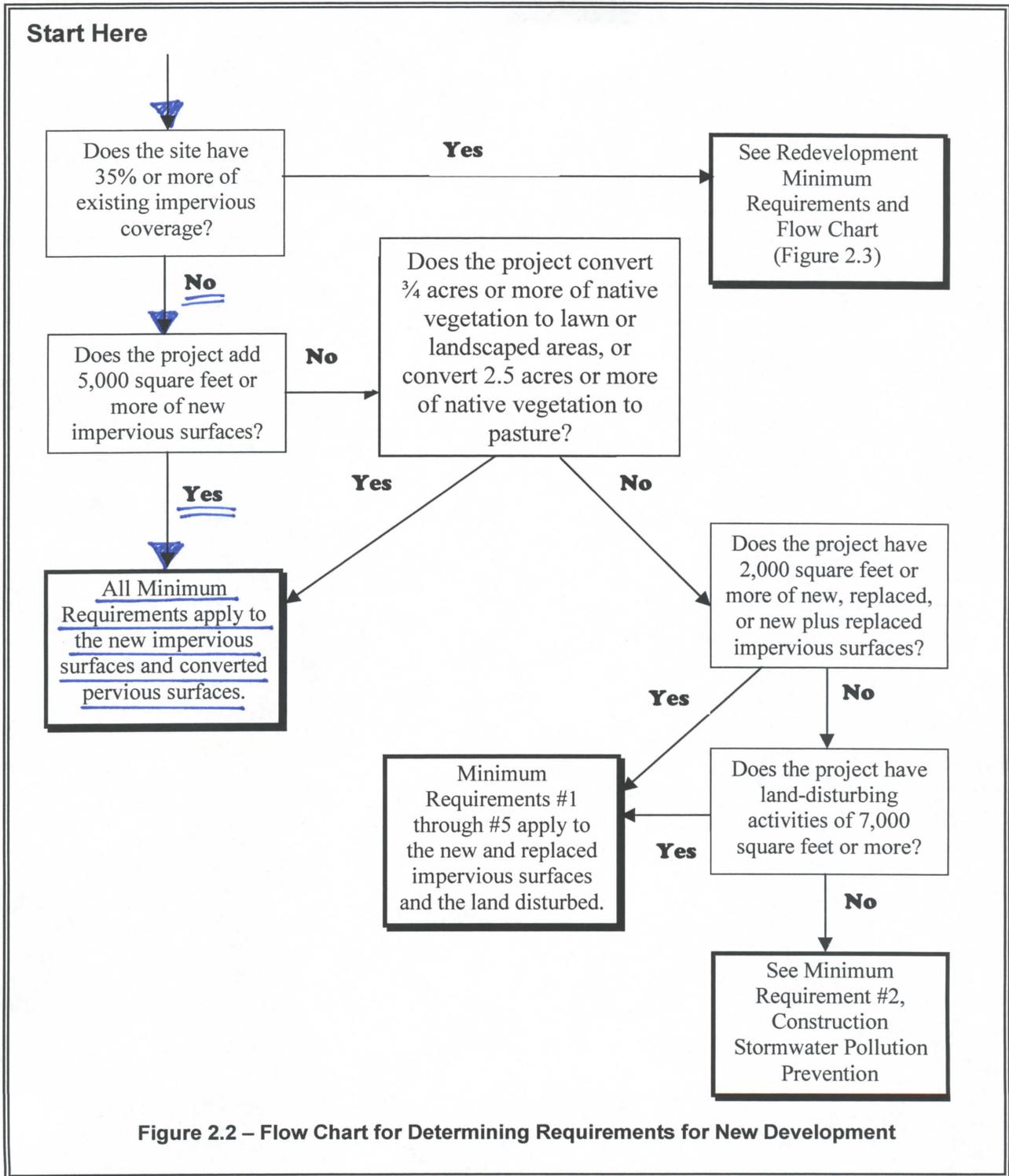
The attached calculations present a breakdown of land type areas used in the WWHM3 model for the predeveloped and the developed scenarios. The predeveloped scenario is a moderately and steeply sloping forested condition with Type C soils. In the developed scenario, the areas of driveway and rooftop which are infiltrated in either rain gardens or infiltration trenches are removed from the area modeled in the developed scenario because they are designed to infiltrate 100%.

