Drainage Report
South Warehouse Addition

Site Plan for:
Dimensional Communication

Prepared For:

Paul Hagman

1220 Anderson Road

Mount Vernon, WA 98274

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Date: April 5, 2018

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GENERAL

Northwest Datum & Design, Inc. (NWDD) prepared this drainage report for the project noted as Stealth Manufacturing Building located in Section 32, Township 34 North, Range 04 East, W.M., Skagit County, Washington (Vicinity Map-Figure 1) owned by Paul Hagman and operated by Dimensional Communications. These parcels are located on the south side of Anderson Road and include address numbers 1212, 1220, 1224, 1226 and 1230 Anderson Road. Total site area included in this drainage report is 3.233 acres, which is Lot 1 of the Dimensional BSP and the portion of the approach and bridge accessing Lot 2. The proposed activities will increase the impervious surface through the construction of additional parking and the construction of a new 9,860 sf. building. This report updates the previously completed drainage evaluation and updates the water quality treatment & detention facilities per the 2012 DOE Drainage Manual.

This report provides the necessary information for the analysis and hydrologic calculations for the site stormwater plan, the operations and maintenance of the drainage system, and provides the Stormwater Pollution Prevention Plan. The format of this report follows the requirements of the 2018 Department of Ecology Stormwater Management Manual for Western Washington.

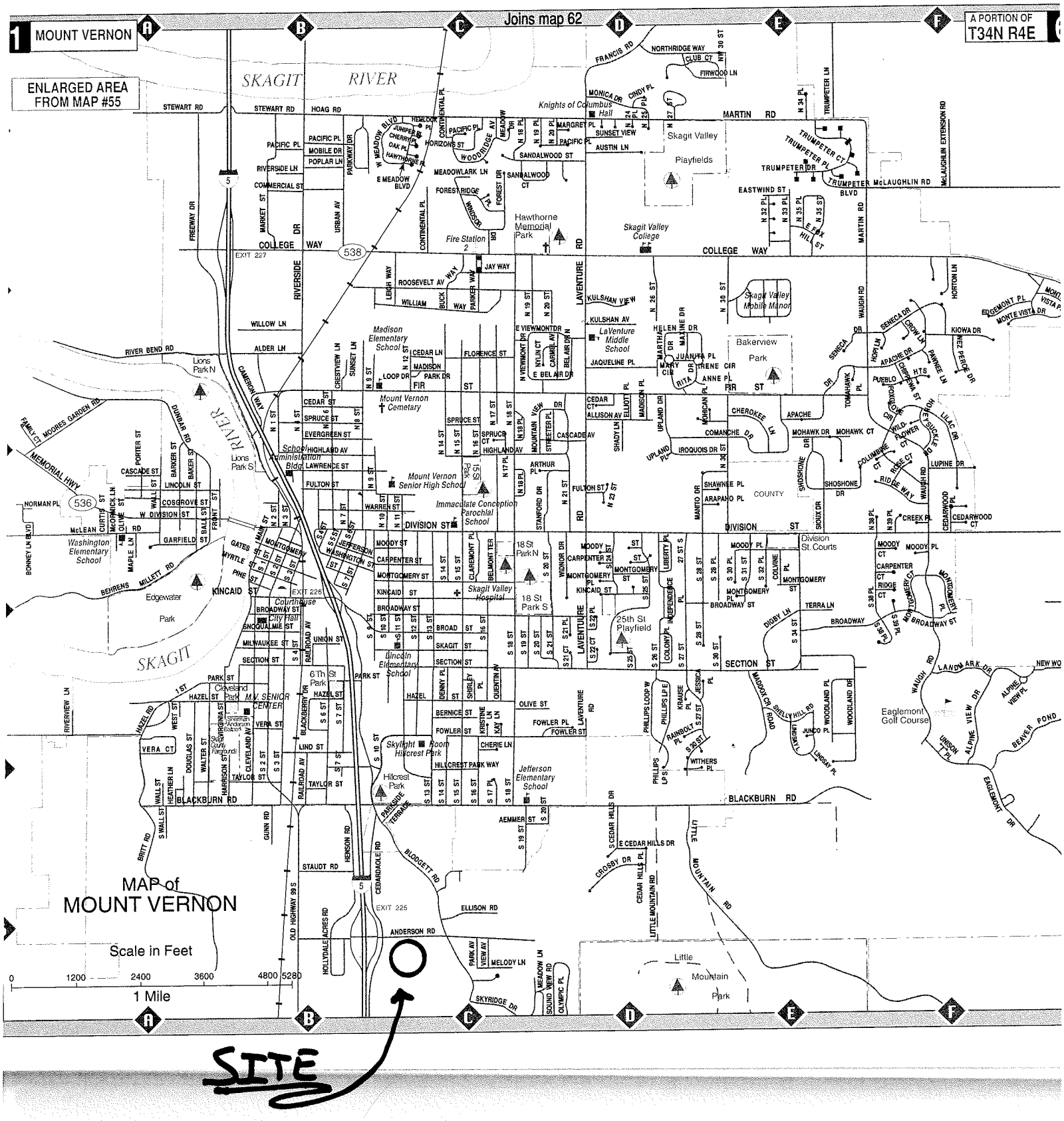
PROJECT OVERVIEW

Existing Conditions

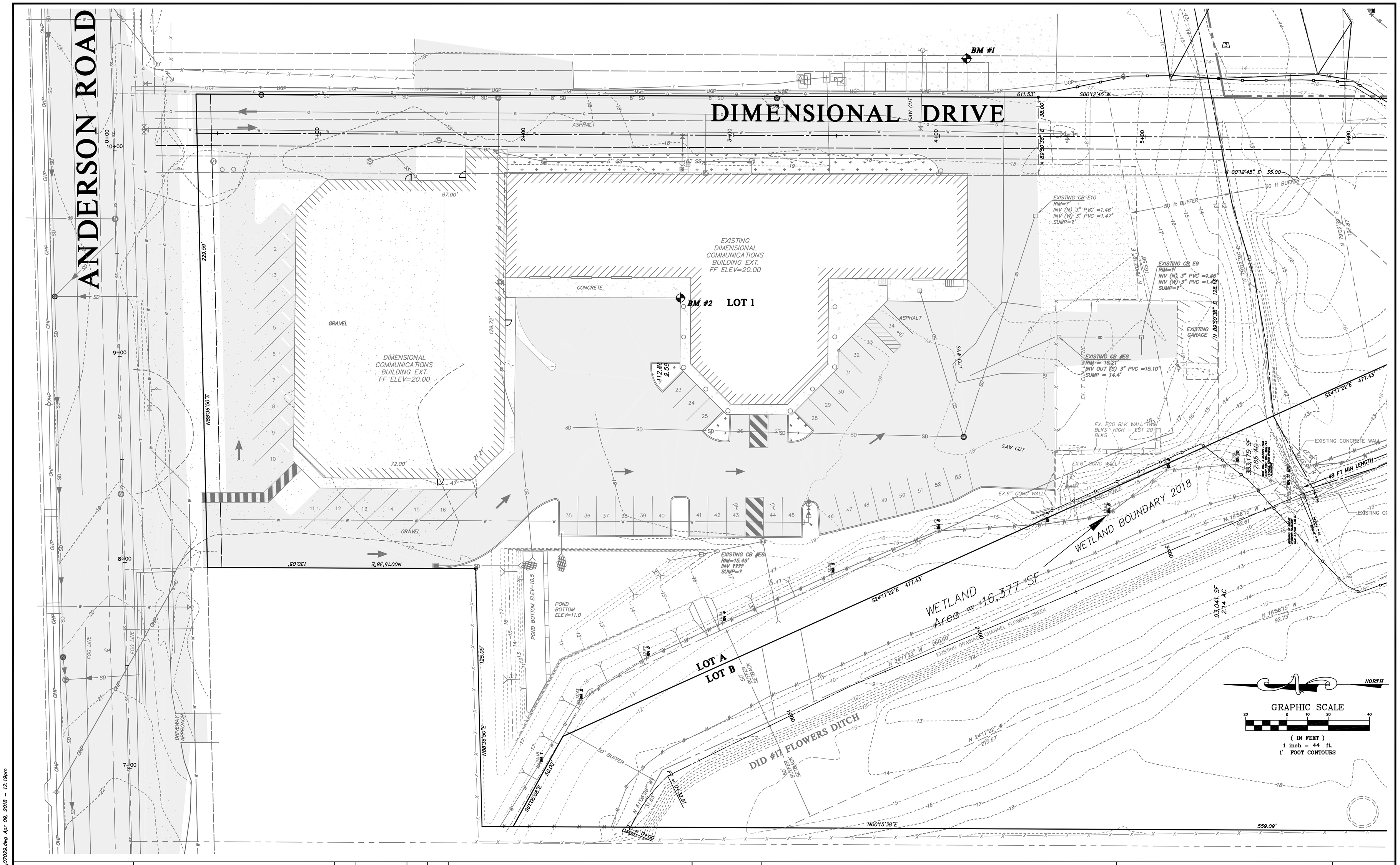
The site has relatively flat topography, with slope ranging between 1-4% with the exception of the slopes to the existing drainage ways known as Maddox Creek Ditch and DID#17 Flowers Ditch (Existing Conditions-Figure 2). From the westerly & southerly edges of the parking, the site slopes at 10% to 30% to the two waterways, Maddox Creek Ditch to the south and Flowers Ditch to the west.

The undeveloped areas of the binding site plan have historically has been used for agricultural purposes. The first modern day structure built is the commercial building & its associated parking constructed in early 2001 with a northerly building addition completed in 2009. The initial construction project included Lots 1, 2 and 3 of the Paul Hagman Binding Site Plan PLO1-0518. With the construction of the northerly addition, the BSP was revised aggregating these three lots into Lot 1 of BSP LU08-058. In addition, there is a garage on the south side of Lot 1, which is used for storage (Aerial Map-Figure 3).

Ravnik and Associates did a drainage analysis for the existing site conditions for the first commercial building dated March 31, 2000. Northwest Datum & Design completed a drainage report in 2009 for the northerly addition that expanded the treatment & detention system for the northerly building addition & parking. This report expands on



Vicinity Map
Figure 1



CALL 48 HOURS BEFORE YOU DIG 811

DESCRIPTION	REV	REVISED	BY	CHK

SOUTH WAREHOUSE ADD SITE PLAN
FOR
DIMENSIONAL COMMUNICATIONS, INC
SECTION 32, T 34 N, R 4 E, W.M.

DATE 4/20/2017
SCALE 1" = 20'
DRAWN BY dko
CHECKED BY des

NORTHWEST DATUM & DESIGN, Inc.
CIVIL ENGINEERING AND SURVEYING SOLUTIONS
1128 E. FAIRHAVEN AVE
BURLINGTON, WASHINGTON 98233
PH: (360) 755-0434 FAX: (360) 755-0464
DOUGLAS E. SCHWIND P.E., P.L.S.

FIGURE 2
EXISTING CONDITIONS

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CALL 48 HOURS BEFORE YOU DIG 811	DESCRIPTION	REV	REVISED	BY	CHK

SOUTH WAREHOUSE ADD SITE PLAN
FOR
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SECTION 32, T 34 N, R 4 E, W.M.

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FIGURE 3 AERIAL MAP
EXISTING CONDITIONS

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the pervious drainage report to address the addition of the proposed southerly building addition, the associated parking & the bridge access to Lot 2 of the revised BSP LU08-058.

Proposed Conditions

Lot 1 of the current BSP will be developed further to the south and will extend into Lot 3 of the current BSP. Per CMV Code, the lot lines will be adjusted to extent Lot 1 to the south to encompass the expanded building & site plan. The proposed building expansion is planned to extend across the Maddox drainage and therefore would require the relocation of the Maddox Ditch. The Department of Fish & Wildlife (WDFW) have been contacted and are supportive of the relocation as the realignment would be complete to the Departments design standards provide habitat for fish. This project would complement the proposed project to be completed by a WSDOT project to move the piped Maddox/Flower drainage that crosses I-5 into the abandon Beavers Slough alignment. As part of the proposed warehouse project a bridge is proposed at the southwest corner of Lot 1 to cross the Flower's Drainage to provide access to Lot 2.

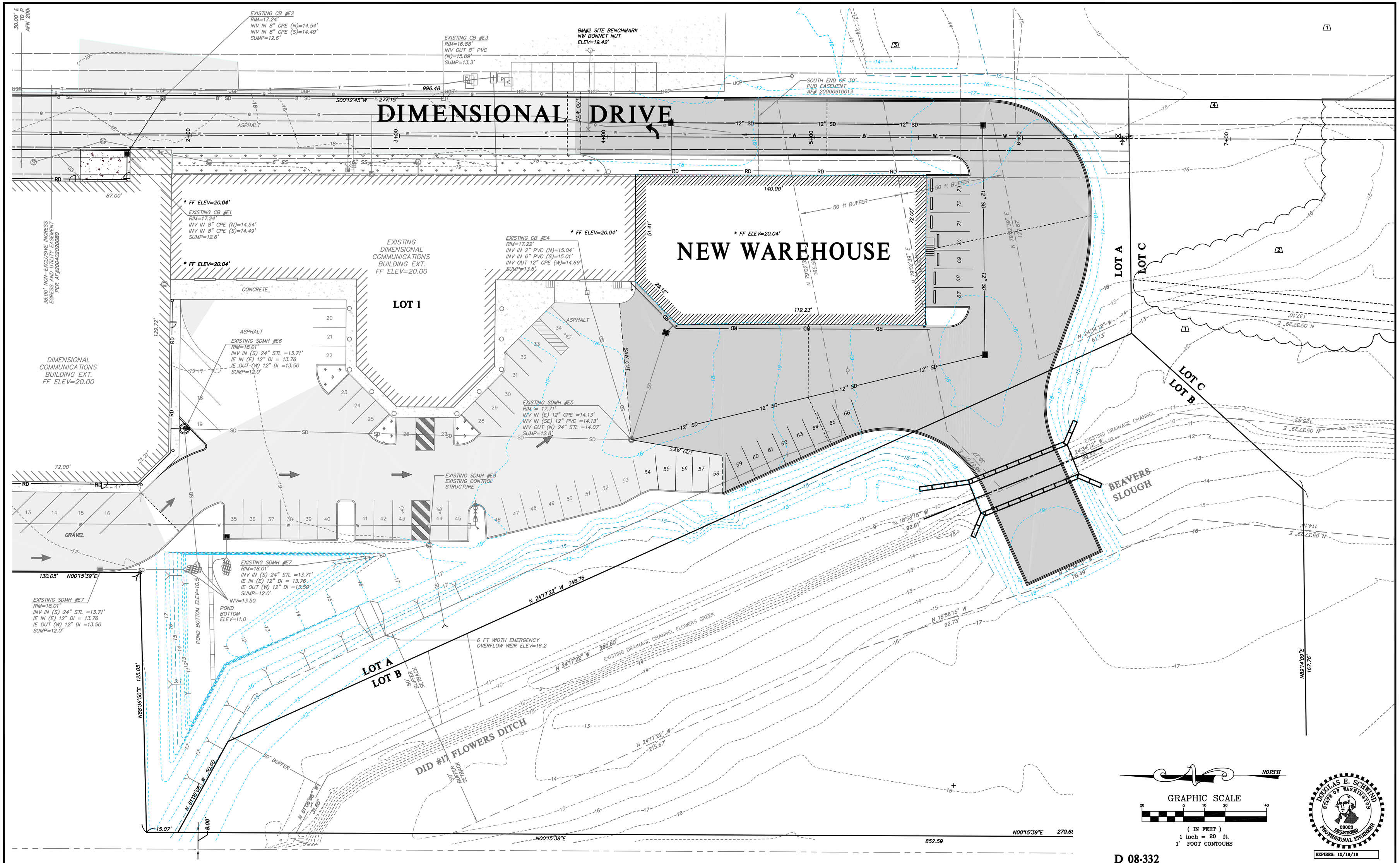
Zoning for this area is C-L, Commercial Limited Industrial. Mt. Vernon zoning code limits the amount of impervious area in these locations to 90% with the remaining 10% required to be pervious landscape areas. Landscaping areas located along the sites periphery and scattered throughout the parking and drive lanes make up the pervious area (Proposed Conditions-Figure 4). The new impervious area for the building, parking and driving lanes around the south end of the building is addressed in this drainage report. The area of impervious & pervious surfaces is summarized below.

Stormwater facilities will be constructed around the south end of the building and the roof drains from the new building will be tied to it. Stormwater runoff from the existing site area will continue in its current path to existing and proposed catch basins and pipes will connect to the existing system. The existing pond is a combination of open pond and underground pipes and catch basins. These facilities are modeled in this report.

STORMWATER TREATMENT AND DETENTION

Provisions of the City of Mount Vernon drainage regulations require water quality treatment per the 2012 DOE Manual. Treatment of stormwater runoff will be provided for by routing stormwater through a wetpond. Stormwater detention will be provided for entirely on-site through the combined use of a pond and pipe system. The site will be graded to sheet flow stormwater across the impervious asphalt area away from the existing and proposed building location to the detention facility. The proposed wetpond facility will provide water quality as well as detention of stormwater. The design for this project will released stormwater at rates at or below 2012 drainage manual rates.

The existing detention pond has a divider wall constructed in the pond. This wall



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DESCRIPTION	REV	REVISED	BY	CHK
REDESIGN OF PARKING LOT		4-14-2009	RAH	DES
CHANGE IN WATER PLAN FROM PUD #1	2	6-16-2009	RAH	DES
WATER AS-BUILTS FROM PUD #1		8-3-2009	RAH	DES

SOUTH WAREHOUSE ADD SITE PLAN
FOR
DIMENSIONAL COMMUNICATIONS, INC
SECTION 32, T 34 N, R 4 E, W.M.

DATE 4/20/2017
SCALE 1" = 20'
DRAWN BY des
CHECKED BY des

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DOUGLAS E. SCHWIND P.E., P.L.S.

PROPOSED CONDITONS
FIGURE 3

PROJECT 07029
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SHEET F3

provides 25% of the wetpool volume in the first cell. The second cell contains the remaining 75% of the volume. The control structure outlet has a one-way valve to allow stormwater to discharge from the detention pond into the stream, thereby preventing stormwater from the stream to flow back into the detention and treatment facility. The outflow will be to the existing drainage way known as DID#17 Flowers Ditch located along the west edge of the project.

OFFSITE ANALYSIS

Upstream Analysis

The site under consideration is located on and surrounded by relatively level terrain south of Anderson Road, Anderson Road intercepts runoff from land area north of the site. Land to the west, south and east slope away from the project and therefore there is not an upstream area contributing runoff to the site.

Downstream Analysis

The downstream analysis for the project assesses the receiving channels, drainage ways and other stormwater facilities downstream of the project. A description of the downstream conveyance system is as follows:

As mentioned above, the stormwater treatment and detention system discharges to the existing drainage ditches known as Flowers Ditch. Shortly downstream, approximately 250 ft. the Flowers Drainage intersect with Maddox Drainage and the combined channels are renamed to Beavers Slough. From this point, Beaver Slough extends south for 2,100 ft. before traversing straight west for 250 ft. in an open ditch before transitioning to a pipe. The drainage flows under a commercial site (Sickesteel Cranes), Cedardale Road and Interstate 5 for a distance of 900 ft.

Hydrologic Modeling

Soils

According to the Soil Survey of Skagit County, prepared by the United States Department of Agriculture, the site has an underlying soil composed of Field Silt Loam, and Mt. Vernon very fine sandy loam. Field Silt Loam is a deep, moderately drained soil with moderate permeability and high water capacity. Mt. Vernon very fine sandy loam is a very deep, moderately drained soil. Both soils are categorized as a Hydrologic Group C soil. See Appendix A of this report for the NRCS Soil Map and additional soil information.

Historic Conditions

For comparison of with previous drainage modeling of the detention volumes this update used the 2012 DOE continuous flow model. The 2012 model treats the project as undisturbed forest to establish release rates for the detention design.

Basin: Historic Conditions

Site Area	=	3.233 acres
Total Area	=	3.233 acres

Developed Conditions

Impervious areas will cover the site as presented in the site plan (Proposed Conditions-Figure 4). Impervious areas consist of the existing and proposed buildings, sidewalks, asphalt parking and driving surface are allowed to be up to 90%. The percent impervious for the proposed plan is 80%. Impervious surfaces will be connected to the existing piped collection network to convey runoff to the wetpond/detention facility.

Pervious areas on site are landscape areas and the buffers of the Flowers Drainage. It is projected that upon completion, the City of Mount Vernon standards for landscape areas will be met, providing for a minimum of 10% of the impervious area. The landscape plan has been designed to provide for these area requirements. The land cover conditions for the site are as follows:

Basin: Developed Conditions

Building, Pavement, Walkways	=	2.586 acres
Landscape	=	0.647 acres
Total Area	=	3.233 acres

Developed condition as well as historic condition runoff rates are presented in Table A.

Table A-Basin Flow Rates Historic and Developed

Event	Historic Condition (CFS)	Developed Conditions (CFS)	Mitigated Release Rate (CFS)	Stage in Design Pond (ft)
2-Year	0.070	1.119	0.074	2.52
5-Year	0.127	1.599	0.126	3.37
10-Year	0.172	1.956	0.175	3.91
25-Year	0.237	2.456	0.257	4.57
50-Year	0291	2.865	0.337	5.04
100-Year	0.349	3.305	0.436	5.51

Water Quality Treatment & Detention

Stormwater quality treatment is required for the expanded development of the Dimensional Communications facility. Water quality treatment is provided through the use of a wetpond. Surface runoff from pollution generating surfaces (PGS) and non-pollution generating surfaces (NPGS), such as roof drains, sheet flow-to, or are connected directly to, catch basins which tie to the detention and treatment system. The water quality facility treats the full site volume. As a detention facility it will detain and release stormwater runoff per the 2012 Manual. The control structure will be modified correcting the size and elevation of orifices. The revised release structure shall include the following Orifices & relative elevation differences:

The water quality treatment volume shall be 0.1111 ac-ft at a flow rate of 0.066 cfs. The present pond provides ac-ft of storage for treatment. The pond as constructed provide 0.133 ac-ft of treatment volume.

Stage-Storage Table

Pond Area Table (Elevation)	Existing Pond Area (sf)	Volume per ft. (cf)	Cumulative Pond Vol. (af)	Design Vol Per ft. (cf)	Design Volume (af)
10.5	708	339	0	0.0	0
11	2452	2,791	0.000	0.0	0.000
Treatment Volume (ac-ft)		2,791 (0.133)			
12	2774	2,613	0.060	1,406	0.076
13	3125	2,950	0.128	3,187	0.160
14	3630	3,378	0.228	3,982	0.266
Piped Detention		4,783	0.305		
15	4144	3,887	0.394	4,866	0.392
16	4640	4,392	0.495	5,838	0.539
17	5102	4,871	0.607	6,899	0.707
Total Volume (cf) =		26,445		26,178	

There is additional storage in the oversize piping under the parking lot. This additional volume is noted in the above stage storage table (Elevation 14).

Conclusions and Recommendations

The three lots owned by Paul Hagman to be developed for Dimensional Communications will utilize the existing onsite stormwater detention and water quality wet pond. There are large pipes under the parking lot that provide a portion of the stormwater detention volume. The wetpool facility will have two cells separated by a wall. The detention and water quality facility have been evaluated using the current

2012 DOE Drainage Manual with infiltration. The owner of this property has noted the detention pond has never reach the level where outflow to Flower's Drainage. The evaluation provided shows the comparison of the constructed pond verse the design calculation showing the volume of the constructed pond has a larger stage- storage volume for both detention/treatment systems.

The recommendations note the pond should remain undisturbed so the developed bio-mat within the pond, bottom & sides, to provide the water quality treatment for the project.