Minimum Requirement No. 7 indicates "that portion of any development project in which the above thresholds are not exceeded * shall apply Onsite Stormwater Management BMPs in accordance with Minimum Requirement No. 5." Following the *SWMMWW*, on-site BMPs will be utilized to infiltrate water on-site because flow control facilities are not required.

* Deleted "in a threshold discharge area" per BIMC 15.20.060.B.

Soil Infiltration

The City determined that the on-site soil investigations performed by Daves Septic Services, Inc., dated 7/3/2013, is adequate soil exploration for Preliminary Plat submittal and approval. An infiltration rate of 0.5-inches/hour was used for preliminary facility sizing, as outlined in our memo dated November 6, 2014. Prior to Plat Utility Permit submittal, a geotechnical engineer will need to perform soil investigations to verify site suitability of the soil for infiltration via trenches and water quality treatment in accordance with Chapter 3.1 Roof Downspout Controls and SSC-6 Soil Suitability for Treatment in Chapter 3.3.7 Site Suitability Criteria in Vol. III of *SWMMWW*. If the soils are found to be unsuitable for infiltration trenches, rain gardens, with different site suitability criteria, will be used.



Browne Wheeler Engineers, Inc.

Individual Lot Development

The development area of each lot will be determined by the individual purchaser. All stormwater runoff generated from each lot will be kept on-site to the maximum extent practicable through the installation of rain gardens or other methods to infiltrate all stormwater from new impervious areas. We evaluated the preliminary home layouts shown on the plans which range between 1,100-sf and 2,400-sf of rooftop area with driveways to each lot varying between 400-sf and 1,250-sf. Attached is a WWHM3 output illustrating an average 2,000-sf rooftop area and 1,000-sf driveway area combination infiltrating 100% of stormwater runoff through a 200-sf rain garden. This is NOT the largest impervious lot coverage allowed by code but a reasonable coverage for the lot based on preliminary plans. Drainage plans for individual lots will be developed during their respective building permit applications. Disturbed landscaping areas will have the soil amended in accordance with BMP T5.13 Post-Construction Soil Quality and Depth.

ON-SITE UTILITIES

WATER

Existing

There is no water utility connection currently to the property. Kitsap PUD's water system is in the vicinity of the project.

Proposed

A new 8-inch water main will be connected to the water system in Sunrise Drive. The new water main will be extended south through the access easement and west and south to provide water service to all seven lots. Two fire hydrants will be installed, one along the North access driveway and one along the South access driveway and will be served by this new water main.

Water service for the proposed seven lots will be provided through seven new 5/8" water meters, connected to the water main extension.

SANITARY SEWER

Existing

There are no sewer services currently serving the property.

Proposed

Each of the seven lots will have a private on-site septic system. The systems have not been designed but space is allocated for drainfields to maintain required separations from stormwater facilities.

Power, telephone, and television cable will be designed by others.

FRONTAGE IMPROVEMENTS

Existing

There are no frontage improvements required since the property does not front any right of way.

Proposed

The property does not front any rights of ways and no frontage improvements are proposed.

EROSION CONTROL

The Contractor will be responsible for maintaining erosion control facilities on the site during construction and for ensuring that sediment does not leave the site. The general principles of construction pollution prevention are:

- Retain native vegetation
- Prevent erosion rather than treat sediment laden water
- Employ site specific best management practices (BMPs)
- Divert upslope runoff around disturbed area
- Phase construction operations to reduce total amount of disturbance at one time
- Amend soils before seeding
- Minimize the slope length and steepness of disturbed areas
- Reduce runoff velocities
- Prevent the tracking of sediment off site
- Employ BMPs that address not only erosion but also other potential pollutants.

A detailed erosion and sediment control plan will be developed during final design.

Very truly yours,

BROWNE WHEELER ENGINEERS, INC.