The SWMMWW requirements for construction of the project are as follows:

1. Construction of Access Route
- Constructed vehicle access shall be, whenever possible, limited to one route. Access points shall be stabilized with quarry spall or crushed rock to minimize the tracking of sediment onto public roads.

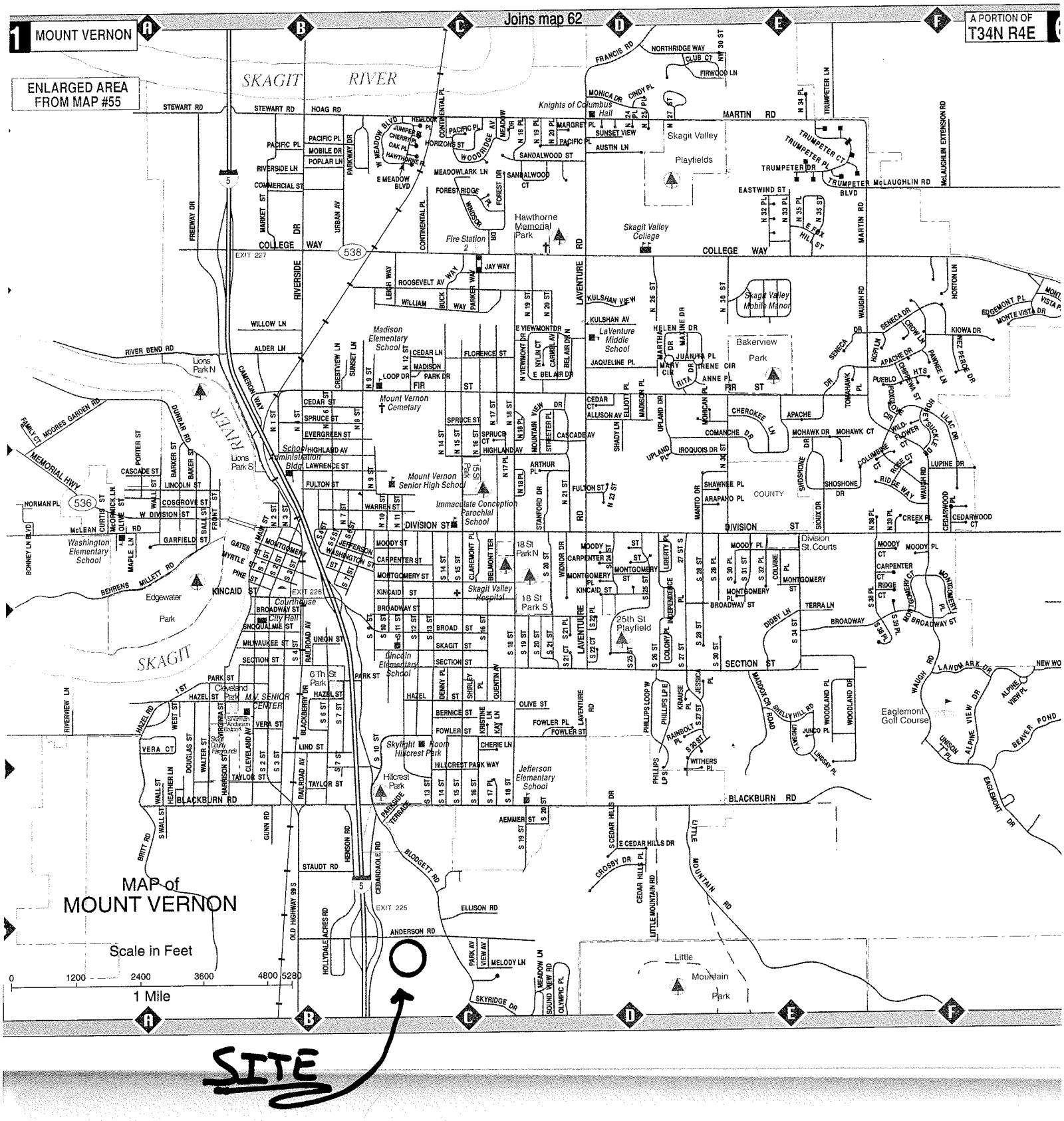
2. Stabilization of Denuded Areas
- All exposed and unworkable soils shall be stabilized by suitable application of BMPs, including but not limited to sod or other vegetation, plastic covering, mulching, or application of gravel based on areas to be paved. All BMPs shall be selected, designed and maintained in accordance with an approved manual. From October 1 through April 30, no soils shall remain exposed for more than 2 days. From May 1 through September 30, no soils shall remain exposed for more than 7 days.

3. Protection of Adjacent Properties
- Adjacent properties shall be protected from sediment deposition by appropriate use of vegetative buffer strips, sediment barriers or filters, dikes or mulching, or by a combination of these measures and other appropriate BMPs.

4. Maintenance
- All erosion and sediment control BMPs shall be regularly inspected and maintained to ensure continued performance of their intended function per the Stormwater Pollution Prevention Plan in Appendix F.

5. Other BMPs
- As required by the local plan approval authority, other appropriate BMPs to mitigate the effects of increased runoff shall be applied.

APPENDIX A - Soil Description and Hydrologic Data



Vicinity Map
Figure 1

Dimensional Site

Skagit County iMap

SKAGIT COUNTY does not attest to the accuracy to the data contained herein and makes no warranty with respect to the correctness or validity of this map. Data contained in this map is limited by the method and accuracy of its collection.

Map Scale: 1 inch = 120 Feet (1 inch = 0.0 Miles)

549750
549780
549810
549840
549870
549900
549930
549960
5360940
5360910
5360880
5360850
5360820
5360790
5360760
5360730
5360700
5360670
5360640
ANDERSON RD
57
96
N
Meters
0
20
40
80
120
Feet
0
50
100
200
300

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Municipalities

Cities

Urban Areas

Water Features

Oceans

Streams and Canals

Transportation

Rails

Roads

Interstate Highways

US Routes

State Highways

Local Roads

Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N

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

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

Date(s) aerial images were photographed: 7/20/1998

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

Map Unit Legend

Skagit County Area, Washington (WA657)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
57	Field silt loam, protected	1.1	13.3%
96	Mt. Vernon very fine sandy loam	7.0	86.7%
Totals for Area of Interest (AOI)		8.1	100.0%

57—Field silt loam, protected. This very deep, moderately well drained soil is on flood plains. Most areas of this soil are partially protected from flooding. The soil formed in recent alluvium with an admixture of volcanic ash. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 10 to 50 feet. The average annual precipitation is about 40 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 220 days.

Typically, the surface layer is dark brown silt loam 13 inches thick. The upper 8 inches of the underlying material is olive silt loam, the next 19 inches is grayish brown and dark gray, stratified fine sand and loamy fine sand, and the lower part to a depth of 60 inches or more is gray and dark gray, stratified very fine sandy loam and fine sand. In some areas the surface layer is fine sandy loam, in some areas the underlying material is loamy, and in some areas the surface layer is thick.

Included in this unit are small areas of Skagit and Sumas soils in depressional areas of flood plains.

Permeability of this Field soil is moderate. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 36 to 48 inches from November to May. The water table has been lowered by drainage of adjacent lowland areas. Runoff is slow, and the hazard of water erosion is slight. Flooding is rare in areas protected by dikes.

This unit is used as cropland, hayland, and pastureland.

This unit is suited to use as cropland. Areas of the unit that are drained are suited to all crops commonly grown in the survey area. Drainage permits field operations earlier in spring and increases yields of perennial crops. Crusting of the surface and compaction of the soil can be reduced by returning crop residue to the soil and by using minimum tillage.

Common forage plants on this soil are perennial grasses, legumes, oats, and corn. Applying animal manure helps to maintain organic matter content, fertility, and tilth. In summer supplemental irrigation is required for maximum production. Sprinkler irrigation is the most suitable method of applying water. Use of proper stocking rates, pasture rotation, and restricted grazing during the wet periods helps to keep the pasture in good condition and to protect the soil from erosion.

This unit has potential for use as woodland. On the basis of a 100-year site curve, the mean site index for Douglas fir is estimated to be 160. On the basis of a 50-year site curve, the mean site index for Douglas fir is estimated to be 120. The potential highest average growth rate for Douglas fir is 170 cubic feet per acre per year at age 65. Trees of limited extent include western redcedar. Common forest understory plants include western swordfern, creambush oceanspray, red huckleberry, and trailing blackberry.

This map unit is in capability subclass IIw.

58—Getchell gravelly silt loam, 30 to 65 percent slopes. This moderately deep, moderately well drained soil is on mountains. It formed in glacial till and volcanic ash underlain by dense glacial till. The native vegetation is mainly conifers. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 90 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 105 days.

Typically, the surface is covered with a mat of leaves and twigs 2 inches thick. The surface layer, where mixed to a depth of 6 inches, is brown gravelly silt loam. The subsoil is strong brown, dark brown, and dark yellowish brown gravelly silt loam 31 inches thick. Grayish brown, dense glacial till that crushes to gravelly loam is at a depth of about 37 inches. Depth to dense glacial till ranges from 20 to 40 inches. In some areas phyllite is in the surface layer and subsoil and in the dense glacial till.

Included in this unit are small areas of Crinker soils, deep soils, and Rock outcrop on mountainsides.

Permeability of this Getchell soil is moderate to the substratum and very slow through it. Available water capacity is moderate to high. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. A perched water table fluctuates between depths of 18 and 36 inches from November to April.

This unit is used as woodland.

Western hemlock is the main woodland species on this unit. On the basis of a 100-year site curve, the mean site index for western hemlock is 129. On the basis of a 50-year site curve, the mean site index for western hemlock is 91. The highest average growth rate for western hemlock is 198 cubic feet per acre per year at age 50. Areas on ridgetops that are subject to strong, persistent winds are less productive than are other areas of this unit. Among the trees of limited extent are Pacific silver fir, Douglas fir, and western redcedar. Common forest understory plants are red huckleberry, deer fern, western brackenfern, ladyfern, bunchberry dogwood, and blueleaved huckleberry.

The main limitation for the harvesting of timber is steepness of slope. Material cast to the side ravels and commonly sloughs when saturated. Steepness of slope restricts the use of wheeled and tracked equipment in

96—Mt. Vernon very fine sandy loam. This very deep, moderately well drained soil is on flood plains. It formed in recent alluvium with an admixture of volcanic ash. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 10 to 50 feet. The average annual precipitation is about 32 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 210 days.

Typically, the surface layer is dark brown very fine sandy loam 10 inches thick. The upper 19 inches of the underlying material is dark yellowish brown and grayish brown, stratified very fine sandy loam, fine sandy loam, loamy fine sand, and fine sand, and the lower part to a depth of 60 inches or more is grayish brown and olive gray, stratified silt loam, very fine sandy loam, fine sandy loam, loamy fine sand, and fine sand. In some areas the surface layer is sandy loam or silt loam, and in some areas the surface layer is not dark colored.

Included in this unit are small areas of soils that are underlain by a layer of sand 10 inches thick or more and soils that are silty throughout and are on flood plains. Also included are small areas of Mt. Vernon soils that have slopes of more than 3 percent and soils that are poorly drained and are in swales.

Permeability of this Mt. Vernon soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table has been lowered by drainage of adjacent lowland areas. A seasonal high water table is at a depth of 24 to 48 inches from November to April. This soil is subject to occasional, brief periods of flooding from November to April.

This unit is used as cropland, pastureland, hayland, and homesites.

The main limitation for use of this unit as cropland is the hazard of flooding. Flooding can be controlled by use of dikes. This unit is suited to all crops commonly grown in the survey area. Artificial drainage permits field operations to be conducted earlier and increases yields of perennial crops. Returning all crop residue to the soil and using cover crops help to maintain organic matter content, fertility, and tilth. In summer supplemental irrigation is required for maximum production. Sprinkler irrigation is the most suitable method of applying water. Crusting of the surface and compaction of the soil can be reduced by returning crop residue to the soil and by using minimum tillage.