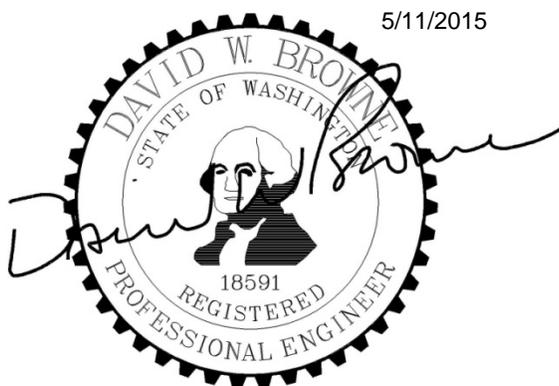


Table 2

Summary of Stormwater Minimum Requirements

<u>Minimum Requirement</u>	<u>Comment</u>
1. Stormwater site plan	A stormwater site plan will be presented.
2. Construction stormwater pollution prevention	A detailed construction stormwater pollution prevention plan will be developed during final design.
3. Source control of pollutants	Not applicable.
4. Preservation of natural drainage systems and outfalls	All stormwater will continue to discharge in the same location.
5. On-site stormwater management	Stormwater will be kept on-site to the maximum extent practicable through infiltration and the amendment of all landscaping areas.
6. Runoff treatment	<p>Water quality treatment for the access driveways will be provided through onsite best management practices. Stormwater treatment facilities are not required.</p> <p>Water quality treatment requirements for driveways on each lot will be determined during development of their respective building permit submittals.</p>
7. Flow control	Infiltration of stormwater runoff will reduce runoff rates below thresholds to require flow control facilities. On-site BMPs will be utilized to infiltrate water on-site.
8. Wetlands protection	Not applicable.
9. Basin and watershed planning	Not applicable.
10. Operation and maintenance	An operation and maintenance manual will be prepared during final design.

ENGINEERING CALCULATIONS

PREDEVELOPED

	Area (sf)	Area (ac)	Slope	Area (sf)	Area (ac)	Land Type
Property	149035	3.4214	Mod 5-15%	82305	1.8895	C, Forest
			Steep >15%	66730	1.5319	C, Forest
N. access Ease.	3976	0.0913	Mod 5-15%	3976	0.0913	C, Forest
S. access Ease.	1159	0.0266	Mod 5-15%	1159	0.0266	C, Forest
Total	154170	3.5393		154170	3.5393	

DEVELOPED

	Area (sf)	Area (ac)	Slope	Area (sf)	Area (ac)	SD Method	Model	Land Type
Property	149035	3.4214	Mod 5-15%	54180	1.2438		1.2438	C, Forest
			Steep >15%	38844	0.8917		0.8917	C, Forest
			Mod 5-15%	28000	0.6428		0.6428	C, Lawn
			North Road	3625	0.0832	Infiltrated	-	Road, Flat
			South Road	3386	0.0777	Infiltrated	-	Road, Mod
N. access Ease.	3976	0.0913	Flat 0-5%	14000	0.3214	Infiltrated	-	Rooftop
			Mod 5-15%	7000	0.1607	Infiltrated	-	Driveway
			Mod 5-15%	1172	0.0269		0.0269	C, Lawn
			Flat 0-5%	2804	0.0644	Infiltrated	-	Road, Flat
S. access Ease.	1159	0.0266	Mod 5-15%	203	0.0047		0.0047	C, Lawn
			Mod 5-15%	956	0.0219		0.0219	Road, Mod
Total	154170	3.5393		154170	3.5393		2.8318	

Entire Site & Access WWHM3 Model

PREDEVELOPED

WWHM3 BGH Whole Site

File Edit View Help

Schematic

SCENARIOS

- Predeveloped
- Mitigated

Run Scenario

ELEMENTS

Move Elements

Save x,y Load x,y

X: 20 Y: 6

Property & Access

Property & Access Predeveloped

Subbasin Name: Property & Access

Flows To: Surface Interflow Groundwater

Area in Basin

Available Pervious

<input type="checkbox"/> A/B. Forest, Flat	0
<input type="checkbox"/> A/B. Forest, Mod	0
<input type="checkbox"/> A/B. Forest, Steep	0
<input type="checkbox"/> A/B. Pasture, Flat	0
<input type="checkbox"/> A/B. Pasture, Mod	0
<input type="checkbox"/> A/B. Pasture, Steep	0
<input type="checkbox"/> A/B. Lawn, Flat	0
<input type="checkbox"/> A/B. Lawn, Mod	0
<input type="checkbox"/> A/B. Lawn, Steep	0
<input type="checkbox"/> C. Forest, Flat	0
<input checked="" type="checkbox"/> C. Forest, Mod	2.0074
<input checked="" type="checkbox"/> C. Forest, Steep	1.5313
<input type="checkbox"/> C. Pasture, Flat	0
<input type="checkbox"/> C. Pasture, Mod	0
<input type="checkbox"/> C. Pasture, Steep	0
<input type="checkbox"/> C. Lawn, Flat	0
<input checked="" type="checkbox"/> C. Lawn, Mod	0
<input type="checkbox"/> C. Lawn, Steep	0

Pervious Total: 3.5393 Acres

Basin Total: 3.5393 Acres

Available Impervious

Show Only Selected

<input type="checkbox"/> ROADS/FLAT	0
<input checked="" type="checkbox"/> ROADS/MOD	0
<input type="checkbox"/> ROADS/STEEP	0
<input type="checkbox"/> ROOF TOPS/FLAT	0
<input type="checkbox"/> DRIVEWAYS/FLAT	0
<input type="checkbox"/> DRIVEWAYS/MOD	0
<input type="checkbox"/> DRIVEWAYS/STEEP	0
<input type="checkbox"/> SIDEWALKS/FLAT	0
<input type="checkbox"/> SIDEWALKS/MOD	0
<input type="checkbox"/> SIDEWALKS/STEEP	0
<input type="checkbox"/> PARKING/FLAT	0
<input type="checkbox"/> PARKING/MOD	0
<input type="checkbox"/> PARKING/STEEP	0
<input type="checkbox"/> POND	0

Impervious Total: 0 Acres

Deselect Zero Select By: 60

DEVELOPED

WWHM3 BGH Whole Site

File Edit View Help

Schematic

SCENARIOS

- Predeveloped
- Mitigated

Run Scenario

ELEMENTS

Move Elements

Save x,y Load x,y

X: 20 Y: 6

Property & Access

Basin 1 Mitigated

Subbasin Name: Property & Access

Designate as Bypass for PDC:

Flows To: Surface Interflow Groundwater

Area in Basin

Available Pervious

<input type="checkbox"/> A/B. Forest, Flat	0
<input type="checkbox"/> A/B. Forest, Mod	0
<input type="checkbox"/> A/B. Forest, Steep	0
<input type="checkbox"/> A/B. Pasture, Flat	0
<input type="checkbox"/> A/B. Pasture, Mod	0
<input type="checkbox"/> A/B. Pasture, Steep	0
<input type="checkbox"/> A/B. Lawn, Flat	0
<input type="checkbox"/> A/B. Lawn, Mod	0
<input type="checkbox"/> A/B. Lawn, Steep	0
<input type="checkbox"/> C. Forest, Flat	0
<input checked="" type="checkbox"/> C. Forest, Mod	1.2438
<input checked="" type="checkbox"/> C. Forest, Steep	0.8917
<input type="checkbox"/> C. Pasture, Flat	0
<input type="checkbox"/> C. Pasture, Mod	0
<input type="checkbox"/> C. Pasture, Steep	0
<input type="checkbox"/> C. Lawn, Flat	0
<input checked="" type="checkbox"/> C. Lawn, Mod	0.6744
<input type="checkbox"/> C. Lawn, Steep	0

Pervious Total: 2.8099 Acres

Basin Total: 2.8318 Acres

Available Impervious

Show Only Selected

<input type="checkbox"/> ROADS/FLAT	0
<input checked="" type="checkbox"/> ROADS/MOD	0.0219
<input type="checkbox"/> ROADS/STEEP	0
<input type="checkbox"/> ROOF TOPS/FLAT	0
<input type="checkbox"/> DRIVEWAYS/FLAT	0
<input type="checkbox"/> DRIVEWAYS/MOD	0
<input type="checkbox"/> DRIVEWAYS/STEEP	0
<input type="checkbox"/> SIDEWALKS/FLAT	0
<input type="checkbox"/> SIDEWALKS/MOD	0
<input type="checkbox"/> SIDEWALKS/STEEP	0
<input type="checkbox"/> PARKING/FLAT	0
<input type="checkbox"/> PARKING/MOD	0
<input type="checkbox"/> PARKING/STEEP	0
<input type="checkbox"/> POND	0

Impervious Total: 0.0219 Acres

Deselect Zero Select By: 60



Developed Increase 0.0469 < 0.1 cfs Threshold

SOUTH ACCESS ROAD INFILTRATION TRENCH

WWHM3 BGH INFIL TRNCH

File Edit View Help

Basin 1 Mitigated

Subbasin Name: South Access Road

Flows To: Surface (Gravel Trench Bed 1), Interflow (Gravel Trench Bed 1), Groundwater