Common forage plants on this unit are perennial grasses, legumes, oats, and corn. Applying animal manure and returning crop residue to the soil help to maintain organic matter content, fertility, and tilth. Animal manure can be properly applied on grass-legume crops periodically during the growing season.

This unit has potential for use as woodland.

On the basis of a 100-year site curve, the mean site index for Douglas fir is estimated to be 174. On the basis of a 50-year site curve, the mean site index for Douglas fir is estimated to be 130. The potential highest average growth rate for Douglas fir is 185 cubic feet per acre per year at age 60. Among the trees of limited extent are bigleaf maple, western redcedar, western hemlock, and red alder. Common forest understory plants are western swordfern, ladyfern, western brackenfern, trailing blackberry, Oregongrape, salal, and geranium.

If this unit is used for homesite development, the main limitations are the hazard of flooding and the seasonal high water table. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Tile drainage can be used to lower the water table if suitable outlets are available. Septic tank absorption fields do not function properly because of wetness. Effluent from the absorption fields may contaminate ground water. Community systems commonly are needed. Roads and streets should be located above the expected flood level.

This map unit is in capability subclass IIw.

97—Mukilteo muck. This very deep, very poorly drained soil is in depressional areas. It formed in decomposed sedges, mosses, shrubs, and grasses. Slope is 0 to 1 percent. The native vegetation is mainly sedges, mosses, shrubs, and grasses. Elevation is 50 to 1,000 feet. The average annual precipitation is about 60 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 160 to 210 days.

Typically, the surface tier is black muck 5 inches thick. The upper 43 inches of the underlying tier is dark reddish brown hemic or sapric material, and the lower part to a depth of 60 inches or more is black sapric material. In some areas the surface tier is dark reddish brown organic material.

Included in this unit are small areas of soils that are underlain by mineral soil material.

Permeability of this Mukilteo soil is moderate. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at or above the surface from October to May. Runoff is ponded, and the hazard of water erosion is none.

Most areas of this unit are used as wildlife habitat. A

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Report—Water Features

Water Features– Skagit County Area, Washington										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
57—Field silt loam, protected										
Field	C	—	January	3.0-4.0	>6.0	—	—	None	—	None
	C	—	February	3.0-4.0	>6.0	—	—	None	—	None
	C	—	March	3.0-4.0	>6.0	—	—	None	—	None
	C	—	April	3.0-4.0	>6.0	—	—	None	—	None
	C	—	May	3.0-4.0	>6.0	—	—	None	—	None
	C	—	November	3.0-4.0	>6.0	—	—	None	—	None
	C	—	December	3.0-4.0	>6.0	—	—	None	—	None
96—Mt. Vernon very fine sandy loam										
Mt. vernon	C	—	January	2.0-4.0	>6.0	—	—	None	Brief	Occasional
	C	—	February	2.0-4.0	>6.0	—	—	None	Brief	Occasional
	C	—	March	2.0-4.0	>6.0	—	—	None	Brief	Occasional
	C	—	April	2.0-4.0	>6.0	—	—	None	Brief	Occasional
	C	—	November	2.0-4.0	>6.0	—	—	None	Brief	Occasional
	C	—	December	2.0-4.0	>6.0	—	—	None	Brief	Occasional

Data Source Information

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Report—Physical Soil Properties

Physical Soil Properties– Skagit County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
57—Field silt loam, protected														
Field	0-13	—	—	10-20	0.85-0.95	4.00-14.00	0.30-0.40	0.0-2.9	5.0-10.0	.28	.32	5	5	56
	13-21	—	—	5-15	0.85-0.95	4.00-14.00	0.20-0.30	0.0-2.9	2.0-7.0	.28	.32			
	21-40	—	—	0-5	1.15-1.30	14.00-42.00	0.07-0.10	0.0-2.9	1.0-5.0	.37	.37			
	40-60	—	—	0-8	1.20-1.30	14.00-42.00	0.07-0.13	0.0-2.9	0.5-3.0	.43	.43			
96—Mt. Vernon very fine sandy loam														
Mt. vernon	0-10	—	—	5-15	0.90-1.10	4.00-14.00	0.20-0.30	0.0-2.9	3.0-9.0	.32	.32	5	2	134
	10-29	—	—	0-10	1.05-1.20	4.00-14.00	0.13-0.18	0.0-2.9	1.0-6.0	.37	.37			
	29-60	—	—	2-10	1.05-1.20	4.00-14.00	0.12-0.18	0.0-2.9	0.0-3.0	.37	.37			

Data Source Information

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

Chemical Soil Properties

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Report—Chemical Soil Properties

Chemical Soil Properties– Skagit County Area, Washington								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
57—Field silt loam, protected								
Field	0-13	33-55	—	6.6-7.3	0	0	0	0
	13-21	33-55	—	6.1-7.3	0	0	0	0
	21-40	2.0-10	—	6.1-7.3	0	0	0	0
	40-60	1.0-8.0	—	6.1-7.3	0	0	0	0
96—Mt. Vernon very fine sandy loam								
Mt. vernon	0-10	22-44	—	5.6-7.3	0	0	0	0
	10-29	22-44	—	5.6-7.3	0	0	0	0
	29-60	2.0-10	—	5.6-7.3	0	0	0	0

Data Source Information

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

Component Legend

This report presents general information about the map units and map unit components in the selected area. It shows map unit symbols and names and the components in each map unit. It also shows the percent of the components in the map units, the kind of component, and the slope range of each component.

Report—Component Legend

Component Legend– Skagit County Area, Washington						
Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. slope		
				Low	RV	High
57—Field silt loam, protected						
	100	Field	Series	0	2	3
96—Mt. Vernon very fine sandy loam						
	100	Mt. vernon	Series	0	2	3

Data Source Information

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factors Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the surface horizon.

Report—RUSLE2 Related Attributes

RUSLE2 Related Attributes– Skagit County Area, Washington							
Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
57—Field silt loam, protected							
Field	100	C	.32	5	30.1	54.9	15.0
96—Mt. Vernon very fine sandy loam							
Mt. vernon	100	C	.32	5	61.6	28.4	10.0

Data Source Information

Soil Survey Area: Skagit County Area, Washington
Survey Area Data: Version 4, Dec 4, 2006

APPENDIX B - Stormwater Runoff Calculations Pre & Post Conditions

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	07029-DimensionalSouthWarehouse-18-02-27
Site Name:	
Site Address:	
City:	
Report Date:	4/5/2018
Gage:	Burlington
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.00
Version Date:	2016/02/25
Version:	4.2.12

POC Thresholds

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

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	3.232
Pervious Total	3.232
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.232

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.647
Pervious Total	0.647
Impervious Land Use	acre
PARKING FLAT	2.586
Impervious Total	2.586
Basin Total	3.233

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	53.03 ft.	
Bottom Width:	53.03 ft.	
Depth:	5 ft.	
Volume at riser head:	0.4004 acre-feet.	
Infiltration On		
Infiltration rate:	2	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		372.57
Total Volume Through Riser (ac-ft.):		17.162
Total Volume Through Facility (ac-ft.):		389.732
Percent Infiltrated:		95.6
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
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:	4 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.33 in.	Elevation:0 ft.
Orifice 2 Diameter:	1.7 in.	Elevation:2.388 ft.
Orifice 3 Diameter:	1.02 in.	Elevation:2.72 ft.
Element Flows To:		
Outlet 1	Outlet 2	

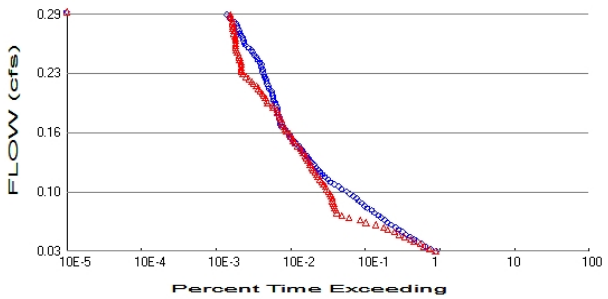
Pond Hydraulic Table

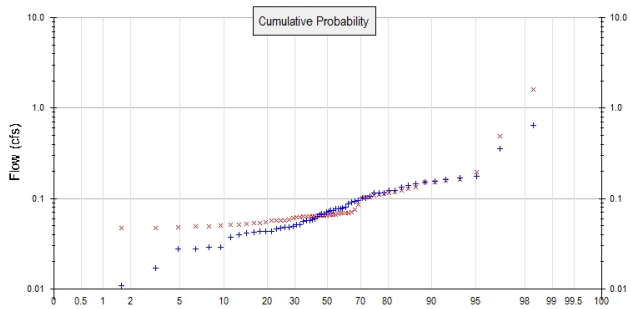
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.064	0.000	0.000	0.000
0.0556	0.065	0.003	0.011	0.130
0.1111	0.066	0.007	0.016	0.130
0.1667	0.067	0.011	0.019	0.130
0.2222	0.067	0.014	0.022	0.130
0.2778	0.068	0.018	0.025	0.130
0.3333	0.069	0.022	0.027	0.130
0.3889	0.070	0.026	0.029	0.130
0.4444	0.071	0.030	0.032	0.130
0.5000	0.072	0.034	0.033	0.130
0.5556	0.072	0.038	0.035	0.130
0.6111	0.073	0.042	0.037	0.130
0.6667	0.074	0.046	0.039	0.130
0.7222	0.075	0.050	0.040	0.130
0.7778	0.076	0.054	0.042	0.130
0.8333	0.077	0.059	0.043	0.130
0.8889	0.078	0.063	0.045	0.130
0.9444	0.079	0.067	0.046	0.130
1.0000	0.080	0.072	0.048	0.130
1.0556	0.080	0.076	0.049	0.130
1.1111	0.081	0.081	0.050	0.130
1.1667	0.082	0.085	0.051	0.130
1.2222	0.083	0.090	0.053	0.130
1.2778	0.084	0.095	0.054	0.130

1.3333	0.085	0.099	0.055	0.130
1.3889	0.086	0.104	0.056	0.130
1.4444	0.087	0.109	0.057	0.130
1.5000	0.088	0.114	0.058	0.130
1.5556	0.089	0.119	0.059	0.130
1.6111	0.090	0.124	0.060	0.130
1.6667	0.091	0.129	0.062	0.130
1.7222	0.092	0.134	0.063	0.130
1.7778	0.093	0.139	0.064	0.130
1.8333	0.094	0.144	0.065	0.130
1.8889	0.095	0.149	0.066	0.130
1.9444	0.096	0.155	0.066	0.130
2.0000	0.097	0.160	0.067	0.130
2.0556	0.098	0.166	0.068	0.130
2.1111	0.099	0.171	0.069	0.130
2.1667	0.100	0.177	0.070	0.130
2.2222	0.101	0.182	0.071	0.130
2.2778	0.102	0.188	0.072	0.130
2.3333	0.103	0.193	0.073	0.130
2.3889	0.104	0.199	0.076	0.130
2.4444	0.105	0.205	0.093	0.130
2.5000	0.106	0.211	0.102	0.130
2.5556	0.107	0.217	0.108	0.130
2.6111	0.108	0.223	0.114	0.130
2.6667	0.109	0.229	0.119	0.130
2.7222	0.110	0.235	0.125	0.130
2.7778	0.111	0.241	0.135	0.130
2.8333	0.112	0.247	0.142	0.130
2.8889	0.113	0.254	0.148	0.130
2.9444	0.114	0.260	0.154	0.130
3.0000	0.115	0.266	0.159	0.130
3.0556	0.116	0.273	0.164	0.130
3.1111	0.118	0.279	0.169	0.130
3.1667	0.119	0.286	0.173	0.130
3.2222	0.120	0.293	0.177	0.130
3.2778	0.121	0.299	0.182	0.130
3.3333	0.122	0.306	0.186	0.130
3.3889	0.123	0.313	0.189	0.130
3.4444	0.124	0.320	0.193	0.130
3.5000	0.125	0.327	0.197	0.130
3.5556	0.127	0.334	0.201	0.130
3.6111	0.128	0.341	0.204	0.130
3.6667	0.129	0.348	0.208	0.130
3.7222	0.130	0.355	0.211	0.130
3.7778	0.131	0.363	0.214	0.130
3.8333	0.132	0.370	0.218	0.130
3.8889	0.133	0.377	0.221	0.130
3.9444	0.135	0.385	0.224	0.130
4.0000	0.136	0.392	0.227	0.130
4.0556	0.137	0.400	0.438	0.130
4.1111	0.138	0.408	0.821	0.130
4.1667	0.139	0.415	1.310	0.130
4.2222	0.141	0.423	1.876	0.130
4.2778	0.142	0.431	2.491	0.130
4.3333	0.143	0.439	3.127	0.130
4.3889	0.144	0.447	3.757	0.130
4.4444	0.145	0.455	4.354	0.130
4.5000	0.147	0.463	4.892	0.130

4.5556	0.148	0.471	5.353	0.130
4.6111	0.149	0.480	5.727	0.130
4.6667	0.150	0.488	6.016	0.130
4.7222	0.152	0.496	6.238	0.130
4.7778	0.153	0.505	6.516	0.130
4.8333	0.154	0.513	6.738	0.130
4.8889	0.155	0.522	6.953	0.130
4.9444	0.157	0.531	7.161	0.130
5.0000	0.158	0.539	7.363	0.130
5.0556	0.159	0.548	7.560	0.130

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.232
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.647
Total Impervious Area: 2.586

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.069887
5 year	0.126966
10 year	0.172308
25 year	0.237434
50 year	0.29127
100 year	0.349409

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.073889
5 year	0.126223
10 year	0.175018
25 year	0.257379
50 year	0.337179
100 year	0.436091

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.169	0.195
1950	0.116	0.108
1951	0.154	0.061
1952	0.091	0.102
1953	0.063	0.053
1954	0.077	0.057
1955	0.067	0.059
1956	0.051	0.065
1957	0.095	0.075
1958	0.057	0.055

1959	0.101	0.066
1960	0.072	0.065
1961	0.049	0.069
1962	0.011	0.063
1963	0.041	0.051
1964	0.048	0.070
1965	0.093	0.124
1966	0.047	0.063
1967	0.060	0.066
1968	0.124	0.134
1969	0.040	0.049
1970	0.028	0.065
1971	0.115	0.117
1972	0.058	0.064
1973	0.068	0.054
1974	0.115	0.069
1975	0.358	1.599
1976	0.043	0.070
1977	0.051	0.057
1978	0.080	0.085
1979	0.043	0.062
1980	0.101	0.150
1981	0.057	0.052
1982	0.140	0.153
1983	0.076	0.068
1984	0.162	0.159
1985	0.029	0.051
1986	0.087	0.066
1987	0.079	0.104
1988	0.134	0.104
1989	0.038	0.065
1990	0.105	0.128
1991	0.151	0.163
1992	0.070	0.066
1993	0.067	0.063
1994	0.017	0.045
1995	0.028	0.049
1996	0.147	0.063
1997	0.651	0.115
1998	0.074	0.057
1999	0.043	0.048
2000	0.029	0.057
2001	0.009	0.048
2002	0.055	0.052
2003	0.043	0.047
2004	0.078	0.111
2005	0.048	0.069
2006	0.122	0.112
2007	0.073	0.064
2008	0.175	0.489
2009	0.046	0.063

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.6510	1.5995
2	0.3578	0.4890
3	0.1748	0.1945

4	0.1686	0.1627
5	0.1621	0.1594
6	0.1535	0.1526
7	0.1514	0.1503
8	0.1468	0.1344
9	0.1395	0.1278
10	0.1336	0.1240
11	0.1236	0.1165
12	0.1218	0.1151
13	0.1163	0.1121
14	0.1154	0.1110
15	0.1148	0.1076
16	0.1054	0.1037
17	0.1013	0.1035
18	0.1013	0.1023
19	0.0952	0.0850
20	0.0926	0.0745
21	0.0907	0.0703
22	0.0867	0.0696
23	0.0797	0.0690
24	0.0790	0.0690
25	0.0776	0.0688
26	0.0766	0.0681
27	0.0761	0.0663
28	0.0738	0.0658
29	0.0732	0.0656
30	0.0724	0.0656
31	0.0700	0.0655
32	0.0683	0.0651
33	0.0674	0.0650
34	0.0665	0.0648
35	0.0628	0.0644
36	0.0597	0.0637
37	0.0584	0.0634
38	0.0572	0.0633
39	0.0567	0.0632
40	0.0553	0.0631
41	0.0510	0.0626
42	0.0508	0.0616
43	0.0492	0.0609
44	0.0484	0.0587
45	0.0479	0.0571
46	0.0474	0.0571
47	0.0457	0.0570
48	0.0432	0.0568
49	0.0429	0.0549
50	0.0428	0.0536
51	0.0428	0.0534
52	0.0413	0.0520
53	0.0397	0.0518
54	0.0376	0.0511
55	0.0290	0.0506
56	0.0289	0.0493
57	0.0277	0.0491
58	0.0277	0.0484
59	0.0168	0.0476
60	0.0108	0.0467
61	0.0085	0.0450

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0349	18837	18576	98	Pass
0.0375	15924	15548	97	Pass
0.0401	13580	13017	95	Pass
0.0427	12217	11563	94	Pass
0.0453	10549	9666	91	Pass
0.0479	9651	8596	89	Pass
0.0505	8489	7187	84	Pass
0.0531	7422	6012	81	Pass
0.0557	6759	5272	77	Pass
0.0582	5935	4252	71	Pass
0.0608	5424	3741	68	Pass
0.0634	4770	2947	61	Pass
0.0660	4226	2201	52	Pass
0.0686	3886	1819	46	Pass
0.0712	3450	1291	37	Pass
0.0738	3187	1039	32	Pass
0.0764	2843	894	31	Pass
0.0790	2603	876	33	Pass
0.0815	2269	836	36	Pass
0.0841	2073	815	39	Pass
0.0867	1955	801	40	Pass
0.0893	1765	781	44	Pass
0.0919	1646	765	46	Pass
0.0945	1473	747	50	Pass
0.0971	1320	713	54	Pass
0.0997	1207	686	56	Pass
0.1023	1025	651	63	Pass
0.1049	946	622	65	Pass
0.1074	816	589	72	Pass
0.1100	722	554	76	Pass
0.1126	673	527	78	Pass
0.1152	608	489	80	Pass
0.1178	570	473	82	Pass
0.1204	531	450	84	Pass
0.1230	504	434	86	Pass
0.1256	467	406	86	Pass
0.1282	436	388	88	Pass
0.1307	412	383	92	Pass
0.1333	382	365	95	Pass
0.1359	368	352	95	Pass
0.1385	349	334	95	Pass
0.1411	318	314	98	Pass
0.1437	306	302	98	Pass
0.1463	289	289	100	Pass
0.1489	277	266	96	Pass
0.1515	248	244	98	Pass
0.1540	234	232	99	Pass
0.1566	220	228	103	Pass
0.1592	210	217	103	Pass
0.1618	205	207	100	Pass
0.1644	186	186	100	Pass
0.1670	177	182	102	Pass
0.1696	163	174	106	Pass

0.1722	157	168	107	Pass
0.1748	155	165	106	Pass
0.1773	151	159	105	Pass
0.1799	149	154	103	Pass
0.1825	147	149	101	Pass
0.1851	143	143	100	Pass
0.1877	141	139	98	Pass
0.1903	139	124	89	Pass
0.1929	137	121	88	Pass
0.1955	134	105	78	Pass
0.1981	126	102	80	Pass
0.2006	125	98	78	Pass
0.2032	121	92	76	Pass
0.2058	120	89	74	Pass
0.2084	118	83	70	Pass
0.2110	108	79	73	Pass
0.2136	106	74	69	Pass
0.2162	102	68	66	Pass
0.2188	101	64	63	Pass
0.2214	99	59	59	Pass
0.2240	95	54	56	Pass
0.2265	93	49	52	Pass
0.2291	90	46	51	Pass
0.2317	89	46	51	Pass
0.2343	87	46	52	Pass
0.2369	86	46	53	Pass
0.2395	82	46	56	Pass
0.2421	77	44	57	Pass
0.2447	74	44	59	Pass
0.2473	69	43	62	Pass
0.2498	66	41	62	Pass
0.2524	64	40	62	Pass
0.2550	58	39	67	Pass
0.2576	54	39	72	Pass
0.2602	51	39	76	Pass
0.2628	50	39	78	Pass
0.2654	49	39	79	Pass
0.2680	46	38	82	Pass
0.2706	45	37	82	Pass
0.2731	43	37	86	Pass
0.2757	42	36	85	Pass
0.2783	41	36	87	Pass
0.2809	40	36	90	Pass
0.2835	37	35	94	Pass
0.2861	33	35	106	Pass
0.2887	33	33	100	Pass
0.2913	30	33	110	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.1111 acre-feet
On-line facility target flow:	0.0656 cfs.
Adjusted for 15 min:	0.0656 cfs.
Off-line facility target flow:	0.0415 cfs.
Adjusted for 15 min:	0.0415 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	☐	354.63			☐	95.60			
Total Volume Infiltrated		354.63	0.00	0.00		95.60	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