Available Pervious		Available Impervious	
A/B, Forest, Flat	0	ROADS/FLAT	0
A/B, Forest, Mod	0	ROADS/MOD	0.0777 → 3.386sf
A/B, Forest, Steep	0	ROADS/STEEP	0
A/B, Pasture, Flat	0	ROOF TOPS/FLAT	0
A/B, Pasture, Mod	0	DRIVEWAYS/FLAT	0
A/B, Pasture, Steep	0	DRIVEWAYS/MOD	0
A/B, Lawn, Flat	0	DRIVEWAYS/STEEP	0
A/B, Lawn, Mod	0	SIDEWALKS/FLAT	0
A/B, Lawn, Steep	0	SIDEWALKS/MOD	0
C, Forest, Flat	0	SIDEWALKS/STEEP	0
C, Forest, Mod	0	PARKING/FLAT	0
C, Forest, Steep	0	PARKING/MOD	0
C, Pasture, Flat	0	PARKING/STEEP	0
C, Pasture, Mod	0	POND	0
C, Pasture, Steep	0		
C, Lawn, Flat	0		
C, Lawn, Mod	0		
C, Lawn, Steep	0		

Pervious Total: 0 Acres
Impervious Total: 0.0777 Acres
Basin Total: 0.0777 Acres

WWHM3 BGH INFIL TRNCH

File Edit View Help

Gravel Trench Bed 1 Mitigated

Facility Name: Gravel Trench Bed 1

Downstream Connection: Facility Type (Gravel Trench/Bed)

Facility Bottom Elevation (ft): 0

Facility Dimensions:

- Trench Length: 185
- Trench Bottom Width: 2
- Effective Total Depth: 2.75
- Bottom slope of Trench: 0.001
- Left Side Slope: 0
- Right Side Slope: 0

Material Layers for:

- Layer 1 Thickness (ft): 2.5
- Layer 1 porosity: 0.4
- Layer 2 Thickness (ft): 0
- Layer 2 porosity: 0
- Layer 3 Thickness (ft): 0
- Layer 3 porosity: 0

Infiltration: YES

Measured Infiltration Rate (in/hr): 0.5 → 0.5 in/hr infiltration rate

Infiltration Reduction Factor: 0.5

Use Wetted Surface Area (sidewalks): YES

Total Volume Infiltrated (acre-ft): 10.256

Total Volume Through Riser (acre-ft): 0

Outlet Structure:

- Riser Height (ft): 0
- Riser Diameter (in): 0
- Riser Type: Flat
- Notch Type:

Orifice Table:

Orifice Number	Diameter (In)	Height (Ft)	QMax (cfs)
1	0	0	0
2	0	0	0
3	0	0	0

Trench Volume at Riser Head (acre-ft): .011

Pond Increment: 0.10

Show Pond Table: Open Table

Total Volume Through Facility (acre-ft): 10.256

Percent Infiltrated: 100

100% INFILTRATED

NORTH ACCESS ROAD + INFILTRATION TRENCH

WWHM3 BGH INFIL TRNCH

File Edit View Help

Schematic

Basin 1 Mitigated

Subbasin Name: North Access Road Designate as Bypass for POC:

Flows To : Surface Interflow Groundwater
 Gravel Trench Bed 1 Gravel Trench Bed 1

Area in Basin Show Only Selected

Available Pervious		Available Impervious	
<input type="checkbox"/> A/B, Forest, Flat	0	<input checked="" type="checkbox"/> ROADS/FLAT	0.1476
<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 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 type="checkbox"/> C, Forest, Flat	0	<input type="checkbox"/> SIDEWALKS/STEEP	0
<input checked="" type="checkbox"/> C, Forest, Mod	0	<input 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 type="checkbox"/> C, Lawn, Flat	0		
<input type="checkbox"/> C, Lawn, Mod	0		
<input type="checkbox"/> C, Lawn, Steep	0		

Pervious Total 0 Acres Impervious Total 0.1476 Acres
 Basin Total 0.1476 Acres

Deselect Zero Select Facility GO

Handwritten notes:
 → 3,625sf onsite + 2,804sf access easement = 6,429sf

WWHM3 BGH INFIL TRNCH

File Edit View Help

Schematic

Gravel Trench Bed 1 Mitigated

Facility Name: Gravel Trench Bed 1

Downstream Connection: Outlet 1: 0, Outlet 2: 0, Outlet 3: 0

Facility Type: Gravel Trench/Bed

Facility Bottom Elevation (ft): 0

Facility Dimensions

Trench Length	399
Trench Bottom Width	2
Effective Total Depth	2.75
Bottom slope of Trench	0.001
Left Side Slope	0
Right Side Slope	0