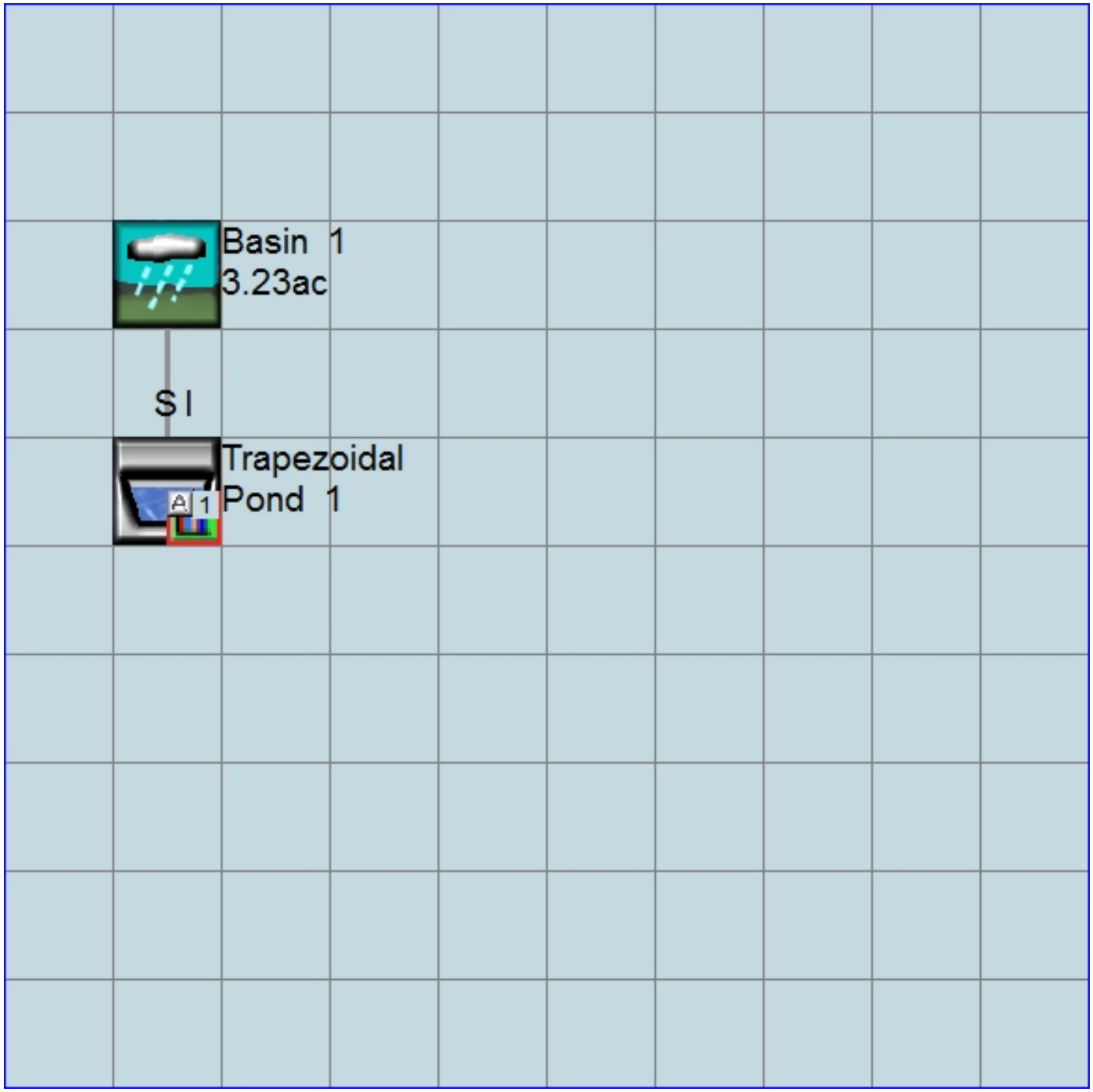
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   07029-DimensionalSouthWarehouse-18-02-27.wdm
MESSU      25   Pre07029-DimensionalSouthWarehouse-18-02-27.MES
           27   Pre07029-DimensionalSouthWarehouse-18-02-27.L61
           28   Pre07029-DimensionalSouthWarehouse-18-02-27.L62
           30   POC07029-DimensionalSouthWarehouse-18-02-271.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                   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***
PERLND  10                       3.232     COPY   501     12
PERLND  10                       3.232     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    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
```

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   07029-DimensionalSouthWarehouse-18-02-27.wdm
MESSU      25   Mit07029-DimensionalSouthWarehouse-18-02-27.MES
           27   Mit07029-DimensionalSouthWarehouse-18-02-27.L61
           28   Mit07029-DimensionalSouthWarehouse-18-02-27.L62
           30   POC07029-DimensionalSouthWarehouse-18-02-271.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND      11
      RCHRES       1
      COPY         1
      COPY       501
      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
  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           ***
   11      PARKING/FLAT           1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   11         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   11         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     ***
   11         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   11           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
   11              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   11              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                       0.647     RCHRES   1      2
PERLND  16                       0.647     RCHRES   1      3
IMPLND  11                       2.586     RCHRES   1      5

******Routing******
PERLND  16                       0.647     COPY     1     12
IMPLND  11                       2.586     COPY     1     15
PERLND  16                       0.647     COPY     1     13
RCHRES   1                           1     COPY   501     17
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-005    2    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  5  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      0.01       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  5.0  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    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.064563  0.000000  0.000000  0.000000
  0.055556  0.065377  0.003609  0.011314  0.130202
  0.111111  0.066197  0.007264  0.016001  0.130202
  0.166667  0.067021  0.010965  0.019597  0.130202
  0.222222  0.067850  0.014711  0.022628  0.130202
  0.277778  0.068685  0.018504  0.025299  0.130202
  0.333333  0.069525  0.022343  0.027714  0.130202
  0.388889  0.070369  0.026229  0.029935  0.130202
  0.444444  0.071219  0.030162  0.032002  0.130202
  0.500000  0.072074  0.034142  0.033943  0.130202
  0.555556  0.072934  0.038170  0.035779  0.130202
  0.611111  0.073800  0.042246  0.037525  0.130202
  0.666667  0.074670  0.046370  0.039194  0.130202
  0.722222  0.075545  0.050543  0.040794  0.130202
  0.777778  0.076426  0.054765  0.042334  0.130202
  0.833333  0.077311  0.059035  0.043820  0.130202
  0.888889  0.078202  0.063355  0.045257  0.130202
  0.944444  0.079098  0.067724  0.046650  0.130202
  1.000000  0.079999  0.072144  0.048002  0.130202
  1.055556  0.080905  0.076613  0.049318  0.130202
  1.111111  0.081816  0.081133  0.050599  0.130202
  1.166667  0.082732  0.085704  0.051848  0.130202
  1.222222  0.083653  0.090326  0.053069  0.130202
  1.277778  0.084580  0.094999  0.054261  0.130202
  1.333333  0.085511  0.099724  0.055428  0.130202
  1.388889  0.086448  0.104500  0.056571  0.130202
  1.444444  0.087390  0.109329  0.057692  0.130202
  1.500000  0.088337  0.114211  0.058791  0.130202
  1.555556  0.089288  0.119145  0.059869  0.130202
  1.611111  0.090246  0.124132  0.060929  0.130202
  1.666667  0.091208  0.129172  0.061971  0.130202
  1.722222  0.092175  0.134266  0.062995  0.130202
  1.777778  0.093147  0.139414  0.064003  0.130202
  1.833333  0.094125  0.144616  0.064995  0.130202
  1.888889  0.095107  0.149872  0.065973  0.130202
  1.944444  0.096095  0.155183  0.066936  0.130202
  2.000000  0.097088  0.160550  0.067885  0.130202
  2.055556  0.098085  0.165971  0.068822  0.130202
  2.111111  0.099088  0.171448  0.069746  0.130202
  2.166667  0.100096  0.176981  0.070657  0.130202
  2.222222  0.101109  0.182570  0.071558  0.130202
  2.277778  0.102128  0.188215  0.072447  0.130202
  2.333333  0.103151  0.193918  0.073325  0.130202
  2.388889  0.104179  0.199677  0.076531  0.130202
  2.444444  0.105213  0.205493  0.093683  0.130202
  2.500000  0.106252  0.211367  0.102144  0.130202
  2.555556  0.107295  0.217299  0.108839  0.130202
  2.611111  0.108344  0.223289  0.114611  0.130202
  2.666667  0.109398  0.229338  0.119787  0.130202
  2.722222  0.110457  0.235445  0.125870  0.130202
  2.777778  0.111521  0.241611  0.135753  0.130202
  2.833333  0.112591  0.247836  0.142640  0.130202
```

```
  2.888889  0.113665  0.254121  0.148695  0.130202
  2.944444  0.114744  0.260466  0.154246  0.130202
  3.000000  0.115829  0.266870  0.159434  0.130202
  3.055556  0.116919  0.273336  0.164340  0.130202
  3.111111  0.118013  0.279862  0.169015  0.130202
  3.166667  0.119113  0.286448  0.173494  0.130202
  3.222222  0.120218  0.293097  0.177805  0.130202
  3.277778  0.121328  0.299806  0.181969  0.130202
  3.333333  0.122444  0.306578  0.186002  0.130202
  3.388889  0.123564  0.313411  0.189918  0.130202
  3.444444  0.124689  0.320307  0.193727  0.130202
  3.500000  0.125820  0.327266  0.197440  0.130202
  3.555556  0.126955  0.334287  0.201063  0.130202
  3.611111  0.128096  0.341372  0.204604  0.130202
  3.666667  0.129242  0.348520  0.208069  0.130202
  3.722222  0.130393  0.355732  0.211464  0.130202
  3.777778  0.131549  0.363008  0.214792  0.130202
  3.833333  0.132710  0.370349  0.218058  0.130202
  3.888889  0.133876  0.377754  0.221266  0.130202
  3.944444  0.135047  0.385224  0.224418  0.130202
  4.000000  0.136223  0.392759  0.227519  0.130202
  4.055556  0.137405  0.400360  0.438842  0.130202
  4.111111  0.138592  0.408027  0.821381  0.130202
  4.166667  0.139783  0.415759  1.310805  0.130202
  4.222222  0.140980  0.423558  1.876399  0.130202
  4.277778  0.142182  0.431424  2.491167  0.130202
  4.333333  0.143389  0.439357  3.127689  0.130202
  4.388889  0.144601  0.447356  3.757892  0.130202
  4.444444  0.145818  0.455423  4.354370  0.130202
  4.500000  0.147041  0.463558  4.892561  0.130202
  4.555556  0.148268  0.471761  5.353522  0.130202
  4.611111  0.149500  0.480033  5.727178  0.130202
  4.666667  0.150738  0.488373  6.015968  0.130202
  4.722222  0.151981  0.496782  6.238842  0.130202
  4.777778  0.153229  0.505260  6.516515  0.130202
  4.833333  0.154481  0.513807  6.738427  0.130202
  4.888889  0.155739  0.522424  6.953114  0.130202
  4.944444  0.157003  0.531112  7.161243  0.130202
  5.000000  0.158271  0.539869  7.363384  0.130202
  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    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1003 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
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        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       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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APPENDIX C – Stormwater Facility Operations and Maintenance Manual

4.6 Maintenance Standards for Drainage Facilities

The facility-specific maintenance standards contained in this section are intended to be conditions for determining if maintenance actions are required as identified through inspection. They are not intended to be measures of the facility's required condition at all times between inspections. In other words, exceedence of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance schedules shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

Table 4.5 – Maintenance Standards

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	~~No contaminants or pollutants present.~~
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

No. 4 – Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 11 – Wetponds

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond area.	Trash and debris removed from pond.
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

APPENDIX D – Stormwater Pollution Prevention Plan

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Dimensional Communications South Warehouse Addition

Prepared for:

The Washington State Department of Ecology

Northwest Regoin

Permittee / Owner	Developer	Operator / Contractor
Dimensional Communications	Paul Hagman	Paul Hagman

1220 Anderson Road, Mount Vernon WA 98274

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBDermined	TB Determined	TB Determined

SWPPP Prepared By

Name	Organization	Contact Phone Number
Douglas E Schwind	Northwest Datum & Design	360-424-4865

SWPPP Preparation Date

April 2018

Project Construction Dates

Activity / Phase	Start Date	End Date
Drainage & Site Plan	June 2018	April 2019

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F. 303(d) List Waterbodies / TMDL Waterbodies Information

G. Contaminated Site Information

H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Dimensiona Communications South Warehouse Additon
Street/Location: 1220 Anderson Road
City: Mount Vernon State: WA Zip code: 98274
Subdivision: Sec 32, T34N, R4E
Receiving waterbody: Skagit River

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage: 8.980 ac
Disturbed acreage: 3.559 ac
Existing structures: 30,600 sf
Landscape topography: 0.675 ac
Drainage patterns: 5.358 ac
Existing Vegetation: 5.358 ac
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes): 4.365 ac

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: No documented impairments

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

List all known or suspected contaminants associated with this site in Table 1. Include contaminants previously remediated.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration

1.2 Proposed Construction Activities

Description of site development (example: subdivision):

- **Project description** –

The purpose of the construction activities is to construct an additional building and associated improvements for the expansion of the company. The total site area is 3.233 acres, with approximately 1 acres of new disturbance. Currently there is a building, paved parking and access to the site. It is being proposed that approximately 4,800 cy of fill material will be used for the construction activities.

Describe the nature and purpose of the construction project. Include the total size of the area, any increase in existing impervious area; the total area expected to be disturbed by clearing, grading, excavation or other construction activities, including off-site borrow and fill areas; and the volumes of grading cut and fill that are proposed.

- **Existing site conditions** –

Topography of the site is relatively flat, with a maximum slope of between 1-2%. There are currently two man made ditches that cross near the boarders of the site. These ditches and their buffers encroachments are being addressed/mitigated with the ditch relocation & habitat enhancement project for the Maddox Drainage. There is currently a building, parking, a vacated barn which are on the property.

Describe the existing topography, vegetation, and drainage. Include a description of any structures or development on the parcel including the area of existing impervious surfaces.

- **Adjacent areas** –

Anderson Road adjacent to the project site will not be modified. Additional commercial businesses are located east of the site, and there is a vacant lot to the northwest of the site. South of the project site is vacant land. The downstream drainage leading from the site is as follows: the treatment and detention system discharges to the existing drainage ditches known as Flowers Ditch which ties to the Maddox Creek drainage about 300 ft downstream of the detention pond. These man made ditches on this property tie to Beaver Slough. Beaver Slough extends south for 2,100 ft before traversing straight west under Cedardale Road and Interstate 5. Beaver Slough is an open ditch for 200 to 300 ft for this first segment of westerly segment before going underground in a CMP until exiting on the west side of I-5.

Describe adjacent areas, including streams, lakes, wetlands, residential areas, and roads that might be affected by the construction project. Provide a description of the downstream drainage leading from the site to the receiving body of water.

- **Critical areas** –

The south and west boundary of the site are Maddox Creek Ditch and Flowers Ditch. Both of these drainages combine into Beavers Slough which from this project site south is an excavated drainage ditch. There are non-contiguous scattered critical areas east and west of these drainage ditches. Stormwater runoff from the site will enter the proposed treatment and detention facility and

then be released to Flowers Ditch as described above.

Describe areas on or adjacent to the site that are classified as critical areas. Critical areas that receive runoff from the site shall be described up to ¼ mile away. The distance may be increased by the Plan Approval Authority. Describe special requirements for working near or within these areas.

• **Soil** –

According to the Soil Survey of Skagit County, prepared by the United States Department of Agriculture, the site has an underlying soil composed of Field Silt Loam, and Mt. Vernon very fine sandy loam. Field silt loam is a deep, moderately drained soil with moderate permeability and high water capacity which are mostly protected from flooding by constructed dikes. Mt. Vernon very fine sandy loam is a very deep, moderately drained soil. Both soils are categorized as a Hydrologic Group C.

Describe the soil on the site, giving such information as soil names, mapping unit, erodibility, settleability, permeability, depth, texture, and soil structure.

• **Potential erosion problem areas** –

The site has very few erosion problem areas. The highest potential is located in the areas nearest the drainage ditches where the bank is steepest. These banks at their steepest have 25% slopes and are located 50 ft from the stream channel.

Describe areas on the site that have potential erosion problems.

• **Construction phasing** –

The project is to be completed in by completing the drainage & habitat enhancement project first with the building and site plan following. On-site utilities and stormwater will be constructed near the beginning of the project with the building area following. The roadway and parking areas will be constructed or reconstructed at the end of the project.

Describe the intended sequence and timing of construction activities any proposed construction phasing.

• **Construction schedule** –

The project will begin in June 2018 and be completed by the spring of 2019. The majority of earthwork will be done during the summer months. BMPs and other TESC measures will be taken to limit sediment transport to nearby receiving waters.

Describe the construction schedule. If the schedule extends into the wet season, describe what activities will continue during the wet season and how the transport of sediment from the construction site to receiving waters will be prevented.

The project includes an existing building and a proposed warehouse building expansion on the south side of the existing building. The existing building has both office and light

manufacturing uses. The office space is located in the front lower and upper portions of the existing building totaling less than 9,000 sf of office space when the entry/waiting area and the open to above areas are excluded. The easterly & northerly portion of the existing building is used for light manufacturing and consists of a single story area of 26,500 sf. A portion of the manufacturing building has a second story floor area of approximately 4,500 sf of light manufacturing

The proposed structure has a gross single story floor area of 9,862 sf to be used for storage. The existing site has an impervious area of 93,000 sf and will be expanded by 28,040 sf to an impervious area totaling near 121,040 sf.

Description of construction activities (example: site preparation, demolition, excavation):

There will be excavation quantities for topsoil stripping, excavation for the new stream alignment, excavation for the footings of buildings & for removal of piping & concrete slave & retaining walls. Fill will consist of material to fill abandon drainages & to grade low areas on this project site and the lots of the binding site plan. Fill materials will be a combination of reuses of suitable soil excavated from the stream alignment & import. Clean topsoil will be stock piled and reused to topsoil the excavated stream banks and over fill place on other lots. All material stripped from the site will be used onsite where possible and excess material exported to approved soil disposal areas.

The new channel excavation will by 4,050 cy. It included the over excavation for topsoil, channel armoring, spawning gravel. Fill material being topsoil, channel armoring & spawning gravel 550 cy. 1,500 cy of the 4,050 excavated materials will be place on Lot 2. Any salvageable material that can be used for structural fill will be used to fill the abandoned drainage channel on Felzer Property, estimated fill = 1,100 cy. Fill for the site grading plan on Lot 1 of Dimensional Communications property is estimated at 4,800 cy which includes fill place to fill the drainage channel on Dimensional's property Lot 1. Material in excess of usable salvaged soil will be disposed of off-site. Where additional material is required for fills soil will be imported from local gravel pits.

Total Excavation 5,500 cy; Fill 8,000 cy.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

The site under consideration is located on and surrounded by relatively level terrain south of Anderson Road, Anderson Road intercepts runoff from land area

north of the site. Land to the west, south and east slope away from the project and therefore there is not an upstream area contributing runoff to the site.

The downstream analysis for the project assesses the receiving channels, drainage ways and other stormwater facilities downstream of the project. A description of the downstream conveyance system is as follows:

The stormwater treatment and detention system discharges to the existing drainage ditches known as Flowers Ditch. Shortly downstream, approximately 250 ft. the Flowers Drainage intersect with Maddox Drainage and the combined channels are renamed to Beavers Slough. From this point, Beaver Slough extends south for 2,100 ft. before traversing straight west for 250 ft. in an open ditch before transitioning to a pipe. The drainage flows under a commercial site (Sickesteel Cranes), Cedardale Road and Interstate 5 for a distance of 900 ft.

Description of final stabilization (example: extent of revegetation, paving, landscaping):

The construction plans show revegetation and landscaping plan requirements to establish vegetation for disturbe area around the new building construction & for the habitat enhancement project. The site has been design to meet the requirements of the adopted 2012 DOE Drainage manual's BMP.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

There are no contaminated soils on this site. No discharges are proposed to the groundwaters, with the exception of the natural infiltration of stormwaters that occurs in the existing treatment/detention pond.

Sewer service are connected to the City of Mount Vernon's treatment system.

2 Construction Stormwater Best Management Practices (BMPs)

Describe the BMPs identified to control pollutants in stormwater discharges. Depending on the site, multiple BMPs for each element may be necessary. For each element identified:

- Clearly describe the control measure(s).
- Describe the implementation sequence.
- Describe the inspection and maintenance procedures for that specific BMP.
- Identify the responsible party for maintaining BMPs (if your SWPPP is shared by multiple operators, indicate the operator responsible for each BMP).

Categorize each BMP under one of the following elements as listed below:

1. Preserve Vegetation / Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outfalls
9. Control Pollutants
10. Control Dewatering
11. Maintain BMPs
12. Manage the Project
13. Protect Low Impact Development

- BMPs must be consistent with the most current approved edition (at the time the CSWGP was issued) of the Stormwater Management Manual for Western Washington (SWMMWW) at sites west of the crest of the Cascade Mountains; the Stormwater Management Manual for Eastern Washington (SWMMEW) for sites east of the crest of the Cascade Mountains; or other Ecology-approved manual.
- Note the location of each BMP on your Site Map in Appendix A.
- Include the corresponding Ecology source control BMPs and runoff conveyance and treatment BMPs in Appendix B.
    - SWMMWW Volume II Chapter 4 Sections 4.1 and 4.2 – https://fortress.wa.gov/ecy/publications/SummaryPages/1410055.html or
    - SWMMEW Chapter 7 Section 7.3.1 and 7.3.2 – http://www.ecy.wa.gov/biblio/0410076.html

If it can be justified that a particular element does not apply to the project site, include a written justification in lieu of the BMP description in the text for the appropriate element.

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

- Prior to beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area. These are marked on the plans, and shall be marked in the field to prevent damage and offsite impacts.
- Plastic fence may be used to mark the clearing limits. The construction plans provided utilize silt fences to mark the downstream limits of the clear limits.
- The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable. Stockpiles locations are identified onsite and shall be covered to prevent erosion based upon the seasonal requirements for dry & wet season construction. Disturbed vegetation shall be replaced immediately upon completion of the ground disturbing activities.
- Suggested BMPs

BMP C101: Preserving Natural Vegetation

BMP C102: Buffer Zones

BMP C103: High Visibility Plastic or Metal Fence

2.1.2 Element 2: Establish Construction Access

- Construction vehicle access and exit shall be limited to one route, if possible, or two for linear projects such as roadways where more than one access is necessary for large equipment maneuvering.
- Access points shall be stabilized with a pad of quarry spalls or crushed rock prior to traffic leaving the construction site to minimize the tracking of sediment onto public roads.
- Wheel wash or tire baths should be located on site, if applicable.
- If sediment is tracked off site, public roads shall be cleaned thoroughly at the end of each day, or more frequently during wet weather, if necessary to prevent sediment from entering waters of the state. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing will be allowed only after sediment is removed in this manner.
- Street wash wastewater shall be controlled by pumping back on site or otherwise be prevented from discharging into systems tributary to state surface waters.
- Suggested BMPs

BMP C105: Stabilized Construction Entrance

BMP C107: Construction Road/Parking Area Stabilization

2.1.3 Element 3: Control Flow Rates

- Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site, as required by local plan approval authority.
- Downstream analysis is necessary if changes in offsite flows could impair or alter conveyance systems, streambanks, bed sediment, or aquatic habitat. See Chapter 3 for offsite analysis guidelines.
- Where necessary to comply with Minimum Requirement #7, stormwater retention/detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces).
- The local permitting agency may require pond designs that provide additional or different stormwater flow control if necessary to address local conditions or to protect properties and waterways downstream from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site.
- If permanent infiltration ponds are used for flow control during construction, these facilities should be protected from siltation during the construction phase.
- Suggested BMPs

BMP C240: Sediment Trap
Refer to Volume 3, Detention Facilities, Infiltration Stormwater Quantity and Flow Control

Will you construct stormwater retention and/or detention facilities?
X Yes ☐ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
X Yes ☐ No The existing pond acts as an infiltration pond. Land owner reports that in the 25 years the pond has exited that it has never reach the overflow level of the low flow outlet of the control structure.

2.1.4 Element 4: Install Sediment Controls

- Prior to leaving a construction site or prior to discharge to an infiltration facility, stormwater runoff from disturbed areas shall pass through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3, bullet #1. Full stabilization means concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent

soil erosion. The Local Permitting Authority shall inspect and approve areas fully stabilized by means other than pavement or quarry spalls.

- Sediment ponds, vegetated buffer strips, sediment barriers or filters, dikes, and other BMPs intended to trap sediment on site shall be constructed as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Earthen structures such as dams, dikes, and diversions shall be seeded and mulched according to the timing indicated in Element #5.
- BMPs intended to trap sediment on site must be located in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages, often during non-storm events, in response to rain event changes in stream elevation or wetted area.
- Suggested BMPs

BMP C230: Straw Bale Barrier
BMP C231: Brush Barrier
BMP C232: Gravel Filter Berm
BMP C233: Silt Fence
BMP C235: Straw Wattles
BMP C240: Sediment Trap
BMP C251: Construction Stormwater Filtration

Element 5: Stabilize Soils

- All exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrop impact, flowing water, and wind.
- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This condition applies to all soils on site, whether at final grade or not. These time limits may be adjusted by the local permitting authority if it can be shown that the average time between storm events justifies a different standard.
- Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.
- Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.
- Soil stabilization measures should be appropriate for the time of year, site conditions, estimated duration of use, and potential water quality impacts that stabilization agents

may have on downstream waters or ground water.

- Soil stockpiles must be stabilized from erosion, protected with sediment trapping measures, and when possible, be located away from storm drain inlets, waterways and drainage channels.
- Linear construction activities, including right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall be conducted to meet the soil stabilization requirement. Contractors shall install the bedding materials, roadbeds, structures, pipelines, or utilities and re-stabilize the disturbed soils so that:
  - From October 1 through April 30 no soils shall remain exposed and un-worked for more than 2 days and
  - From May 1 to September 30, no soils shall remain exposed and un-worked for more than 7 days.
- Suggested BMPs

BMP C120: Temporary and Permanent Seeding
BMP C121: Mulching
BMP C122: Nets and Blankets
BMP C123: Plastic Covering
BMP C125: Topsoiling
BMP C130: Surface Roughening
BMP C131: Gradient Terraces
BMP C140: Dust Control

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: June 2018 End date: April 2019

Will you construct during the wet season?
X Yes ☐ No

2.1.5 Element 6: Protect Slopes

- Design and construct cut and fill slopes in a manner that will minimize erosion.
- Consider soil type and its potential for erosion.
- Reduce slope runoff velocities by reducing continuous length of slope with terracing and diversions, reduce slope steepness, and roughen slope surface.
- Off-site stormwater (run-on) shall be diverted away from slopes and disturbed areas with interceptor dikes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.
- Diversion swales will collect both on-site and off site surface water & convey it to the TESC sedimentation ponds.
- Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.
- Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.