Material Layers for

Layer 1 Thickness (ft)	2.5
Layer 1 porosity	0.4
Layer 2 Thickness (ft)	0
Layer 2 porosity	0
Layer 3 Thickness (ft)	0
Layer 3 porosity	0

Infiltration: YES

Measured Infiltration Rate (in/hr): 1

Infiltration Reduction Factor: 0.5

Use Wetted Surface Area (sidewalls): YES

Total Volume Infiltrated (acre-ft): 19.185

Total Volume Through Riser (acre-ft): 0

Outlet Structure

Orifice Number	Diameter (In)	Height (Ft)	QMax (cfs)
1	0	0	0
2	0	0	0
3	0	0	0

Notch Type: Flat

Trench Volume at Riser Head (acre-ft): 0.11

Pond Increment: 0.10

Show Pond Table: Open Table

Total Volume Through Facility (acre-ft): 19.185

Percent Infiltrated: 100

Handwritten notes:
 → Infiltration Trench along access Road (Two trenches modeled as one)
 → 0.5 in/hr infiltration rate
 = 100% INFILTRATED

Typical Residential Lot Rain Garden Sizing

Basin 1 Mitigated

Subbasin Name: Typical SFR Lot

Flows To: Gravel Trench Bed 1

Available Pervious		Available Impervious	
A/B. Forest, Flat	0	ROADS/FLAT	0
A/B. Forest, Mod	0	ROADS/MOD	0.023
A/B. Forest, Steep	0	ROADS/STEEP	0
A/B. Pasture, Flat	0	ROOF TOPS/FLAT	0.0459
A/B. Pasture, Mod	0	DRIVEWAYS/FLAT	0
A/B. Pasture, Steep	0	DRIVEWAYS/MOD	0
A/B. Lawn, Flat	0	DRIVEWAYS/STEEP	0
A/B. Lawn, Mod	0	SIDEWALKS/FLAT	0
A/B. Lawn, Steep	0	SIDEWALKS/MOD	0
C. Forest, Flat	0	SIDEWALKS/STEEP	0
C. Forest, Mod	0	PARKING/FLAT	0
C. Forest, Steep	0	PARKING/MOD	0
C. Pasture, Flat	0	PARKING/STEEP	0
C. Pasture, Mod	0	POND	0
C. Pasture, Steep	0		
C. Lawn, Flat	0		
C. Lawn, Mod	0		
C. Lawn, Steep	0		

Pervious Total: 0 Acres
Impervious Total: 0.0689 Acres
Basin Total: 0.0689 Acres

Handwritten notes:
→ 1,000sf Driveway
→ 2,000sf Rooftop

Gravel Trench Bed 1 Mitigated

Facility Name: SFR Rain Garden

Facility Type: Gravel Trench/Bed

Facility Bottom Elevation (ft): 0

Facility Dimensions:

- Trench Length: 20
- Trench Bottom Width: 10
- Effective Total Depth: 3
- Bottom slope of Trench: 0.0001
- Left Side Slope: 3
- Right Side Slope: 3

Material Layers for:

- Layer 1 Thickness (ft): 1.5
- Layer 1 porosity: 0.4
- Layer 2 Thickness (ft): 0
- Layer 2 porosity: 0
- Layer 3 Thickness (ft): 0
- Layer 3 porosity: 0

Infiltration: YES

Measured Infiltration Rate (in/hr): 1

Infiltration Reduction Factor: 0.5

Use Wetted Surface Area (sidewalks): YES

Total Volume Infiltrated (acre-ft): 8.934

Total Volume Through Facility (acre-ft): 0

Total Volume Through Riser (acre-ft): 0

Outlet Structure:

- Riser Height (ft): 2.5
- Riser Diameter (in): 6
- Riser Type: Flat
- Notch Type: []

Orifice Table:

Orifice Number	Diameter (In)	Height (FT)	QMax (cfs)
1	0	0	0
2	0	0	0
3	0	0	0

Trench Volume at Riser Head (acre-ft): 0.14

Pond Increment: 0.10

Show Pond Table: Open Table

Percent Infiltrated: 100

Handwritten notes:
→ 1' ponded Depth above 1.5' soil
→ 200sf Rain Garden
→ 0.5 in/hr infiltration rate
100% INFILTRATED