- Check dams shall be placed at regular intervals within channels that are cut down a slope.
- Stabilize soils on slopes, as specified in Element #5.
- Suggested BMPs

Will steep slopes be present at the site during construction?
X Yes ☐ No

BMP C120: Temporary and Permanent Seeding
BMP C130: Surface Roughening
BMP C131: Gradient Terraces
BMP C201: Grass-Lined Channels
BMP C204: Pipe Slope Drains
BMP C205: Subsurface Drains
BMP C206: Level Spreader
BMP C207: Check Dams
BMP C208: Triangular Silt Dike (Geotextile-Encased Check Dam)

2.1.6 Element 7: Protect Drain Inlets

- All storm drain inlets made operable during construction shall be protected so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.
- All approach roads shall be kept clean. Sediment and street wash water shall not be allowed to enter storm drains without prior and adequate treatment unless treatment is provided before the storm drain discharges to waters of the state.
- Inlets should be inspected weekly at a minimum and daily during storm events. Inlet protection devices should be cleaned or removed and replaced when sediment has

filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

- Suggested BMPs

BMP C220: Storm Drain Inlet Protection

2.1.7 Element 8: Stabilize Channels and Outlets

- All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10- year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used.
- Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.
- Suggested BMPs

BMP C202: Channel Lining
BMP C209: Outlet Protection

2.1.8 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)

- All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on site.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste). On-site fueling tanks shall include secondary containment.

- Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.
- Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system or to the sanitary sewer.
- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application rates and procedures shall be followed.
- BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Stormwater discharges shall not cause or contribute to a violation of the water quality standard for pH in the receiving water.
- Construction sites with significant concrete work shall adjust the pH of stormwater if necessary to prevent violations of water quality standards.
- Suggested BMPs

BMP C151: Concrete Handling

BMP C152: Saw cutting and Surfacing Pollution Prevention

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
X Yes ☐ No

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes X No

Will pH-modifying sources be present on-site?
☐ Yes X No

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?
☐ Yes X No

2.1.9 Element 10: Control Dewatering

- Foundation, vault, and trench de-watering water, which have similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond. Channels must be stabilized, as specified in Element #8.
- Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through stormwater sediment ponds.
- Highly turbid or contaminated dewatering water from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam, shall be handled separately from stormwater.
- Other disposal options, depending on site constraints, may include:
    1. infiltration
    2. transport offsite in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters,
    3. Ecology-approved on-site chemical treatment or other suitable treatment technologies,
    4. sanitary sewer discharge with local sewer district approval, if there is no other option, or
    5. use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.

2.1.10 Element 11: Maintain BMPs

- All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with BMP specifications.
- All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.11 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
  - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
  - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
  - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Check all the management BMPs that apply at your site:

Table 5 – Management

☐	Design the project to fit the existing topography, soils, and drainage patterns
☐	Emphasize erosion control rather than sediment control
☐	Minimize the extent and duration of the area exposed
☐	Keep runoff velocities low
☐	Retain sediment on-site
☐	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

Optional: Fill out Table 6 by listing the BMP associated with specific construction activities. Identify the phase of the project (if applicable). To increase awareness of seasonal requirements, indicate if the activity falls within the wet or dry season.

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Phase of Construction Project	**Stormwater BMPs**	**Date**	**Wet/Dry Season**
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	To be selected when contractor is hired	[Insert Number]
Resident Engineer	Douglas E Schwind	360-507-0507
Emergency Ecology Contact	Shawn Hopkins	360-407-6442
Emergency Permittee/ Owner Contact	Paul Hagman	(360) 770-2627
Non-Emergency Owner Contact	Paul Hagman	(360) 770-2627
Monitoring Personnel	To be selected at time of contractor selection	
Ecology Regional Office	Northwest Region,	(425) 649-7000

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

Create your own Site Inspection Form or use the Construction Stormwater Site Inspection Form found on Ecology's website.
http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Check the analysis method you will use:

Table 8 – Turbidity Sampling Method

☐	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

Check the analysis method you will use:

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Circle the applicable answer, if necessary:

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☐ No

List the impairment(s):

If yes, discharges must comply with applicable effluent limitations in S8.C and S8.D of the CSWGP.

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

Describe the method(s) for TMDL compliance:

List and describe BMPs:

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

This section does not need to be filled out. It is a list of reminders for the permittee.

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Select and retain applicable paragraph.

Cumulative soil disturbance is less than one (1) acre; therefore, Discharge Monitoring Reports (DMRs) will not be submitted to Ecology because water quality sampling is not being conducted at the site.

Or

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

To sign up for WQWebDMR go to:
http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County

- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

A. Site Map

The site map must meet the requirements of Special Condition S9.E of the CSWGP

B. BMP Detail

Insert BMPs specification sheets here.
Download BMPs from the Ecology Construction Stormwater website at:
http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html
Select Resources and Guidance to find the links to the Stormwater Manuals.

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

Create your own or download Ecology's template:
http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html
Select Permit, Forms and Application to find the link to the Construction Stormwater Site Inspection Form.

E. Construction Stormwater General Permit (CSWGP)

Download the CSWGP:
http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html

F. 303(d) List Waterbodies / TMDL Waterbodies Information

Proposed New Discharge to an Impaired Water Body form
SWPPP Addendum addressing impairment

G. Contaminated Site Information

Administrative Order
Sanitary Discharge Permit
Soil Management Plan
Soil and Groundwater Reports
Maps and Figures Depicting Contamination

H. Engineering Calculations

6.2.3 Site Inspection Form

General Information			
Project Name:			
Inspector Name:		**Title:** **CESCL # :**	
Date:		**Time:**	
Inspection Type:	◻ After a rain event ◻ Weekly ◻ Turbidity/transparency benchmark exceedance ◻ Other		
Weather			
Precipitation	Since last inspection	In last 24 hours	
Description of General Site Conditions:			

Inspection of BMPs							
Element 1: Mark Clearing Limits							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	
Element 2: Establish Construction Access							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

Element 3: Control Flow Rates

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 4: Install Sediment Controls

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 5: Stabilize Soils

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 6: Protect Slopes						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 7: Protect Drain Inlets						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

Element 8: Stabilize Channels and Outlets

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

Element 9: Control Pollutants

BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
		Y	N	Y	N	NIP	

BMP:							
Location	Inspected		Functioning				Problem/Corrective Action
	Y	N	Y	N	NIP		
Element 10: Control Dewatering							
BMP:							
Location	Inspected		Functioning				Problem/Corrective Action
	Y	N	Y	N	NIP		
BMP:							
Location	Inspected		Functioning				Problem/Corrective Action
	Y	N	Y	N	NIP		
BMP:							
Location	Inspected		Functioning				Problem/Corrective Action
	Y	N	Y	N	NIP		

Stormwater Discharges From the Site			
	Observed?		Problem/Corrective Action
	Y	N	
Location			
Turbidity			
Discoloration			
Sheen			
Location			
Turbidity			
Discoloration			
Sheen			

Water Quality Monitoring		
Was any water quality monitoring conducted?	☐ Yes	☐ No
If water quality monitoring was conducted, record results here:		

If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs? ☐ Yes ☐ No
If Ecology was notified, indicate the date, time, contact name and phone number below: Date: Time: Contact Name: Phone #:
General Comments and Notes Include BMP repairs, maintenance, or installations made as a result of the inspection.
Were Photos Taken? ☐ Yes ☐ No If photos taken, describe photos below:

Field Form and Checklist

Stormwater Quality Survey of Western Washington Construction Sites

Field Sampler _____ Date _____

Site Name _____ Time _____

Lat/Long _____GPS datum NAD27 Permit No. _____

Description of construction site sampling location (general, pond outfall, culvert size, and fraction full, etc.)

_____

_____

_____

_____

_____

Weather (current)_____

Weather preceding visit (days of preceding dryness, number of days of precipitation, amount of precipitation, if known):

_____

_____

_____

Type of site ___ residential, multiple unit (e.g., subdivision)

___ residential, single unit only

___ commercial

___ industrial

___ highway/transportation

___ utility

___ other (describe) _____

Size of site ___ small (less than 5 acres)

___ medium (5 or greater but less than 20 acres)

___ large (20 acres or greater)

Size of soil disturbance (acres or square feet) _____(note if estimate or known)

Stage of project (check one that best describes overall stage of project):

1. ___ Initial ground clearing, grubbing, or stump clearing
2. ___ Initial installation of erosion/sediment control BMPs
3. ___ Rough/mass grading, cut and fill
4. ___ Final/finish grading
5. ___ Temporary stabilization, including winter shut down

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Land drainage characteristics (check one that best applies):

___ Sloped, well-drained

___ Slightly sloped to flat and less than well drained

___ Low, flat, often wet, poorly drained

Best Management Practices

1. Are storm drain inlets protected from sediment?

__Yes __ No

(Seven types of inlet protection BMPs listed in BMP C220; Stormwater Management Manual for Western Washington, Vol. II, page 4-77.)

2. Is runoff from the site being routed to one or more sediment ponds or basins?

__Yes __No

3. Are most of the disturbed soils covered or otherwise protected from erosion?

__Yes __No

(Cover or protection may include mulch, plastic, vegetation, erosion control blankets. It does not include silt fences, straw bales or other sediment trapping measures.)

Turbidity data at site discharge(s) (**for multiple discharges, rate in order from highest estimated flow (1.)):**

1. _____NTU Is the discharge from pond, basin or trap? ___Yes ___No

_____NTU (Replicate – separate, independent sample)

2. _____NTU Is the discharge from pond, basin or trap? ___Yes ___No
3. _____NTU Is the discharge from pond, basin or trap? ___Yes ___No

4. _____NTU Is the discharge from pond, basin or trap? ___Yes ___No

Observations/Comments:

_____

_____

Transparency tube data for discharge sampling location with highest estimated flow (1., above):

_____cm.

_____cm. (replicate – second, independent sample)

Observations/Comments:_____

_____

Receiving Water Sampling: Name of waterbody: _____

Description of **upstream sampling location**:_____

_____

Turbidity data collected at upstream (background) location:

1. _____NTU
2. _____NTU (replicate – second, independent sample)

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Observations/Comments about upstream sampling point:

_____

_____

_____

Description of **downstream sampling locations:**

Description of sampling location and receiving water **100 feet downstream** of discharge point (include description of mixing, extraneous contributing flows between site discharge and sampling locations):

_____

_____

_____

Estimated receiving water width (ft) _____

Turbidity data collected downstream – 100' from discharge point:

1. _____NTU

2. _____NTU (replicate – separate, independent sample)

Observations/Comments: (Note: If alternate sampling location was required, report the approximate distance from discharge (ft.)

_____

_____

_____

Description of sampling location and receiving water **downstream 3x channel width**:

Estimated distance along bank from discharge to 3x width (ft) _____

Turbidity data collected downstream – 3X stream width:

1. _____NTU

2. _____NTU (Second measurement only if construction site is one where replicates will be taken. Collect from waterbody again as a separate sample.)

Observations/Comments:

_____

_____

_____

Observations/Comments - stage of project:

_____

_____

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Side 4/4

Observations/Comments: land drainage, soil type, degree of erosion, site condition:

_____

_____

_____

_____

Observation/Comments: Best Management Practices (BMPs), description, functionality:

_____

Other Observations/Comments: