Preliminary Stormwater Site Plan

July 10, 2024

PROJECT

Butterworth Short Plat
5330 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

John Babb, EIT
Civil Designer

REVIEWED BY

Andy Epstein, PE
Civil Engineer

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REVIEWED BY

Andy Epstein, PE
Civil Engineer

07/10/2023

I hereby state that this Preliminary Stormwater Site Plan for the Butterworth Short Plat project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that the City of Mercer Island does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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Section 1 – Project Overview

The Butterworth Short Plat project is a project that includes the demolition of the existing driveway, portions of the site vegetation, existing concrete walkways. The project aims to split the existing property into three lots, provide a shared access road, and utility improvements to allow each of the proposed lots to operate independently. The project will work in conjunction with the Butterworth Road Remodel project (2405-053) which includes the demolition of portions of the onsite existing structure, construction of home renovations, and associated stormwater improvements.

The site address is 5330 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.92 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington. Refer to Exhibit A-1 in Appendix A for a Vicinity Map.

The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site.

The site generally slopes from west to east, with a total elevation of about 26 feet. There is an unnamed Type F stream located on the project parcel near the southern property line. This project proposes connections to the existing stormwater system on site through conveyance pipes.

The project is designed in accordance with the Department of Ecology *2019 Stormwater Management Manual for Western Washington (SMMWW)*, as adopted by the City of Mercer Island.

Section 2 – Existing Conditions Summary

The existing site consists of an existing structure, driveway, and tennis court. In total, the parcel is approximately 1.92 acres in size. There is an existing stormwater system which conveys stormwater throughout the site including existing downspouts to an outfall within Lake Washington along the eastern property line.

There are no other known wetlands or sensitive areas located on or downstream of the site. All work is outside of the shoreline and there are no other known area-specific requirements established in local plans, ordinances, regulations, or in Water Clean-Up Plans approved by the Department of Ecology. Refer to Exhibit A-3 in Appendix A for a Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM).

An NRCS report was also prepared for this project and it defines the soils in the project area as approximately 100% Kitsap silt loam, 15 to 30 percent slopes. Refer to Exhibit A-6 in Appendix A for the NRCS Soil Map.

Section 3 – Offsite Analysis Report

Qualitative Analysis

Define and map the study area

The project site is located on parcel 8661400040 in the City of Mercer Island. Refer to the standalone Civil Engineering Drawings which show the project site and surveyed background.

Study area information review

The following resources were reviewed and the following tasks were performed in order to determine the stormwater flow patterns and to identify any existing or potential problems in the study area:

1. Maps and record drawings from MacPherson Construction & Design were reviewed and show information related to the existing City storm network, discharge location, and any applicable drainage requirements.
2. A topographic survey performed by Cascade Land Surveying was reviewed and provided the basis of design for this project.

Study area field inspection

The project site was field inspected to determine the flow patterns and to identify potential drainage problems. The project area generally sloped from west to east and drains to localized existing yard drains that will be maintained following the completion of this project. No potential drainage problems were identified.

Drainage system description

Based on site observations, the site survey, and other research, stormwater from the project site is collected through roof drains, a stream, and yard drains all of which drain to Lake Washington through outfalls within the ordinary high-water mark.

The downstream path was not analyzed because all stormwater runoff is directly discharged into Lake Washington. Based on existing and proposed grades, stormwater does not flow onto the project site from adjacent parcels.

Section 4 – Permanent Stormwater Control Plan

Existing Site Hydrology

Within the project site there is a total elevation change of approximately 26 feet. In general, the site slopes from west to east. Stormwater runoff is collected around the project site and conveyed to outfalls in Lake Washington. Refer to Exhibit A-4 in Appendix A for an existing conditions map.

Developed Site Hydrology

The proposed stormwater project improvements consist of connections to the existing roof drainage systems, a manufactured treatment device, and conveyance connections to the existing outfall near the eastern property line. Refer to Exhibit A-5 in Appendix A for a proposed conditions map detailing the location of the proposed improvements and storm connections. See also Table 1 for a summary of the proposed project improvement areas.

Table 1 – Proposed Area Summary

Surface Type	Proposed Site
New and Replaced PGIS	0.18 acres
New and Replaced Non-PGIS	0.01 acres
Remodeled Building Roofline	0.02 acres
New and Replaced Pervious	0.18 acres
Existing Non-PGIS	0.01 acres
Total	0.40 acres

Performance Standards and Goals

All Minimum Requirements from the *SMMWW* apply to the new hard surfaces and the converted vegetation areas. This is based on Figure I-3.2 in the *SMMWW* as the project falls under redevelopment requirements. Refer to Exhibit A-2 in Appendix A for flow charts including the flowchart for determining MR 5 requirements.

Low Impact Development Features

The project implements BMP T5.13 Post-Construction Soil Quality and Depth for all disturbed landscape areas.

Flow Control System

The project proposes less than 10,000 square feet of new plus replaced hard surfaces and is flow control exempt, therefore flow control is not required.

Water Quality System

Project improvements include more than 5,000 sf of pollution generating impervious surface; therefore, a water quality system is required. The project site does not require oil or phosphorus treatment. Enhanced treatment is not required because the project discharges to Lake Washington which is listed as a "Basic Treatment Receiving Water" in Appendix III-A of the *SMMWW*. Refer to Exhibit A-2 in Appendix A for flow charts including the flowchart for determining MR 6 requirements.

Conveyance System

Conveyance calculations are included in Appendix D.

Section 5 – Discussion of Minimum Requirements

MR 1 – Preparation of Preliminary Stormwater Site Plans

This report provides the necessary Preliminary Stormwater Site Plan narrative, exhibits, figures, and calculations. Standalone civil engineering plans are provided in the form of temporary erosion and sedimentation control plans and drainage plans.

MR 2 – Construction Stormwater Pollution Prevention Plan (SWPPP)

The proposed project is required to provide a Construction Stormwater Pollution Prevention Plan (SWPPP), including a narrative and Erosion Control Plans. The Construction SWPPP complies with the 12 elements identified in the *SMMWW*. The SWPPP is included in Appendix B.

MR 3 – Source Control of Pollution

All applicable, available, and reasonable source control Best Management Practices (BMPs) must be applied to the project. The temporary erosion and sedimentation control (TESC) plans for the project address all necessary BMPs. Source control BMPs must be selected, designed, and maintained according to the *SMMWW*. In addition to the source control BMPs applicable to all sites, other applicable BMPs include S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots, S411 BMPs for Landscaping and Lawn/Vegetation Management, and S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems. For source control BMPs during construction, refer to the Construction SWPPP in Appendix B.

MR 4 – Preservation of Natural Drainage Systems and Outfalls

Following project improvements, stormwater will continue to drain in existing patterns. Project improvements will therefore preserve the natural discharge location and will not cause an adverse impact to downstream receiving waters and downgradient properties.

MR 5 – On-Site Stormwater Management

This project discharges into a flow control exempt waterbody, Lake Washington, through an entirely man-made conveyance system with sufficient hydraulic capacity to convey stormwater for all developments onsite. Therefore, the project is flow control exempt. The project will not aim to meet the LID Performance Standard outlined in the *SMMWW* section I-3.4.5; Therefore, the project is required to consider the BMPs in List #3 and use the first BMP that is considered feasible.

MR 6 – Runoff Treatment

The project proposes a manufactured treatment device within the 15' utility easement between proposed Lots 1 and 2 to treat stormwater generated by the shared access road. Water quality calculations are shown in Appendix D.

MR 7 – Flow Control

As discussed above the project meets requirements to be considered flow control exempt.

MR 8 – Wetlands Protection

There are no known wetlands on the project site or within the vicinity of the project. Therefore, wetland protection measures are not required.

MR 9 – Operation and Maintenance

The operations and maintenance requirements are discussed in Section 9. Refer to Appendix C for the Operations and Maintenance (O&M) manual.

Section 6 – Construction Stormwater Pollution Prevention Plan

A Construction SWPPP has been prepared and is included in Appendix B. The Construction SWPPP will address the 13 Elements outlined by Minimum Requirement 2 of the *SMMWW.* The intent of the Construction SWPPP is to minimize erosion and prevent sediment-laden runoff from discharging off the project site. BMPs outlined in Volume II of the *SMMWW* will be used to prevent or reduce the release of pollutants to the waters of Washington State.

Section 7 – Special Reports and Studies

A critical areas report for the existing Type F stream onsite was completed by Altmann Oliver Associates on June 29, 2024.

An arborist report was completed by Layton Tree Consulting on May 28, 2024.

Both reports have been provided under separate cover.

Section 8 – Other Permits

The permits that are expected to be required for the project include:

- City of Mercer Island Short Subdivision

- City of Mercer Island Shoreline Substantial Development
- City of Mercer Land Use

Section 9 – Operation and Maintenance

Operations and maintenance of onsite stormwater facilities are the responsibility of the owner, MacPherson Construction & Design. Contact information for the owner is provided below:

Dan Buchser
dan@macphersonconstruction.com
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

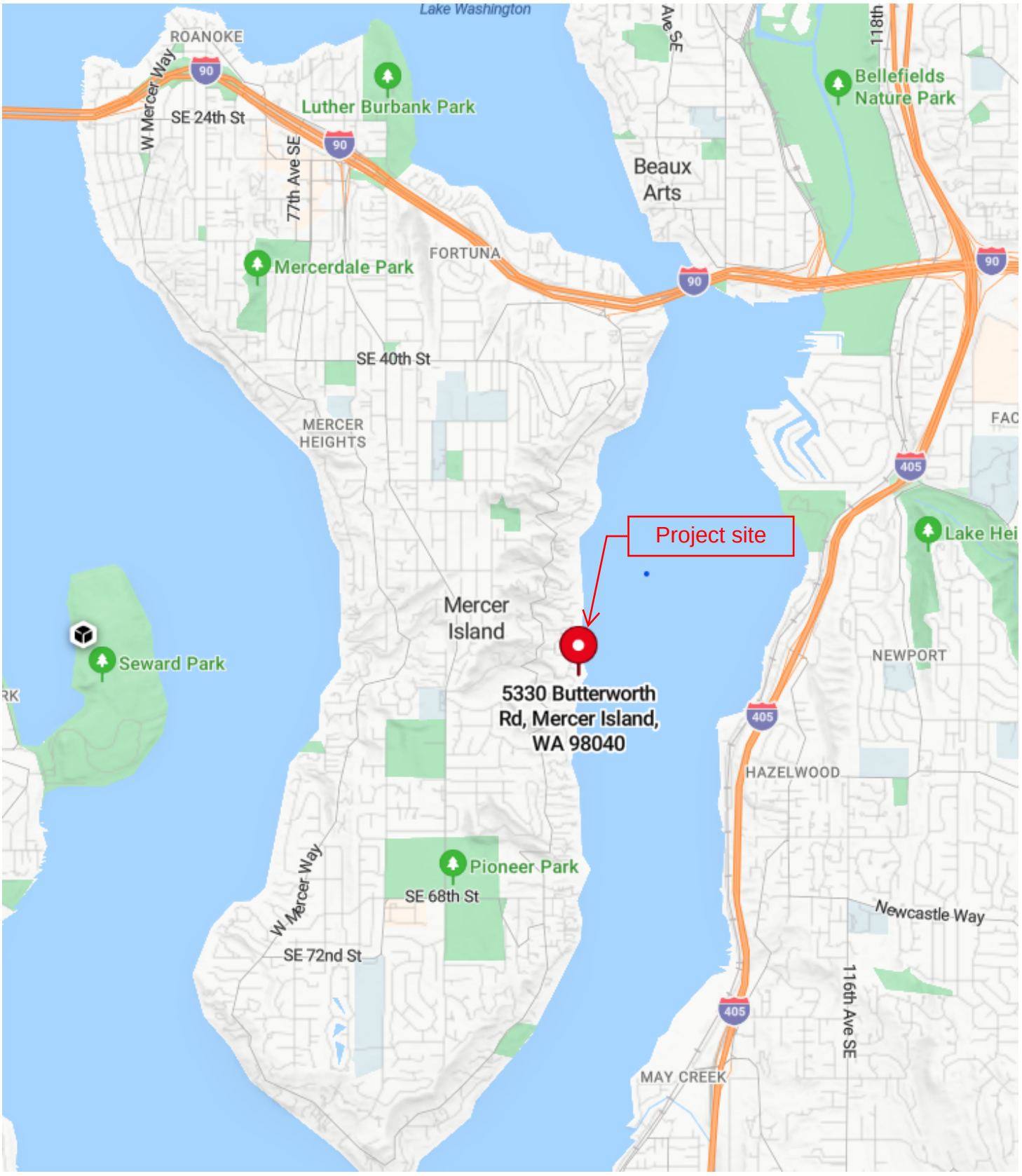
All stormwater facilities shall be maintained and operated in compliance with the City of Mercer Island and *SMMWW* maintenance standards. An operations and maintenance manual is included in Appendix C.

Section 10 – Conclusion

This project is designed to meet the requirements of the Department of Ecology *2019 Stormwater Management Manual for Western Washington,* as adopted by the City of Mercer Island. This analysis is based on data and records either supplied to or obtained by Ethos Civil. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

Appendix A

Exhibits



ETHOS CIVIL	**Butterworth Short Plat**	A-1
	Vicinity Map	

Figure I-3.1: Flow Chart for Determining Requirements for New Development

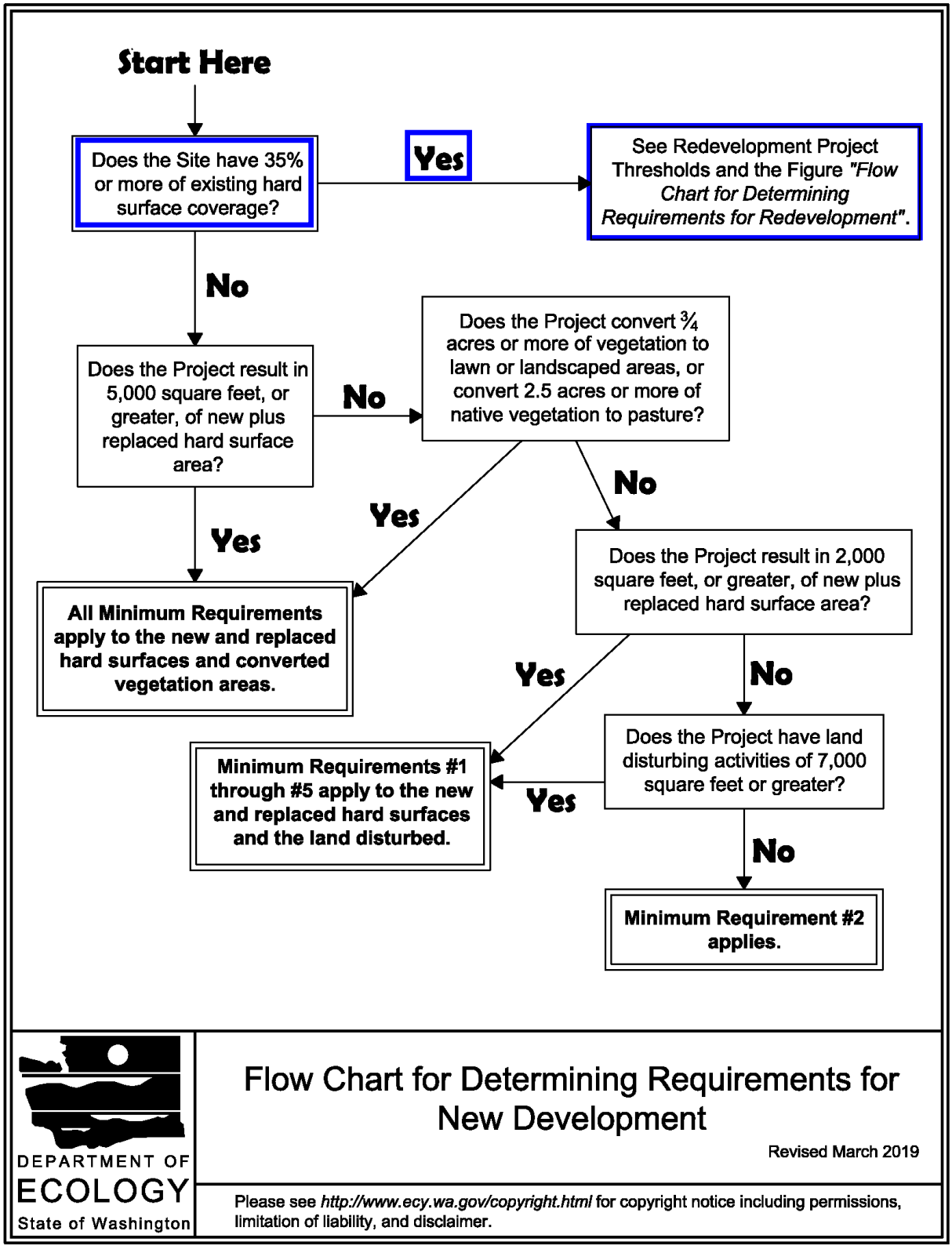


Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment

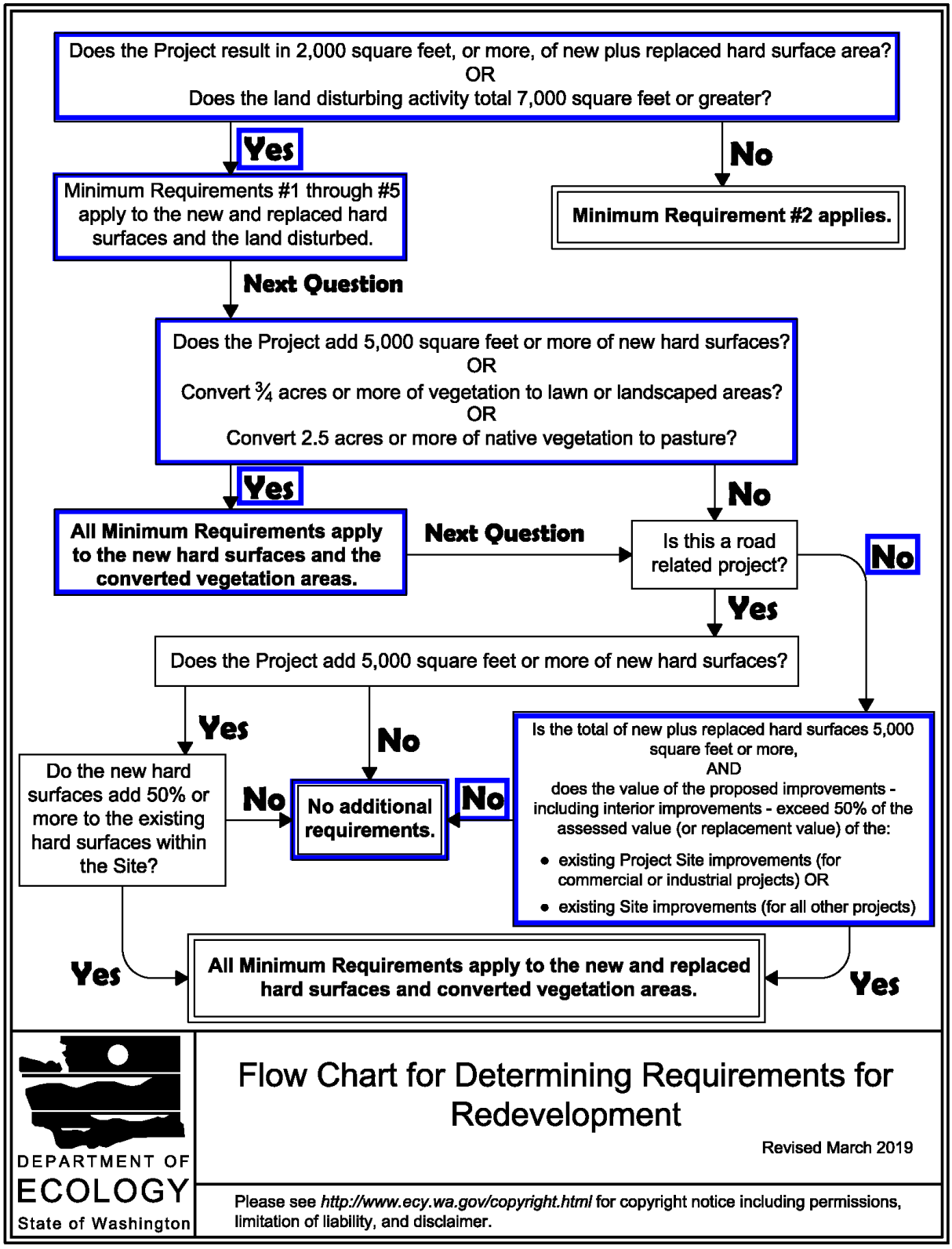


Figure I-3.3: Flow Chart for Determining MR #5 Requirements

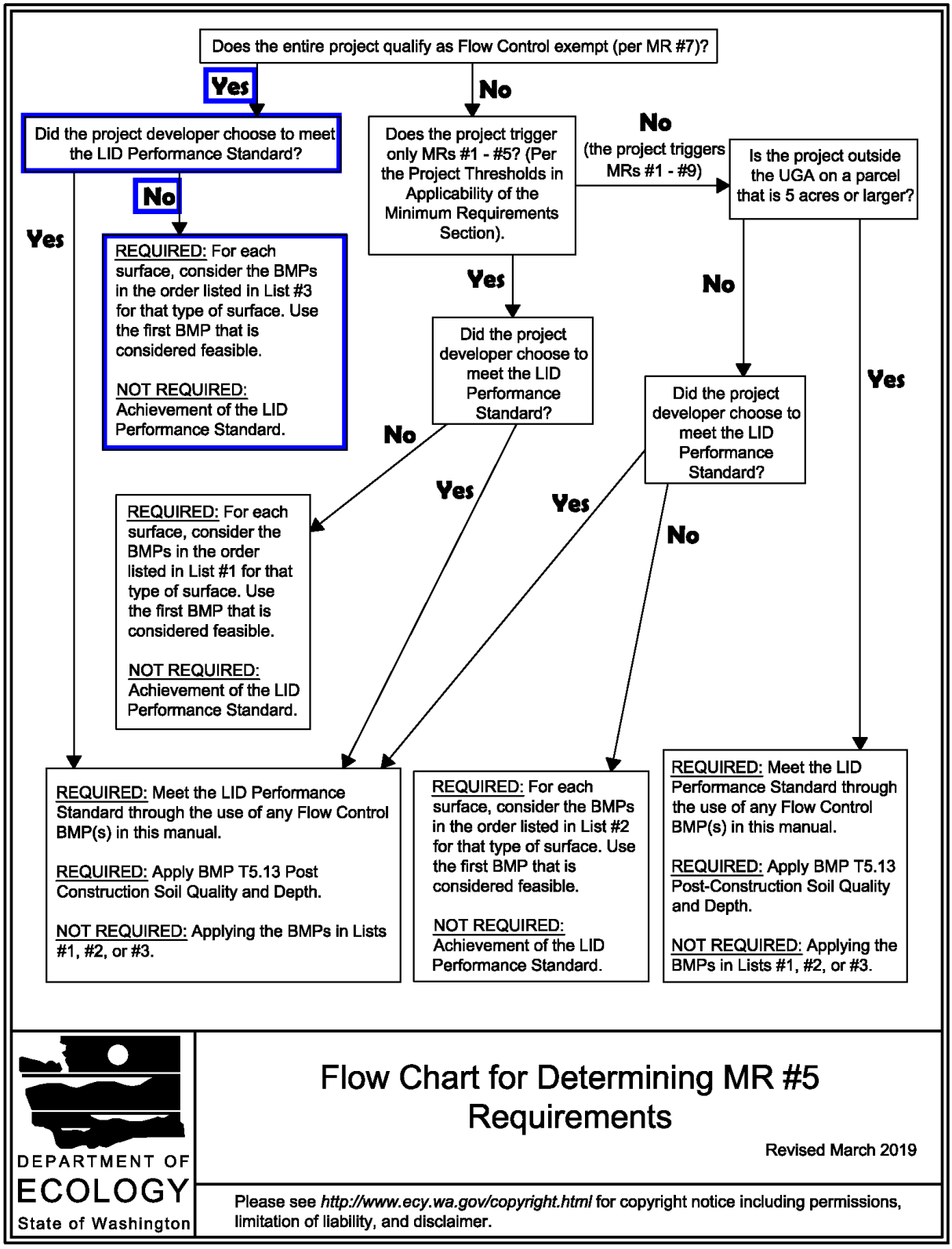
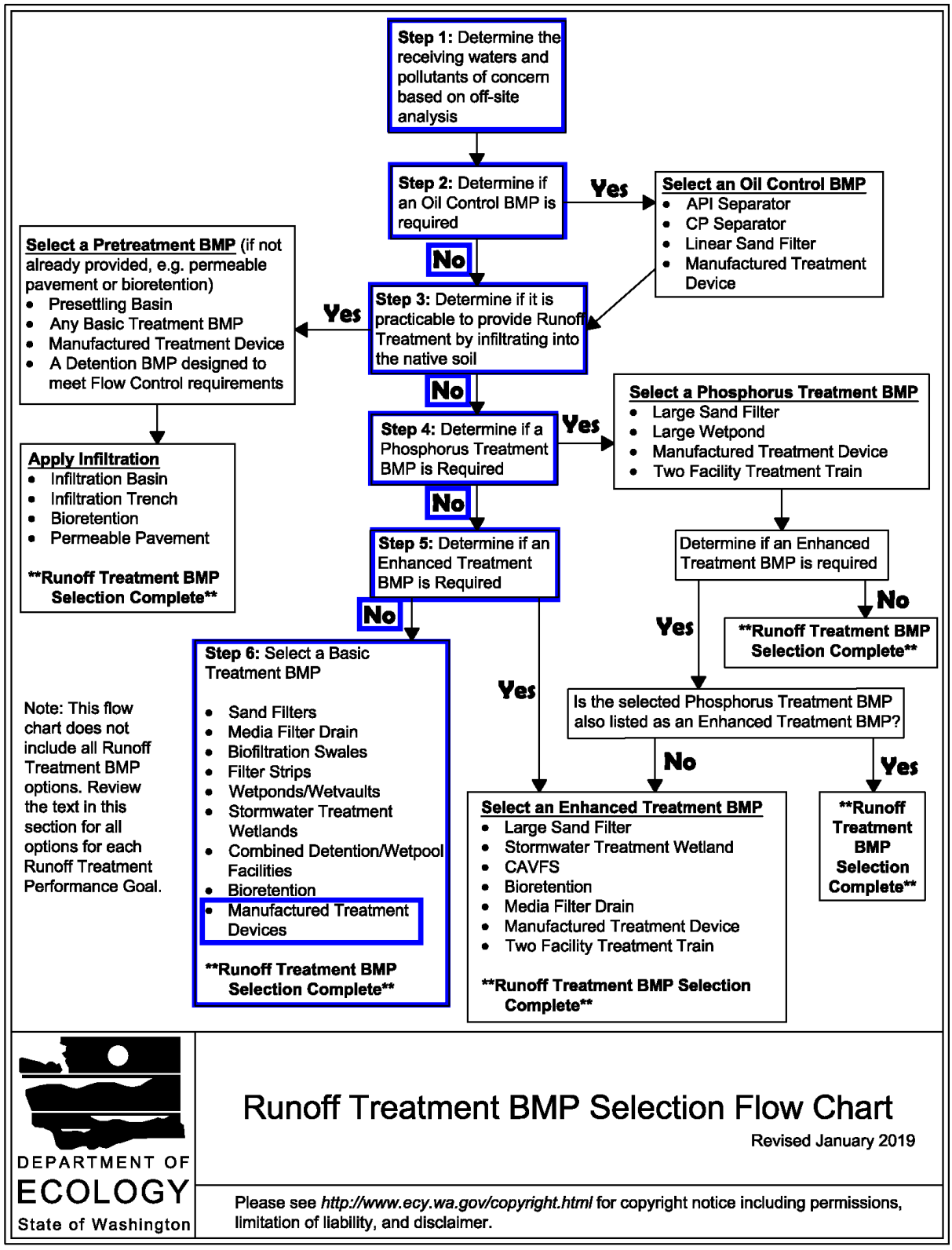


Figure III-1.1: Runoff Treatment BMP Selection Flow Chart

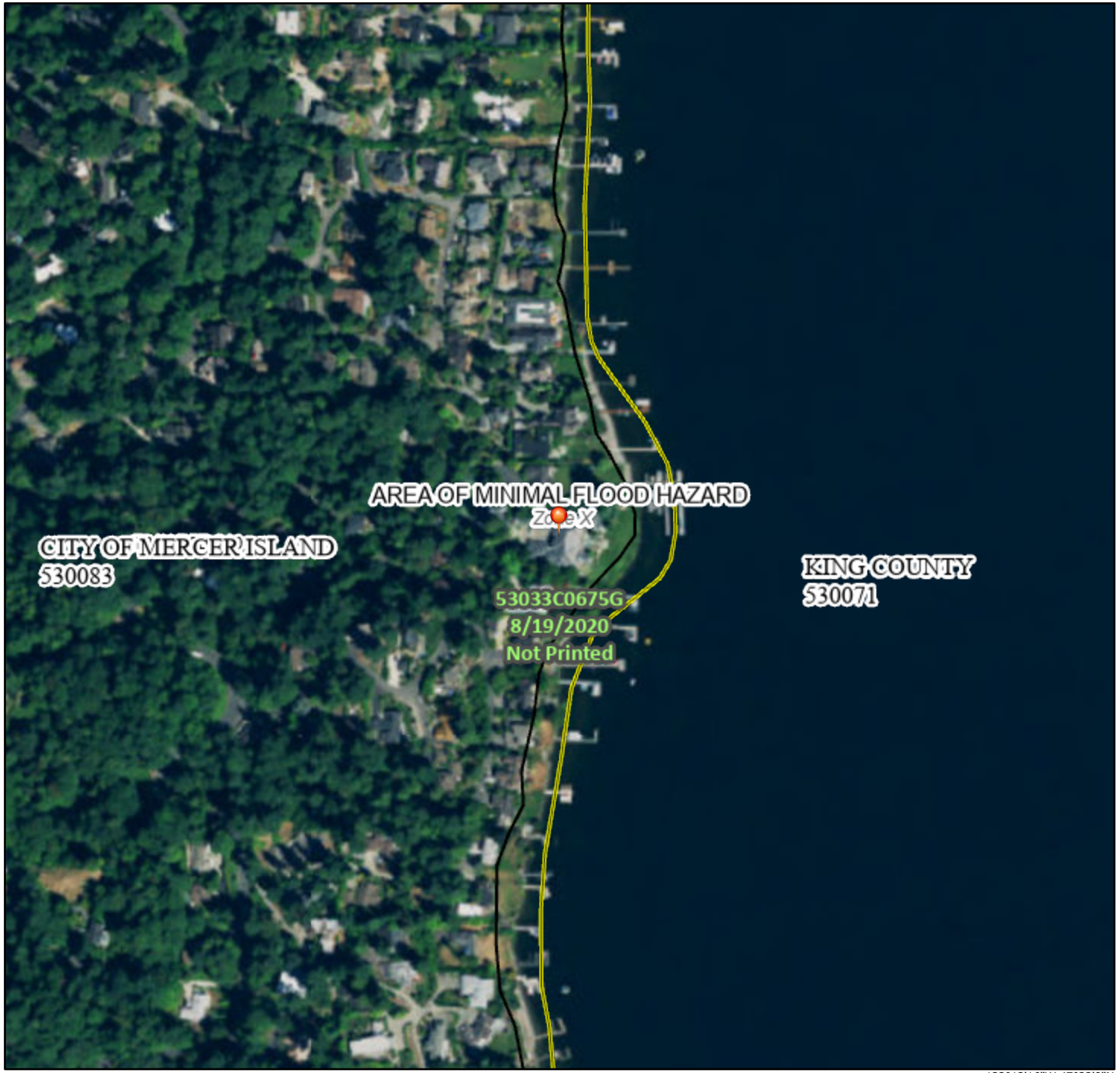


National Flood Hazard Layer FIRMette

A-3

FEMA

122°12'53"W 47°33'32"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

122°12'16"W 47°33'8"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/21/2024 at 5:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

ALTA/NSPS LAND TITLE SURVEY

LOCATED IN THE S.E. 1/4, OF THE N.E. 1/4, OF SECTION 19, TOWNSHIP 24 NORTH, RANGE 5 EAST, W.M., KING COUNTY, WASHINGTON

A-4

SCHEDULE B, PART 2, EXCEPTIONS:

(PER CHICAGO TITLE COMPANY OF WASHINGTON, COMMITMENT NO. 0246999-ETU
COMMITMENT – THIRD, DATED JANUARY 11, 2024)

SPECIAL EXCEPTIONS:

1. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:

GRANTED TO: MERCER ISLAND SEWER DISTRICT, A MUNICIPAL CORPORATION
PURPOSE: SEWER PIPELINE AND ALL NECESSARY APPURTENANCES
RECORDING DATE: JUNE 19, 1964
RECORDING NO.: 5750998
RECORDING DATE: JULY 8, 1964
RECORDING NO.: 5758750
AFFECTS: A PORTION OF SHORELANDS LYING WITHIN STRIP OF LAND 10 FEET IN WIDTH

(EASEMENT(S) ARE DEPICTED HEREON IN AN APPROXIMATE LOCATION, WITHIN THE SHORELANDS)

2. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN IN THE DOCUMENT:

RECORDING DATE: APRIL 23, 1965
RECORDING NO.: 5870467
PURPOSE: STORM DRAINAGE AND UTILITIES
AFFECTS: WESTERLY 10 FEET OF LOT 3, TRACT A, AND OTHER PROPERTY ADJOINING BUTTERWORTH ROAD

(EASEMENT(S) ARE DEPICTED HEREON)

3. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:

GRANTED TO: CITY OF MERCER ISLAND
PURPOSE: UNDERGROUND STORM DRAIN RECORDING
DATE: APRIL 23, 1965
RECORDING NO.: 5870467
AFFECTS: THE NORTH 10 FEET OF LOT 1 AND ALL OF TRACT A

(EASEMENT(S) ARE DEPICTED HEREON)

4. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:

GRANTED TO: MERCER ISLAND SEWER DISTRICT, A MUNICIPAL CORPORATION
PURPOSE: UNDERGROUND RIGID CONDUITS
RECORDING DATE: MAY 12, 1965
RECORDING NO.: 5878038
AFFECTS: PORTION OF TRACT A

(EASEMENT IS DEPICTED HEREON)

5. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN IN THE DOCUMENT

RECORDING DATE: SEPTEMBER 11, 1996
RECORDING NO.: 9609110173
PURPOSE: INGRESS AND EGRESS
AFFECTS: PORTION OF LOT 4 DESCRIBED AS FOLLOWS:
BEGINNING AT THE MOST WESTERLY CORNER OF SAID LOT 4, THEN SOUTH 22°26'49" EAST ALONG THE WESTERLY LINE OF SAID LOT 4 A DISTANCE OF 23.56 FEET; THENCE SOUTH 73°10'02" EAST ALONG THE SOUTHERLY LINE OF SAID LOT 4 A DISTANCE OF 35.00 FEET; THENCE NORTH 5°05'50" WEST A DISTANCE OF 53.14 FEET TO THE POINT OF BEGINNING.

(EASEMENT IS DEPICTED HEREON)

6. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:

GRANTED TO: CITY OF MERCER ISLAND
PURPOSE: PUBLIC STORM DRAINAGE
RECORDING DATE: DECEMBER 29, 2000
RECORDING NO.: 20001229000271
AFFECTS: SOUTHEASTERLY PORTION OF SAID PREMISES

(EASEMENT IS DEPICTED HEREON, SEE NOTE)

7. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN IN THE DOCUMENT

RECORDING DATE: AUGUST 15, 2002
RECORDING NO.: 20020815001275
PURPOSE: UTILITIES TOGETHER WITH MAINTENANCE THEREOF
AFFECTS: SOUTHERLY PORTION OF SAID PREMISES

(EASEMENT(S) ARE DEPICTED HEREON)

8. COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS, IF ANY, BUT OMITTING ANY COVENANTS OR RESTRICTIONS, IF ANY, INCLUDING BUT NOT LIMITED TO THOSE BASED UPON RACE, COLOR, RELIGION, SEX, SEXUAL ORIENTATION, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, HANDICAP, NATIONAL ORIGIN, ANCESTRY, OR SOURCE OF INCOME, AS SET FORTH IN APPLICABLE STATE OR FEDERAL LAWS, EXCEPT TO THE EXTENT THAT SAID COVENANT OR RESTRICTION IS PERMITTED BY APPLICABLE LAW, AS SET FORTH ON MERCER ISLAND BOUNDARY LINE REVISION NO. M.I. 92-09-43:

RECORDING NO: 9212299014

(EASEMENT IS DEPICTED HEREON)

9. COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS, IF ANY, BUT OMITTING ANY COVENANTS OR RESTRICTIONS, IF ANY, INCLUDING BUT NOT LIMITED TO THOSE BASED UPON RACE, COLOR, RELIGION, SEX, SEXUAL ORIENTATION, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, HANDICAP, NATIONAL ORIGIN, ANCESTRY, OR SOURCE OF INCOME, AS SET FORTH IN APPLICABLE STATE OR FEDERAL LAWS, EXCEPT TO THE EXTENT THAT SAID COVENANT OR RESTRICTION IS PERMITTED BY APPLICABLE LAW, AS SET FORTH ON THE BOUNDARY LINE ADJUSTMENT NO. 94-0467:

RECORDING NO: 9606139004

(EASEMENT(S) ARE DEPICTED HEREON)

10. EXCEPTIONS AND RESERVATIONS CONTAINED IN DEED WHEREBY THE GRANTOR EXCEPTS AND RESERVES ALL OIL, GASES, COAL, ORES, MINERALS, FOSSILS, ETC., AND THE RIGHT OF ENTRY FOR OPENING, DEVELOPING AND WORKING THE SAME AND PROVIDING THAT SUCH RIGHTS SHALL NOT BE EXERCISED UNTIL PROVISION HAS BEEN MADE FOR FULL PAYMENT OF ALL DAMAGES SUSTAINED BY REASON OF SUCH ENTRY

GRANTOR: STATE OF WASHINGTON
RECORDING NO.: 1579699

RIGHT OF THE STATE OF WASHINGTON OR ITS SUCCESSORS, SUBJECT TO PAYMENT OF COMPENSATION, TO ACQUIRE RIGHTS OF WAY FOR PRIVATE RAILROADS, SKID ROADS, FLUMES, CANALS, WATER COURSES OR OTHER EASEMENTS FOR TRANSPORTING AND MOVING TIMBER, STONE, MINERALS AND OTHER PRODUCTS FROM THIS AND OTHER LAND, AS RESERVED IN ABOVE-REFERENCED DEED.

AFFECTS: SECOND CLASS SHORELANDS

11. COVENANTS, CONDITIONS, RESTRICTIONS, LIABILITY FOR ASSESSMENTS, AND EASEMENTS BUT OMITTING ANY COVENANTS OR RESTRICTIONS, IF ANY, INCLUDING BUT NOT LIMITED TO THOSE BASED UPON RACE, COLOR, RELIGION, SEX, SEXUAL ORIENTATION, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, HANDICAP, NATIONAL ORIGIN, ANCESTRY, SOURCE OF INCOME, GENDER, GENDER IDENTITY, GENDER EXPRESSION, MEDICAL CONDITION OR GENETIC INFORMATION, AS SET FORTH IN APPLICABLE STATE OR FEDERAL LAWS, EXCEPT TO THE EXTENT THAT SAID COVENANT OR RESTRICTION IS PERMITTED BY APPLICABLE LAW, AS SET FORTH IN THE DOCUMENT

RECORDING DATE: APRIL 23, 1965
RECORDING NO.: 5870467

(EASEMENTS ARE DEPICTED HEREON)

12. AGREEMENT, AND THE TERMS AND CONDITIONS THEREOF:

RECORDING DATE: DECEMBER 8, 1955
RECORDING NO.: 4644177
REGARDING: ESTABLISHING THE NORTH BOUNDARY LINE OF SECOND CLASS SHORELANDS ADJOINING LOT 1

(AGREEMENT NOTE IS DEPICTED HEREON)

SCHEDULE B, PART 2, EXCEPTIONS (CONTINUED):

13. AGREEMENT, AND THE TERMS AND CONDITIONS THEREOF:

RECORDING DATE: AUGUST 4, 1977
RECORDING NO.: 7708040644
REGARDING: THE BUILDING AND MAINTENANCE OF A DOCK ON THE SECOND CLASS SHORELANDS

(AGREEMENT NOTE IS DEPICTED HEREON)

14. AGREEMENT TO REMOVE AND REPLACE ENCROACHMENTS WITHIN PUBLIC RIGHT-OF-WAY, AND THE TERMS AND CONDITIONS THEREOF:

RECORDING DATE: NOVEMBER 25, 1997
RECORDING NO.: 9711251057

(IT IS UNCLEAR FROM THE DOCUMENT IF ANY ENCROACHMENTS HAVE BEEN OR WILL BE REMOVED UPON CITY NOTICE)

15. ANY QUESTION THAT MAY ARISE DUE TO SHIFTING AND CHANGING IN THE COURSE, BOUNDARIES OR HIGH WATER LINE OF LAKE WASHINGTON.

16. RIGHTS OF THE STATE OF WASHINGTON IN AND TO THAT PORTION, IF ANY, OF THE LAND WHICH LIES BELOW THE LINE OF ORDINARY HIGH WATER OF LAKE WASHINGTON.

17. ANY PROHIBITION OR LIMITATION OF USE, OCCUPANCY OR IMPROVEMENT OF THE LAND RESULTING FROM THE RIGHTS OF THE PUBLIC OR RIPARIAN OWNERS TO USE ANY PORTION WHICH IS NOW OR WAS FORMERLY COVERED BY WATER.

18. PARAMOUNT RIGHTS AND EASEMENTS IN FAVOR OF THE UNITED STATES FOR COMMERCE, NAVIGATION, FISHERIES AND THE PRODUCTION OF POWER.

19. RESERVATIONS AND EXCEPTIONS IN UNITED STATES PATENTS OR IN ACTS AUTHORIZING THE ISSUANCE THEREOF; INDIAN TREATY OR ABORIGINAL RIGHTS.

24. ANY RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING MATTERS DISCLOSED BY AN INSPECTION AND BY SURVEY PREPARED BY M.W. MARSHALL DATED OCTOBER 5, 1992, UNDER JOB NO. 1260-E:

A) QUESTION OF THE LOCATION OF A HEDGE AND A CHAIN LINK FENCE ALONG A PORTION OF THE NORTH BOUNDARY LINE THAT DO NOT CONFORM TO THE PROPERTY LINE;

B) QUESTION OF THE LOCATION OF PLANTINGS ALONG THE WEST LINE OF THE PROPERTY THAT DO NOT CONFORM TO THE PROPERTY LINE;

C) QUESTION OF THE LOCATION OF PLANTINGS AND VEGETATION ALONG THE SOUTH LINE OF THE PROPERTY THAT DO NOT CONFORM TO THE PROPERTY LINE.

NOTES:

1. MONUMENTS VISITED ON 03/15/2024.

2. THIS SURVEY WAS PERFORMED ON THE GROUND BETWEEN THE DATES OF 02/12/24 AND 03/15/2024 UNDER THE GUIDELINES OF THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS AS ADOPTED BY ALTA AND NSPS.

3. NO EVIDENCE OF CEMETARIES, BURIAL GROUNDS OR LAKES BORDER OR RUN THROUGH THESE PREMISES. AN EXISTING STREAM WITH SMALL MAN-MADE PONDS BORDERS THE SOUTHERN BOUNDARY HEREON AND IS DEPICTED.

4. UTILITIES LOCATED AND MAPPED BY DIRECT FIELD OBSERVATIONS AND UTILITY COMPANY MARKED LOCATIONS. UTILITIES LOCATED AND MARKED THE WEEK OF MARCH 11, 2024 BY MT. VIEW LOCATING SERVICES.

5. NO EVIDENCE OF ANY RECENT EARTH WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS WERE OBSERVED DURING THIS SURVEY.

6. NO PROPOSED CHANGES IN STREET RIGHT-OF-WAY LINES OR EVIDENCE OF RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS WAS OBSERVED DURING THIS SURVEY.

7. NO WETLANDS MARKERS WERE FOUND DURING THIS SURVEY.

8. THE REVISED PROPERTY AREA AS SHOWN ON THE ROSA LINE REVISION (RLR) EQUALS 83,107 SQ. FT., EXCLUSIVE OF EASEMENT FOR INGRESS & EGRESS. OUR CACULATED AREA EQUALS 83,106 SQ. FT. THESE AREAS ARE TO THE ROCK SEAWALL (HIGH WATER LINE) AS DEPICTED ON THE REVISION.
AS-BUILT LOCATIONS OF THE CURRENT ROCK SEAWALL DIFFER SLIGHTLY FROM THE 1996 REVISION. PROPERTY AREAS TO THE APPROXIMATE CURRENT FACE OF SEAWALL ARE AS FOLLOWS: 83,640 SQ. FT. (INCLUDING EASEMENT) AND 83,320 SQ. FT. EXCLUDING EASEMENT.

9. THE SEAWALL LOCATION WAS SURVEYED AND MEASURED ON FEB. 12, 2024. IT WAS MEASURED AT THE APPROXIMATE FACE (WATER SIDE) OF 2-MAN OR LARGER ROCKS AT POINTS OF ANGLE OR END POINTS. THESE MEASURED POINTS ARE ARBITRARY AS ROCK FACES ARE NOT ALIGNED IN CONTINUOUSLY STRAIGHT SECTIONS AND CONTAIN UNEVEN SURFACES. THE FACE OF SEAWALL IS SUBJECT TO CHANGE DUE TO NATURAL CAUSES. ACTUAL OWNERSHIP LINES EXTEND TO THE LIMITS OF SECOND CLASS SHORELANDS ADJOINING. NO ATTEMPT WAS MADE TO SURVEY THESE LIMITS.

REFERENCE SURVEYS:

1. PLAT OF TONJA ESTATES, VOL. 77, PAGE 64, KING COUNTY, WA.
2. ROSA LINE REVISION, CITY OF MERCER ISLAND FILE NO. 94-0467, REC. NO. 9606139004
3. FELTIS-EYRING BOUNDARY LINE REVISION, MERCER ISLAND FILE NO. M.I. 92-09-43, REC. NO. 9212299014

LEGEND:

⊗	FOUND CONCRETE MONUMENT IN CASE W/ 3/8" BRASS PLUG & PUNCH
●	SET 1/2" REBAR & CAP "CASCADE LS 37540"
○	FOUND REBAR & CAP OR IRON PIPE & CAP AS DESCRIBED
⊠	SET OR FOUND NAIL & WASHER AS DESCRIBED
CB	CATCH BASIN
AD	AREA DRAIN
S	SANITARY SEWER MANHOLE
GV	GAS VALVE
GM	GAS METER
	FIRE HYDRANT
WV	WATER VALVE
WM	WATER METER
WH	WATER HOT BOX
	WATER FAUCET
T	TELEPHONE OR COMM RISER
PT	POWER TRANSFORMER
PV	POWER VAULT
E	ELECTRIC BOX
	UTILITY POLE
	GUY ANCHOR
MB	MAIL BOX
	CONIFER TREE
	LEYLAND CYPRESS IN ROW
	DECIDUOUS TREE
E	OVERHEAD ELECTRICAL AND/OR COMM LINES
UE	UNDERGROUND ELECTRICAL LINES
G	UNDERGROUND GAS MAIN
T	UNDERGROUND COMM LINES
S	SANITARY SEWER MAIN
W	UNDERGROUND WATER MAIN
	IRON FENCE ON CONC. FOOTING
X	CHAIN LINK FENCE
	ROCKERY
(P)	PLAT OF TONJA ESTATES
(RLR)	ROSA LINE REVISION REC. NO. 9606139004
CLF	CHAIN LINK FENCE
G	GATE
CP	CONCRETE PILLAR
EA	EDGE OF PAVEMENT
EC	EXTRUDED CURB
APP	APPLE
CW	COTTONWOOD
MAG	MAGNOLIA
SPR	SPRUCE
K	KATSURA
C	CEDAR
F	FIR
PE	PAULOWNIA/EMPRESS
CC	CHINESE CATALPA
DT	DECIDUOUS TREE
M	MAPLE
JS	JAPANESE STEWARTIA
P	PINE
L	LAUREL
J	JUNIPER
B	BIRCH
PC	PHOTINIA CV.
26.30	SPOT ELEVATION
A	PROPERTY CORNER NOTE
1	EXCEPTION REFERENCE NO. PER SCHEDULE B
	AREAS OF GRAVEL
	AREAS OF STONE PAVERS
	AREAS OF CONCRETE
	AREAS OF CONCRETE PAVERS

ALTA/NSPS LAND TITLE SURVEY CERTIFICATION

TO ROGER MACPHERSON RESIDENTIAL TRUST AND NANCY MACPHERSON RESIDENTIAL TRUST AND TO CHICAGO TITLE COMPANY OF WASHINGTON:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 4 AND 5 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON MARCH 15, 2024.

DATE OF PLAT MAP: 03/21/24
NAME: Jeffrey Allen Otterson
REGISTRATION NO. 37540

JEFFREY ALLEN OTTERSON STATE OF WASHINGTON 37540 REGISTERED PROFESSIONAL LAND SURVEYOR 03/21/24

SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT AT THE REQUEST OF ROGER MACPHERSON RESIDENTIAL TRUST IN AND NANCY MACPHERSON RESIDENTIAL TRUST ____ Mar. 2024

Jeffrey Allen Otterson
P.L.S. CERTIFICATE NO. 37540

JEFFREY ALLEN OTTERSON STATE OF WASHINGTON 37540 REGISTERED PROFESSIONAL LAND SURVEYOR 03/21/24

ALTA/NSPS LAND TITLE SURVEY
FOR: MACPHERSON RESIDENTIAL TRUST
5330 BUTTERWORTH ROAD
MERCER ISLAND, WA 98040

CASCADE LAND SURVEYING
Complete Land Surveying Services
16009 AP TUBBS RD E. BUCKLEY, WA 98321
PHONE: (253) 820-4016
Email: jeff@cascadels.com

DRAWN BY: JAO
JOB NO.: 2024-003
CHECKED BY: JAO
SCALE: N/A
SHEET: 1 of 2
DATE: Thu., Mar. 21, 2024

C:\Cascade\Projects\2024\2024-003.pro

GRAPHIC SCALE 1"=20'

20 0 20

BASIS OF BEARINGS:

THE CENTERLINE OF BUTTERWORTH ROAD, BEING NORTH 20°10'45" EAST PER THE PLAT OF TONJA ESTATES, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 77 OF PLATS, PAGE 64, IN KING COUNTY, WASHINGTON.

VERTICAL DATUM:

NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

BENCHMARK:

LAKE WASHINGTON WATER SURFACE ELEVATION PER U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT, WATER MANAGEMENT. ELEVATION = 17.17 NAVD 88 ON MARCH 1, 2024 AT 10:30 A.M.

CONTOUR INTERVAL:

2 FEET

LEGAL DESCRIPTION:

(PER CHICAGO TITLE COMPANY OF WASHINGTON COMMITMENT NO. 0246999-ETU, THIRD, DATED JANUARY 11, 2024)

LOTS 3 AND 4, TONJA ESTATES, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 77 OF PLATS, PAGE 64, IN KING COUNTY, WASHINGTON,

EXCEPT THAT PORTION OF SAID LOT 3, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SAID LOT 3;

THENCE SOUTH 01°35'04" WEST ALONG THE EASTERLY LINE OF LOT 3 A DISTANCE OF 75.31 FEET;

THENCE NORTH 10°03'02" WEST A DISTANCE OF 74.73 FEET;

THENCE NORTH 76°21'57" WEST A DISTANCE OF 10.15 FEET, MORE OR LESS, TO THE NORTH LINE OF SAID LOT 3;

THENCE SOUTH 88°24'56" EAST ALONG SAID NORTH LINE 25.00 FEET TO THE POINT OF BEGINNING, AND THE END OF THIS EXCEPTION;

TOGETHER WITH AN UNDIVIDED 1/7TH INTEREST IN LOT 1 OF SAID PLAT; AND

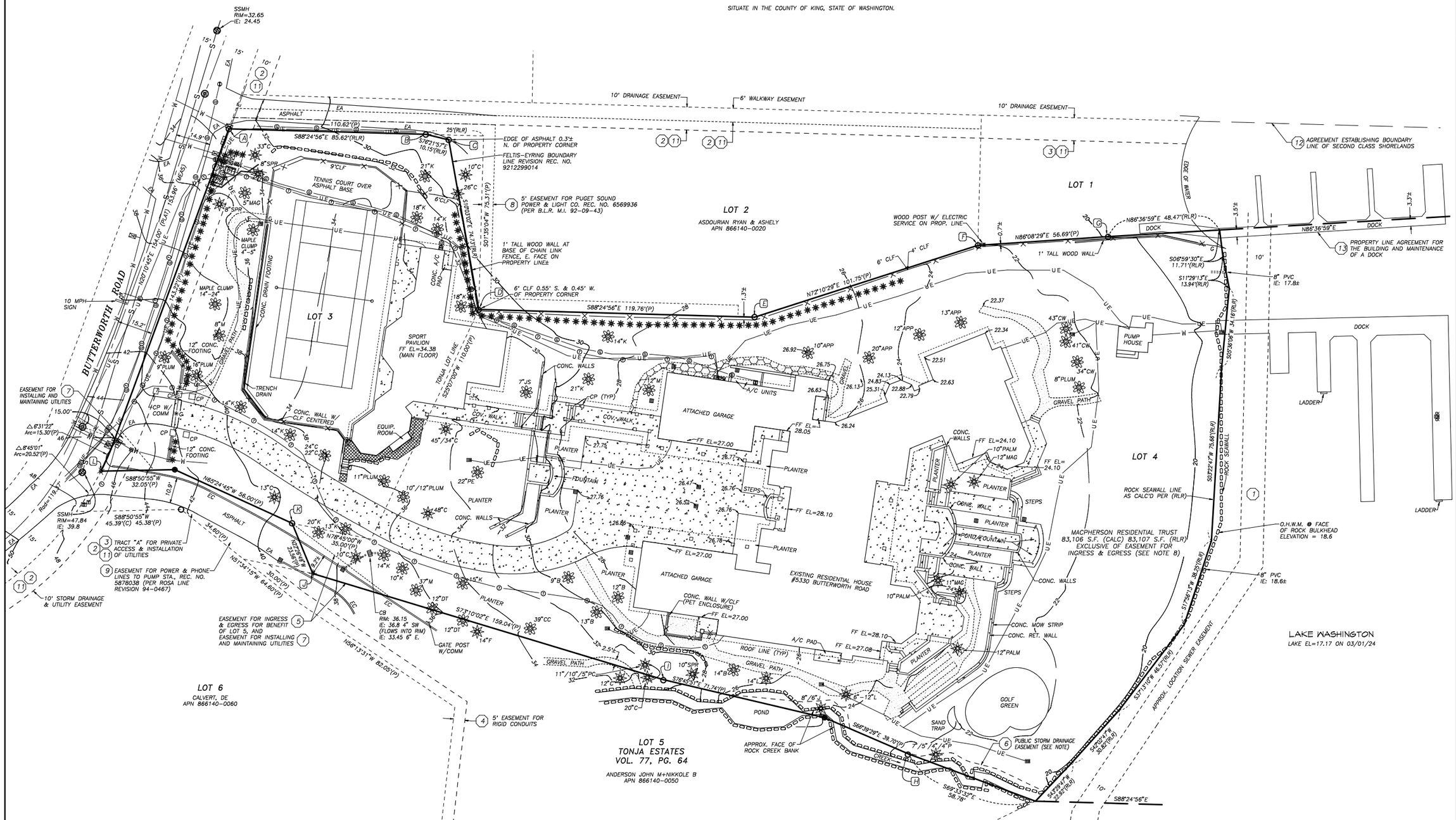
TOGETHER WITH AN UNDIVIDED 1/2 INTEREST IN TRACT A OF SAID PLAT;

(ALSO KNOWN AS THE ROSA LINE REVISION, CITY OF MERCER ISLAND FILE NO. 94-0467, RECORDED UNDER RECORDING NUMBER 9606139004).

SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

FOUND/SET PROPERTY CORNER LEGEND:

- (A) FOUND 3/4" IRON PIPE & CAP "LS 20764" S49°E 0.09'
- (B) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S38°W 0.09'
- (C) FOUND 1/2" REBAR & CAP "TERRANE 15025 56664 52088 57176"
- (D) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S26°W 0.16'
- (E) FOUND 1/2" REBAR & CAP "TERRANE 15025 56664 52088 57176"
- (F) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S51°E 0.08'
- (G) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S4°W 0.17'
- (H) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S34°W 0.41'
- (I) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S22°W 0.22'
- (J) FOUND MAG NAIL & WASHER "37427" N49°E 0.09'
- (K) FOUND 1/2" REBAR & CAP "TRIAD ASSOC 19620 22335 21402 18094"
- (L) SET MAG NAIL & I.D. WASHER "LS 37540"



SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT AT THE REQUEST OF ROGER MACPHERSON RESIDENTIAL TRUST IN MAY, 2024 AND NANCY MACPHERSON RESIDENTIAL TRUST

Jeffrey Allen Peterson

P.L.S. CERTIFICATE NO. 37540

JEFFREY ALLEN PETERSON 37540 REGISTERED PROFESSIONAL LAND SURVEYOR STATE OF WASHINGTON

ALTA/NSPS LAND TITLE SURVEY

FOR: MACPHERSON RESIDENTIAL TRUST
5330 BUTTERWORTH ROAD
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CASCADE LAND SURVEYING
Complete Land Surveying Services
16009 AP TUBBS RD E, BUCKLEY, WA 98321
PHONE: (253) 820-4016
Email: jeff@cascadels.com

DRAWN BY: JAO CHECKED BY: JAO SHEET: 2 OF 2 DATE: Thu, Mar. 21, 2024
JOB NO.: 2024-003 SCALE: 1"=20'

C:\Cascade\Projects\2024\2024-003.pro

PROJECT LIMITS

NEW AND REPLACED
PGIS = 0.18 AC

NEW AND REPLACED
NON-PGIS = 0.01 AC

REMODELED BUILDING
ROOFLINE = 0.02 AC

NEW AND REPLACED
PERVIOUS = 0.18 AC

EXISTING NON-PGIS = 0.01 AC

TOTAL SITE AREA = 0.40 AC

10 MPH SIGN

N

30 15 0 30 60

SCALE IN FEET

ETHOS CIVIL

BUTTERWORTH SHORT PLAT

PROPOSED CONDITIONS MAP

A-5

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for King County Area, Washington

Butterworth Road Remodel

May 21, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

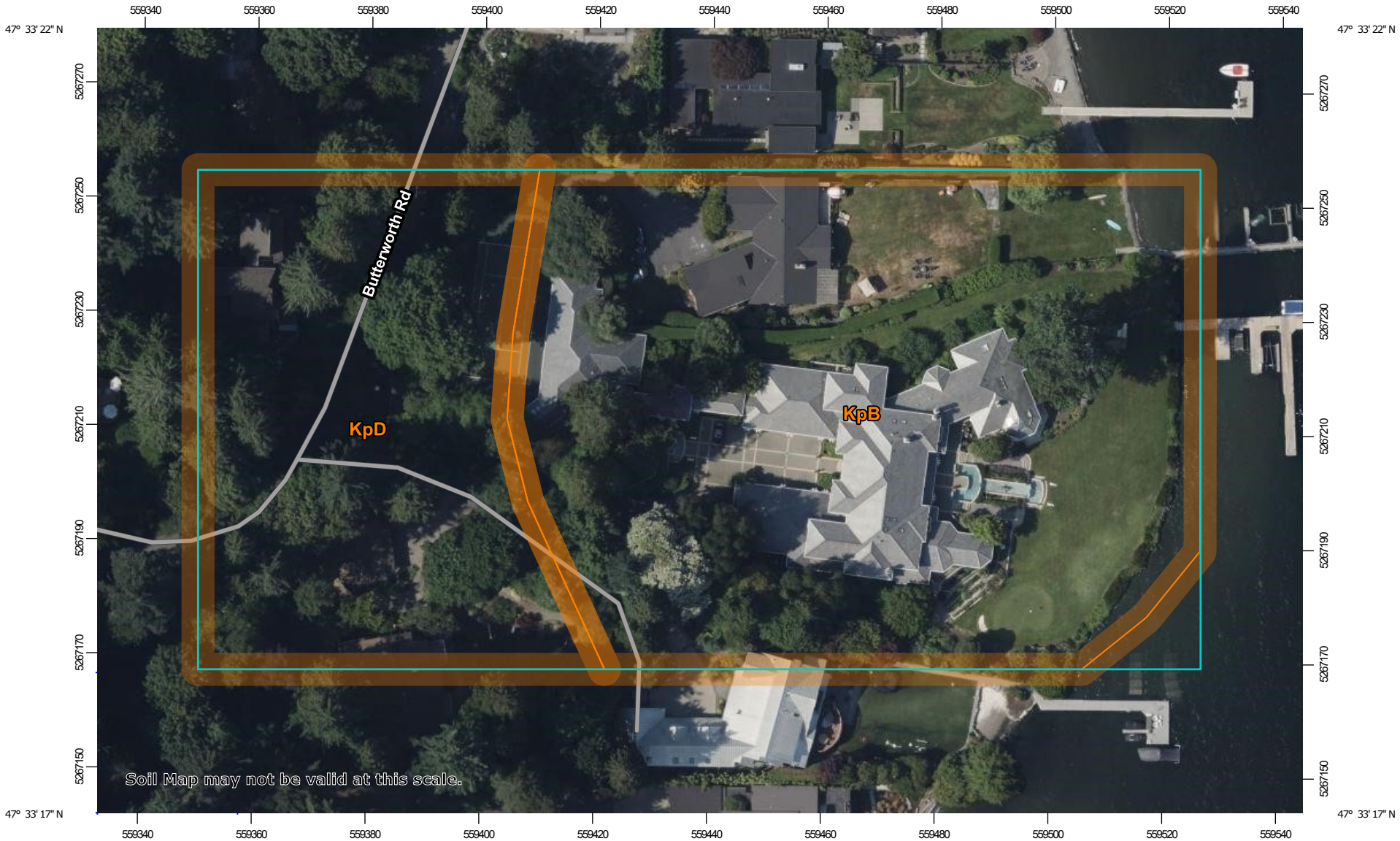
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Butterworth Road Remodel)



Map Scale: 1:968 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 19, Aug 29, 2023

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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 (Butterworth Road Remodel)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
KpB	Kitsap silt loam, 2 to 8 percent slopes	2.5	65.1%
KpD	Kitsap silt loam, 15 to 30 percent slopes	1.3	33.7%
Totals for Area of Interest		**3.8**	**100.0%**

Map Unit Descriptions (Butterworth Road Remodel)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

King County Area, Washington

KpB—Kitsap silt loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1hmt9
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 24 inches: silt loam
H3 - 24 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Soils with Few Limitations (G002XN502WA)
Other vegetative classification: Soils with Few Limitations (G002XN502WA)
Hydric soil rating: No

Minor Components

Alderwood

Percent of map unit: 10 percent
Hydric soil rating: No

Bellingham

Percent of map unit: 3 percent

Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Tukwila

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

KpD—Kitsap silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1hmtc
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 40 inches: silt loam
H3 - 40 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Sloping to Steep Soils (G002XN702WA)
Other vegetative classification: Sloping to Steep Soils (G002XN702WA)
Hydric soil rating: No

Minor Components

Tukwila

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Bellingham

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

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Appendix B

Construction Stormwater Pollution Prevention Plan (CSWPPP)

ETHOS
CIVIL

Construction Stormwater Pollution Prevention Plan

July 4, 2024

PROJECT

Butterworth Short Plat
5330 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

John Babb, EIT
Civil Designer

REVIEWED BY

Andy Epstein, PE
Project Manager & Owner

ETHOS CIVIL

Construction Stormwater Pollution Prevention Plan

July 4, 2024

PROJECT

Butterworth Short Plat
5330 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

07/10/2023

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

John Babb, EIT
Civil Designer

REVIEWED BY

Andy Epstein, PE
Project Manager & Owner

I hereby state that this Construction Stormwater Pollution Prevention Plan for the Butterworth Short Plat project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that the City of Mercer Island does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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- BMP 220 Inlet Protection

Section 1 – Introduction

In 1972, Congress passed the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act (CWA), to restore and maintain the quality of the nation's waterways. The ultimate goal was to make sure that rivers and streams were fishable, swimmable, and drinkable. In 1987, the Water Quality Act (WQA) added provisions to the CWA that allowed the Environmental Protection Agency (EPA) to govern stormwater discharges from construction sites. The National Pollutant Discharge Elimination System (NPDES) General Permit includes provisions for development of a Stormwater Pollution Prevention Plan (SWPPP) to maximize the potential benefits of pollution prevention, and sediment and erosion control measures at construction sites.

The proposed project will disturb less than 1 acre and is therefore not required to obtain an NPDES General Permit for Stormwater Associated with Construction Activities.

The 2019 Stormwater Management Manual for Western Washington requires a Construction SWPPP for projects that add or replace more than 2,000 square feet of impervious surface. The proposed project will exceed this threshold; therefore, a Construction SWPPP is required.

Development, implementation, and maintenance of the Construction SWPPP will provide the selected General Contractor with the framework for reducing soil erosion and minimizing pollutants in stormwater during construction of the Butterworth Road Remodel project. The SWPPP will:

- Define the characteristics of the site and the type of construction that will occur.
- Describe the practices that will be implemented to control erosion and the release of pollutants in stormwater.
- Create an implementation schedule to ensure that the practices described in this SWPPP are in fact implemented, and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in stormwater discharged from the site.
- Describe the final stabilization/termination design to minimize erosion and prevent stormwater impacts after construction is complete.

This Construction SWPPP:

- Identifies the SWPPP Coordinator with a description of this person's duties.
- Identifies the Stormwater Pollution Prevention Team (SWPP Team) that will assist in implementation of the SWPPP during construction.
- Describes the existing site conditions, including existing land use for the site, soil types at the site, as well as the location of surface waters that are located on or next to the site.
- Identifies the body or bodies of water that will receive runoff from the construction site, including the ultimate body of water that receives the stormwater.
- Identifies the drainage areas and potential stormwater contaminants.
- Describes the stormwater management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment, and pollutants in stormwater discharge.
- Describes the facility monitoring plan and how controls will be coordinated with construction activities.
- Describes the implementation schedule and provisions for amendment of the plan.

Section 2 – Project Description

The Butterworth Short Plat project is a project that includes a short subdivision of the existing lot into 3 lots. The replacement of the existing shared access road, associated utilities, stormwater, and sewer improvements.

The site address is 5330 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.89 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington. Refer to Exhibit A-1 in Appendix A for a Vicinity Map. The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site. The site generally slopes from west to east, with a total elevation of about 26 feet. There is a man-made unnamed Type F stream located on the project parcel near the southern property line. This project proposes connections to the existing stormwater system on site through conveyance pipes.

Section 3 – Erosion Control Specialist (ESC)

The General Contractor shall be required to provide an Erosion Control Specialist (ECS) prior to construction. Once this individual is identified, the City Inspector will be notified.

The duties of the ECS include:

- Implement the SWPPP/TESC plan with the aid of the SWPP Team.
- Oversee maintenance practices identified as BMPs in the Construction SWPPP.
- Conduct or provide inspection and monitoring activities.
- Identify other potential pollutant sources and make sure they are added to the plan.
- Identify any deficiencies in the Construction SWPPP and make sure they are corrected.
- Ensure that any changes in construction plans are addressed in the Construction SWPPP.

To aid in the implementation of the Construction SWPPP, the members of the SWPP Team include the following: General Contractor, ECS, City of Mercer Island Inspector, CPSD facilities, and Ethos Civil LLC. The General Contractor will ensure that all housekeeping and monitoring procedures are implemented, while the ECS will ensure the integrity of the structural BMPs. The SWPP Team will observe construction and erosion control practices and recommend revisions or additions to the Construction SWPPP and drawings.

Section 4 – Existing Site Conditions

The existing site consists of an existing structure, driveway, and tennis court. In total, the parcel is approximately 1.89 acres in size. There is an existing stormwater system which conveys stormwater throughout the site including existing downspouts to an outfall within Lake Washington along the eastern property line. The existing system will be maintained and modified to connect the proposed improvements to the existing system. A survey of the site was completed by Cascade Land Surveying.

Existing utilities serving the project parcel include power, gas, sewer, water and communication lines.

Section 5 – Adjacent Areas

The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site.

Section 6 – Critical Areas

There are no other known wetlands or sensitive areas located on or downstream of the site. There are no known area-specific requirements established in local plans, ordinances, regulations, or in Water Clean-Up Plans approved by the Department of Ecology.

Section 7 – Soils

An NRCS report was also prepared for this project and it defines the soils in the project area as approximately 100% Kitsap silt loam, 15 to 30 percent slopes. Refer to Exhibit A-6 in Appendix A of the SSP for an NRCS Soil Map.

Section 8 – Erosion Problem Areas

To our knowledge, there are no erosion problems on the project site.

Section 9 – Construction Stormwater Pollution Prevention Plan Elements

The purpose of this section is to describe how each of the 12 Construction SWPPP elements has been addressed, and to identify the type and location of BMPs used in the Temporary Erosion and Sedimentation Control (TESC) and demolition plans to satisfy the required element. If a Construction SWPPP element is not applicable to the project, a reason is provided.

Mark Clearing Limits

Prior to beginning land-disturbing activities, clearing limits will be marked with high visibility plastic or metal fence (BMP C103). Significant vegetation to remain will be marked and protected by fencing.

Establish Construction Access

The contractor shall use the existing site driveway for construction access. Construction vehicle ingress and egress will be limited to this entrance. If sediment tracking should occur, the contractor will be required to sweep the impacted roadways. Dump trucks hauling material to and from the site will be covered by a tarp.

Control Flow Rates

Flow rates will be controlled by using SWPPP Element 4 sediment controls and BMP T.5.13 Amended Soils if necessary.

Install Sediment Controls

Inlet Protection (BMP C220) is proposed for existing and proposed catch basins within the project area.

Stabilize Soils

To protect soils from the erosive forces of rainfall, surface runoff flow, and wind, all disturbed areas that are expected to remain exposed and unworked for more than 2 days from October 1 to March 31, or 7 days from April 1 to September 30, will be stabilized with the following BMPs:

- Temporary hydroseeding (C120).
- Topsoil stockpiles will be stabilized with plastic coverings (BMP C123).
- Dust control (BMP C140) will be provided by sprinkling the site with water.
- Permanent erosion control measures will include site paving and seeding or sodding of exposed soils.

Soil stabilization measures shall 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 groundwater.

Protect Slopes

Slope protection BMPs are unnecessary due to the project area not containing any significant slopes.

Protect Drain Inlets

All storm drain inlets made operable during construction shall be protected so that surface water runoff does not enter the conveyance system without first being filtered. Storm Drain Inlet Protection (BMP C220) is specified in the construction plans and shall be inspected weekly, at a minimum, and daily during storm events for sediment buildup, and shall be cleaned or removed and replaced as appropriate.

Stabilize Channels and Outlets

There are no channels or outlets requiring stabilization.

Control Pollutants

All waste materials will be collected and stored in a securely closed metal dumpster. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of once per week, and the trash will be hauled to the local landfill. No construction materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of three times per week. Good housekeeping and spill control practices will be followed during construction to minimize stormwater contamination from petroleum products, fertilizers, and concrete.

Table 1 below lists several pollutants that are commonly found on construction sites that have the potential to contaminate storm runoff. These pollutants will be present, mainly in areas pavement construction. The Contractor and the SWPPP/TESC coordinator will be responsible for identifying areas where these pollutants are being used and will monitor runoff coming from these areas. Pollutant sources will be covered with plastic if contaminated runoff is observed from these areas. If contaminated runoff is found in sediment traps or soils, the ECS will direct the Contractor to remove the polluted water/soil and dispose of it in an approved area offsite.

Table 1: Potential Construction Site Stormwater Pollutants

Trade Name Material	Chemical/Physical Description[(1)]	Stormwater Pollutants[(1)]
Pesticides (insecticides, fungicides, herbicide, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, Sediment

(1) Data obtained from MSDS when available.

The following BMPs or equivalent measures are required of all businesses and agencies during concrete pouring and asphalt application at temporary sites:

- Employees must be educated on the pollution hazards of concrete and asphalt application and cutting.
- Loose aggregate chunks and dust must be swept or shoveled and collected (not hosed down a storm drain) for recycling or proper disposal at the end of each work day, especially at work sites such as streets, driveways, parking lots, sidewalks, curbs, and gutters where rain can readily pick

up the loose material and carry it to the nearest stormwater conveyance. Small amounts of excess concrete, grout, and mortar can be disposed of in the trash.

- Storm drain covers or similarly effective containment devices must be placed over all nearby drains at the beginning of each day. Shovel or vacuum slurry and remove from the site. All accumulated runoff and solids must be collected and properly disposed at the end of each work day, or more often if necessary.

- Exposed aggregate washing, where the top layer of unhardened concrete is hosed or scraped off to leave a rough finish, must be done with a mechanism for containment and collection of the discarded concrete slurry (such as the storm drain covers mentioned above). The easiest way to contain the wash water will be to direct the washings to a hole in the ground where the water can percolate into the ground and the solids later covered with soil.

- Cleaning of concrete application and mixing equipment or concrete vehicles on the work site must be done in a designated area where the rinse water is controlled. The rinse water must either be collected for proper disposal or put into a hole in the ground where the water can percolate away, and the solids later covered with soil or recovered and disposed or recycled.

The use of any treatment BMP must not result in the violation of groundwater, surface water, or drinking water quality standards.

Control Dewatering

Large volumes of dewatering of construction areas or utility trenches are not anticipated because groundwater is not likely to be encountered at the proposed elevations of proposed utility construction for the project.

Maintain BMPs

Temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure performance of their intended functions.

Sediment control BMPs shall be inspected weekly or after a runoff-producing event. Temporary erosion and sediment control BMPs will be removed within 30 days after final site stabilization is achieved. The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

- Temporary and permanent seeding will be inspected for bare spots, washouts, and healthy growth.

- The Contractor ESC Lead will provide erosion control inspection services and stormwater disposal monitoring through construction. The City of Mercer Island Inspector will be notified of daily construction activities and scheduled meetings between the Erosion Control Inspector and the Contractor.

The maintenance inspection report will be made after each inspection. Copies of the report forms to be completed by the SWPPP coordinator are attached as Exhibit 1 of this Construction SWPPP. Completed forms will be provided to the City Inspector and will also be maintained onsite during the entire construction project. If construction activities or design modifications are made to the site plan that could impact stormwater, or if Ethos Civil determines that the measures are not adequate to prevent

erosion and the discharge of sediment from the site (based on turbidity measurements), this Construction SWPPP will be amended appropriately. The amended Construction SWPPP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

Manage the Project

The following practices will be required during construction to properly manage activities:

- Identify an Erosion Control Specialist (ECS).
- Comply with seasonal work limitations.
- Inspect, maintain, and repair BMPs.
- Maintain the Construction SWPPP onsite at all times, including narrative, logs, and plans.

Section 10 – Construction Phasing

Phased construction is anticipated for this project. A general sequence for construction is described briefly below:

1. Arrange and attend a pre-construction meeting with the City of Mercer Island.
2. Stake/flag clearing and construction limits.
3. Construct all temporary erosion control BMPs according to the plan.
4. Demolish existing site features indicated for removal.
5. Maintain erosion control measures in accordance with City of Mercer Island standards and manufacturer's recommendations.
6. Rough grade site. All grading shall be done in conformance with the plan.
7. Adjust temporary erosion control BMPs as necessary to match site conditions as construction progresses.
8. Apply erosion control mulch and seeding, straw mulch or equal, to areas that will not be brought to final grade or permanently vegetated within 2 days of exposure during the dry season, and 7 days of exposure during the wet season.
9. Excavate and fill in accordance with rough grading plan.
10. Construct utilities and storm drainage features. Construct storm drain inlet protection for all catch basins subject to onsite runoff.
11. Relocate erosion control measures or install new measures so that, as site conditions change, the erosion and sediment control is always in accordance with the City of Mercer Island Construction SWPPP minimum requirements.

12. Final grade site and construct final surfacing treatments. Ensure that surface water is positively directed toward proposed stormwater control facilities.

13. Remove the remaining temporary erosion control items once site has been stabilized and upon approval.

14. Complete final hydroseeding.

The sequence for the remaining phase(s) of construction will be provided as construction documentation for permit approval is finalized.

Section 11 – Construction Schedule

Construction of the Butterworth Road Remodel project will begin in the Fall of 2024 and is to be completed by Spring of 2025. Based on this schedule, construction will be ongoing during the wet season of 2024.

Section 12 – Financial/Ownership Responsibilities

The property owner is the party responsible for initiation of bonds and other financial securities required for development of the site.

Exhibit 1

Inspection Logs

Butterworth Road Remodel

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inch or more

Inspector: Date:

Inspector's Qualifications:

Days since last rainfall: Amount of last rainfall: inches

Stabilization Measures

Drainage Area	Date Since Last Disturbance	Date of Next Disturbance	Stabilized (yes/No)	Stabilized With	Condition

Stabilization required:

To be performed by: _____ On or before: _____

Butterworth Road Remodel

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Changes required to the pollution prevention plan:

Reasons for changes:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: _____

Exhibit 2

Best Management Practices (BMPs)

BMP 103 High Visibility Fence

BMP 120 Temporary and Permanent Seeding

BMP 123 Plastic Covering

BMP 140 Dust Control

BMP 220 Inlet Protection

burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
    - Irrigation.
    - Reapplication of mulch.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications greater than six months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
    - Temporary ditch liner.
    - Pond liner in temporary sediment pond.
    - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
    - Emergency slope protection during heavy rains.
    - Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
    1. Run plastic up and down the slope, not across the slope.
    2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap at the seams.
4. On long or wide slopes, or slopes subject to wind, tape all seams.
5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion.
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

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BMP C124: Sodding

Purpose

The purpose of sodding is to establish turf for immediate erosion protection and to stabilize drainage paths where concentrated overland flow will occur.

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to BMP C105: Stabilized Construction Access and BMP C106: Wheel Wash.
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

  Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
    - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
    - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
    - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
    - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
    - Encourage the use of alternate, paved routes, if available.
    - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
    - Limit dust-causing work on windy days.
    - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122: Nets and Blankets.

- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See I-2.11 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

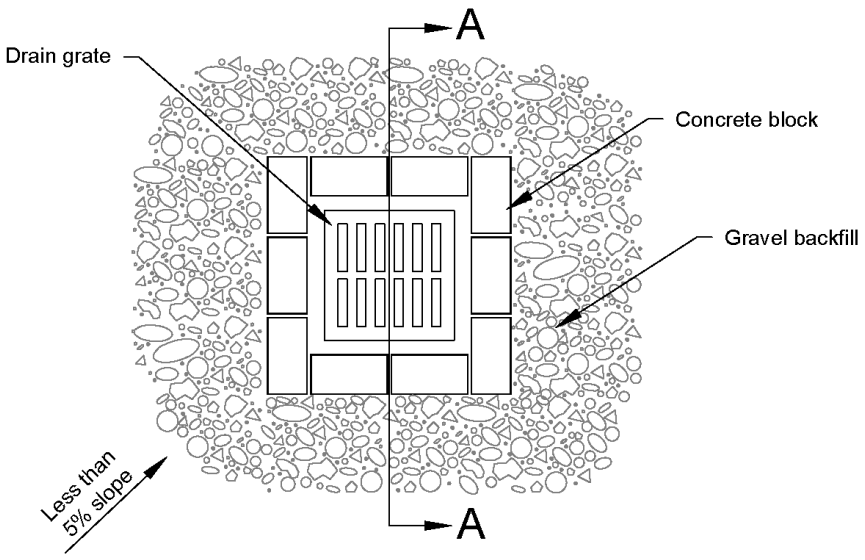
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

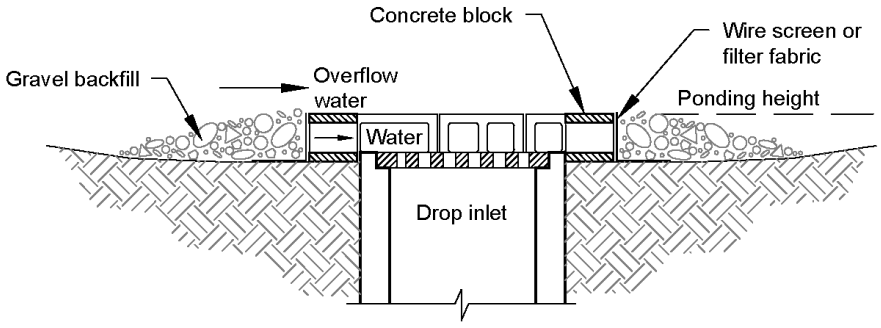
A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Plan View



Section A-A

Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Block and Gravel Filter

Revised June 2016

Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
    - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
    - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
    - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

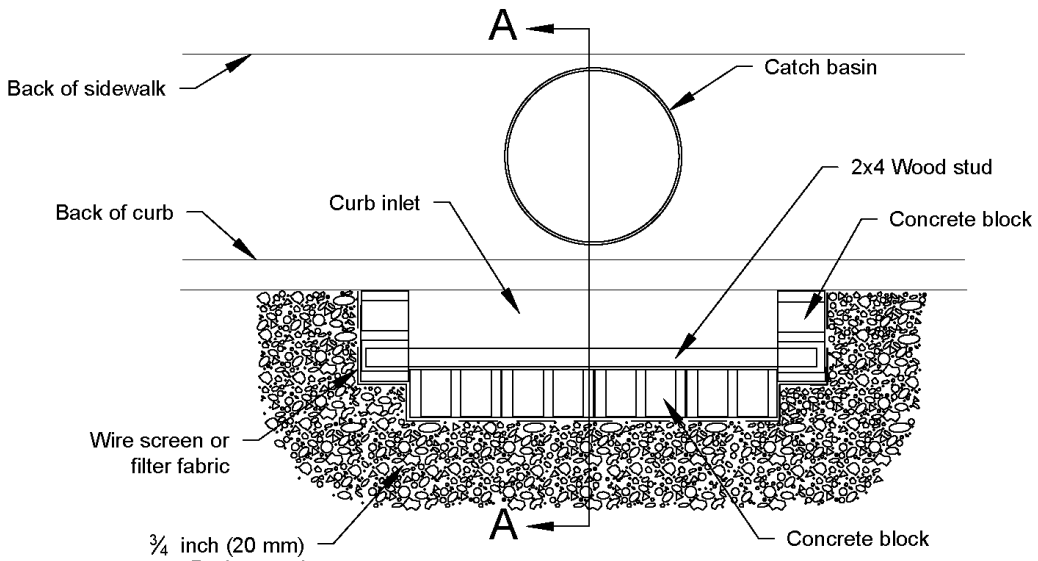
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

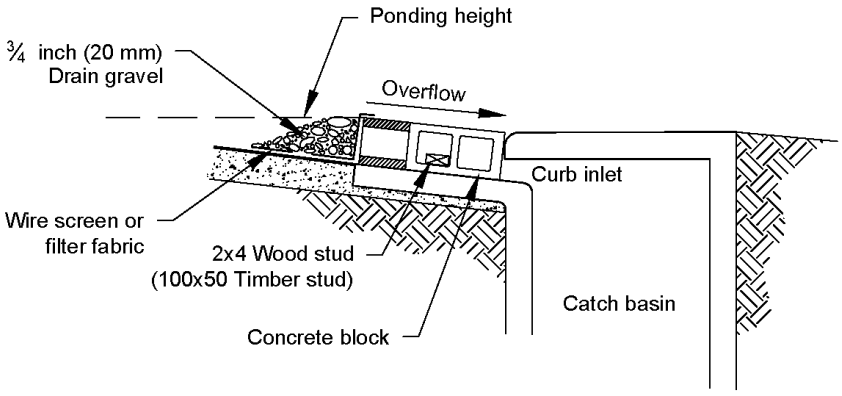
Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Plan View



Section A-A

Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Block and Gravel Curb Inlet Protection

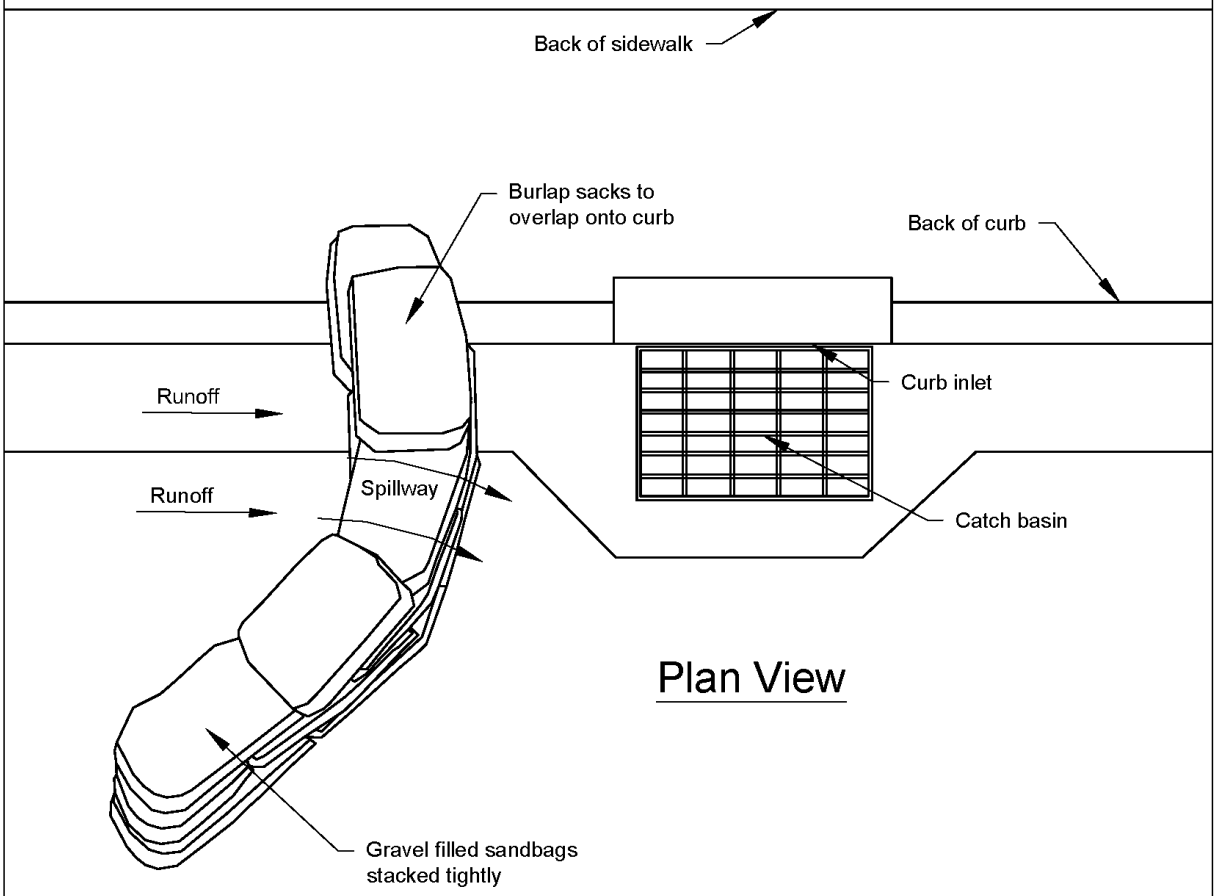
Revised June 2016

Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Curb and Gutter Barrier

Revised June 2016

Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

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BMP C231: Brush Barrier

Purpose

The purpose of brush barriers is to reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Brush barriers may be used downslope of disturbed areas that are less than one-quarter acre.
- Brush barriers are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be directed to a sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a brush barrier, rather than by a sediment trapping BMP, is when the area draining to the barrier is small.
- Brush barriers should only be installed on contours.

Design and Installation Specifications

- Height: 2 feet (minimum) to 5 feet (maximum).
- Width: 5 feet at base (minimum) to 15 feet (maximum).
- Filter fabric (geotextile) may be anchored over the brush berm to enhance the filtration ability of the barrier. Ten-ounce burlap is an adequate alternative to filter fabric.

BMP T5.13 "POST CONSTRUCTION SOIL QUALITY AND DEPTH"
IN THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON

Excerpted from the Washington State Department of Ecology's Stormwater Management Manual for Western Washington, Vol. V: Runoff Treatment BMPs, Chapter 5, pages 5-8 to 5-11 (or pages 105 to 108 in the online PDF file) as revised December 2014. "BMP" means "Best Management Practice", a term used for techniques that are recommended or (in this case) required. The Manual can be found online at www.ecy.wa.gov/programs/wq/stormwater/manual.html

Purpose and Definition

Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions including: water infiltration; nutrient, sediment, and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition. These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Not only are these important stormwater functions lost, but such landscapes themselves become pollution generating pervious surfaces due to increased use of pesticides, fertilizers and other landscaping and household/industrial chemicals, the concentration of pet wastes, and pollutants that accompany roadside litter.

Establishing soil quality and depth regains greater stormwater functions in the post development landscape, provides increased treatment of pollutants and sediments that result from development and habitation, and minimizes the need for some landscaping chemicals, thus reducing pollution through prevention.

Applications and Limitations

Establishing a minimum soil quality and depth is not the same as preservation of naturally occurring soil and vegetation. However, establishing a minimum soil quality and depth will provide improved on-site management of stormwater flow and water quality.

Soil organic matter can be attained through numerous materials such as compost, composted woody material, biosolids, and forest product residuals. It is important that the materials used to meet the soil quality and depth BMP be appropriate and beneficial to the plant cover to be established. Likewise, it is important that imported topsoils improve soil conditions and do not have an excessive percent of clay fines.

This BMP can be considered infeasible on till soil slopes greater than 33 percent.

Design Guidelines

Soil retention. Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable. In any areas requiring grading remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas, to be reapplied to other portions of the site where feasible.

Soil quality. All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structural fill or slope shall, at project completion, demonstrate the following:

1) A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.
2) Mulch planting beds with 2 inches of organic material.
3) Use compost and other materials that meet these organic content requirements:
    a) The organic content for "pre-approved" amendment rates can be met only using compost meeting the compost specification for Bioretention (BMP T7.30), with the exception that the compost may have up to 35% biosolids or manure.
    The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.
    The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.
    b) Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

The resulting soil should be conducive to the type of vegetation to be established.

Editor's note: "other organic materials" includes other composts not meeting the stringent specification in BMP T5.30, which is designed for bioretention swales. Any mature, stable compost is appropriate for general soil amendment.

Implementation Options. The soil quality design guidelines listed above can be met by using one of the methods listed below:

1) Leave undisturbed native vegetation and soil, and protect from compaction during construction.
2) Amend existing site topsoil or subsoil either at default "pre-approved" rates, or at custom calculated rates based on tests of the soil and amendment.
3) Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default "pre-approved" rate or at a custom calculated rate.
4) Import topsoil mix of sufficient organic content and depth to meet the requirements.

More than one method may be used on different portions of the same site. Soil that already meets the depth and organic matter quality standards, and is not compacted, does not need to be amended.

Planning/Permitting/Inspection/Verification Guidelines & Procedures

Local governments are encouraged to adopt guidelines and procedures similar to those recommended in *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*. This document is available at: http://www.soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf

Maintenance

- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
- Plant vegetation and mulch the amended soil area after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

Runoff Model Representation

Areas meeting the design guidelines may be entered into approved runoff models as "Pasture" rather than "Lawn."

Flow reduction credits can be taken in runoff modeling when BMP T5.13 is used as part of a dispersion design under the conditions described in:

BMP T5.10B Downspout Dispersion

BMP T5.11 Concentrated Flow Dispersion

BMP T5.12 Sheet Flow Dispersion

BMP T5.18 Reverse Slope Sidewalks

BMP T5.30 Full Dispersion (for public road projects)

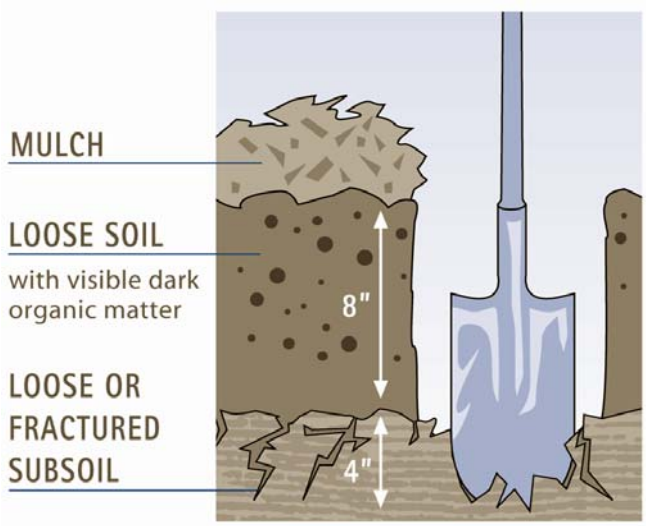

Figure 5.3.3 – Planting bed Cross-Section
(Reprinted from *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*, 2010, Washington Organic Recycling Council)

Related BMP's in the same volume (Vol. V, Ch. 5) of the Stormwater Management Manual for Western Washington
available online at
www.ecy.wa.gov/programs/wq/stormwater/manual.html

- **BMP T5.40 Preserving Natural Vegetation**
- **BMP T5.41 Better Site Design**

See also Chapters 7 and 9 in Volume V on Infiltration and Biofiltration/Bioretention BMPs
and see Volume III, Appendix C "Low Impact Development Flow Modeling Guidance"

Appendix C

Operations and Maintenance Manual

Operations and Maintenance Manual

July 4, 2024

PROJECT

Butterworth Short Plat
5330 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

John Babb, EIT
Civil Designer

REVIEWED BY

Andy Epstein, PE
Project Manager & Owner

ETHOS CIVIL

Operations and Maintenance Manual

July 4, 2024

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PREPARED BY

John Babb, EIT
Civil Designer

REVIEWED BY

Andy Epstein, PE
Project Manager & Owner

07/10/2023

I hereby state that this Operations and Maintenance Manual for the Butterworth Short Plat project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that the City of Mercer Island does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

Table of Contents

Section 1 – Introduction

The Butterworth Short Plat project is a project that includes the demolition of the existing driveway, portions of the site vegetation, existing concrete walkways. The project aims to split the existing property into three lots, provide a shared access road, and utility improvements to allow each of the proposed lots to operate independently. The project will work in conjunction with the Butterworth Road Remodel project (#XXX-XX) which includes the demolition of portions of the onsite existing structure, construction of home renovations, and associated stormwater improvements.

The site address is 5330 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.89 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington. Refer to Exhibit A-1 in Appendix A for a Vicinity Map.

The site generally slopes from west to east, with a total elevation of about 26 feet. There is a man-made unnamed Type F stream located on the project parcel near the southern property line. This project proposes connections to the existing stormwater system on site through conveyance pipes. The project also proposes a manufactured treatment device to meet runoff treatment requirements.

The owner shall be responsible for maintaining the project stormwater facilities.

This report presents a maintenance program that meets the requirements of the Department of Ecology *2019 Stormwater Management Manual for Western Washington (SMMWW)*. It is vitally important that the owner maintains these facilities in a timely and conscientious manner to avoid operational difficulties in the future. If catch basins are not adequately inspected and kept free of debris, it could lead to flooding and surcharging of the stormwater system. Siltation, debris, or lack of maintenance can reduce the capabilities of the system. If manufactured treatment devices are not adequately inspected and kept free of debris stormwater can pass through the treatment device without being treated and pollute the downstream receiving waterbody.

Section 2 – Responsibility

The project improvements will be owned and maintained by the property owner.

Section 3 – Maintenance Schedule

Maintenance of the stormwater facilities shall follow the schedule specified in the *SMMWW.* Additional maintenance may be required to respond to unusual storm events or reduced performance of the stormwater treatment system. A copy of the recommended maintenance schedule is included in Appendix C and may be photocopied and used for inspection records. Periodic stormwater facility maintenance should include sediment removal and vegetation management. Permanent erosion and sedimentation controls should be maintained as needed. Inspection records should be kept on file at the project site.

Section 4 – Cost

The following is an estimate of the average annual cost of maintenance for the stormwater facilities within the scope of this project.

Personnel at $50/hour x 2 hour	$100
Replacement of treatment device cartridge filter at $?/year	$?
Total Estimated Annual Cost	**$?**

Section 5 – Vegetation Management Plan

The attached maintenance schedule provides guidance on vegetation control and management. Irrigation and other maintenance shall be provided as necessary to ensure that vegetation remains viable and that a hardy root structure forms in the first year. Vegetation planting shall be provided as described in the construction documents.

Section 6 – Source Control

All proposed new plus replaced impervious surfaces are non-pollution generating. Source control is therefore not required.

Section 7 – Instructions for Person Maintaining Stormwater System

Appendix C contains a Stormwater Facility Maintenance Schedule. A checklist should be completed for all system components per the following schedule:

- Monthly from November through April
- Once in late summer (preferably September)
- After any major storm event

Using photocopies of the pages in Appendix C, check off the problems that are noted each time the item is inspected. Document comments on problems found and the corrective action taken. The inspection checklist sheets should be kept on file. Use the Department of Ecology suggested inspection frequency at the left of each item as an inspection guide.

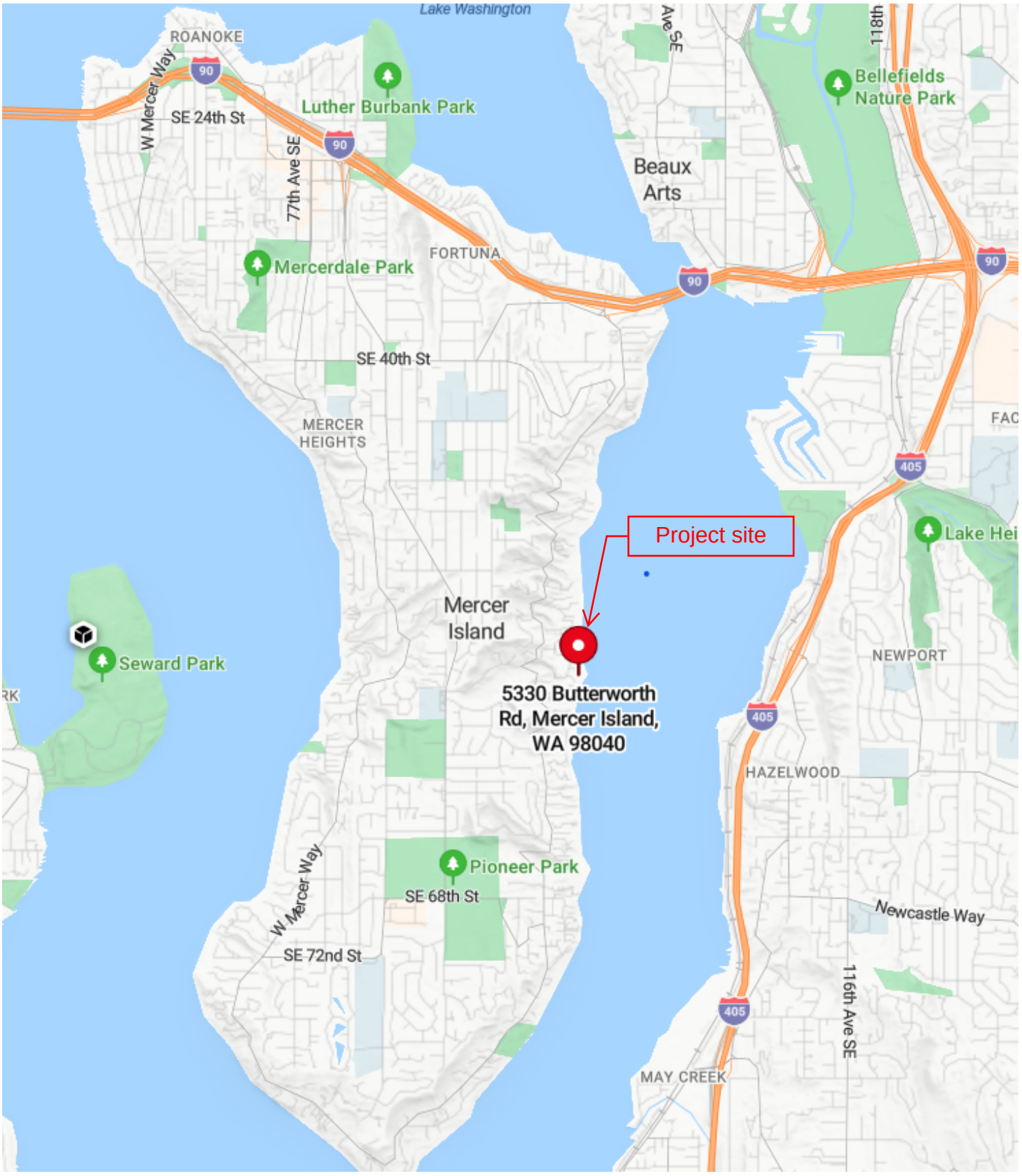
For questions, contact the Washington State Department of Ecology.

Section 8 – Conclusion

This maintenance plan is developed for the Butterworth Short Plat project. The maintenance plan has been prepared within the guidelines of the Department of Ecology *2019 Stormwater Management Manual for Western Washington.* IF this plan is implemented, the owner can expect the stormwater conveyance system to function as designed.
This analysis is based on data and records either supplied to or obtained by Ethos Civil. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

Appendix A

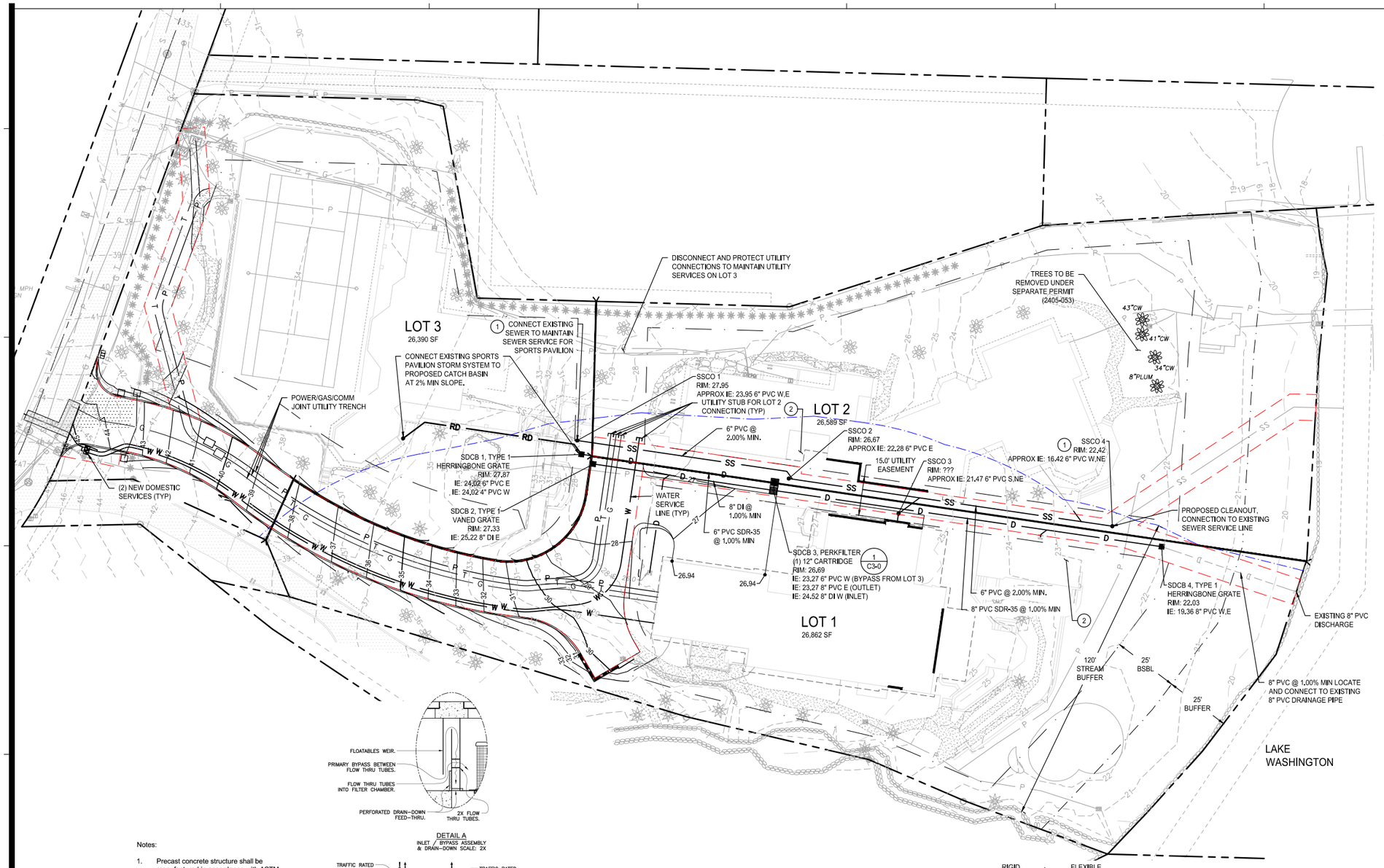
Vicinity Map



ETHOS CIVIL	**Butterworth Short Plat**	A-1
	Vicinity Map	

Appendix B

Civil Plan Sheets



LEGEND

- RIGHT-OF-WAY/PROPERTY LINE
- PROPOSED PROPERTY LINE
- CENTERLINE
- EASEMENT
- CATCH BASIN TYPE 1 (2 C4-0)
- D — STORM DRAINAGE PIPING (2 C3-0)
- W — WATER PIPING
- WATER METER (3 C4-0)
- SS — SANITARY SEWER LINE (2 C3-0)
- CLEANOUT (4 C4-0)
- G — GAS LINE
- P — UNDERGROUND POWER LINE (2 C3-0)
- T — UNDERGROUND COMMUNICATION LINE (2 C3-0)

KEYNOTES

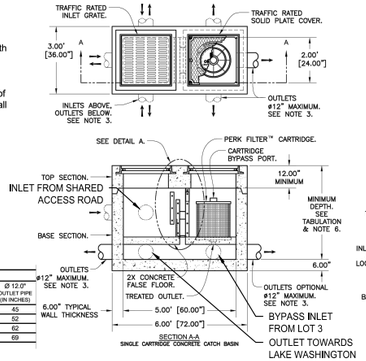
1. POTHOLE TO LOCATE EXACT LOCATION AND DEPTH OF EXISTING SANITARY SEWER LINE.
2. LOCATE AND CONNECT EXISTING ROOF DRAINAGE SYSTEM TO PROPOSED STORM DRAIN.

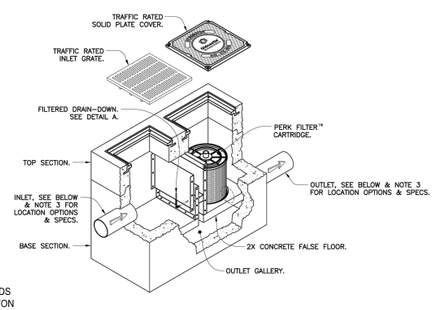
DETAIL A
INLET / BYPASS ASSEMBLY & DRAIN-DOWN SCALE: 2x

Notes:

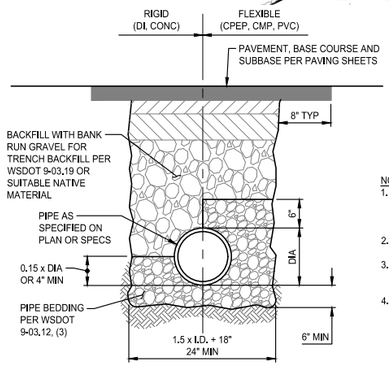
1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.
2. Perk Filter™ Catch basin shall be supplied with traffic rated (H20) bicycle-proof grates and solid plate cover.
3. Inlet pipe(s) may enter device on three sides of the inlet chamber. Outlet pipe(s) may exit on all four sides. All pipe is Ø 12" maximum.
4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.
5. Perk Filter™ cartridge shall be maintained in accordance with manufacturer recommendations.
6. For depths less than the specified minimum contact Oldcastle® Stormwater Solutions for engineering assistance.

MINIMUM DEPTHS (SEE NOTE 6)					
	CARTRIDGE SIZE	Ø 6.0" OUTLET PIPE (IN INCHES)	Ø 8.0" OUTLET PIPE (IN INCHES)	Ø 10.0" OUTLET PIPE (IN INCHES)	Ø 12.0" OUTLET PIPE (IN INCHES)
	12.00"	39	41	43	45
	18.00"	46	48	50	52
STACKED	12.00" + 12.00"	56	58	60	62
STACKED	18.00" + 12.00"	83	65	67	69





1 OLDCASTLE PERKFILTER SINGLE CARTRIDGE CONCRETE CATCH BASIN
NOT TO SCALE



NOTES:
1. BACKFILL MATERIAL SHALL NOT HAVE ROCKS OR PARTICLES LARGER THAN 1" WITHIN 12" OF THE PIPE. BACKFILL MATERIAL SHALL BE PLACED IN 8" MAXIMUM LOOSE LIFTS AND COMPACTED TO 95% MAXIMUM DRY DENSITY PER MODIFIED PROCTOR TEST (ASTM D-1557).
2. CONSTRUCT ALL STORM AND ROOF DRAINS IN CONFORMANCE WITH THIS DETAIL UNLESS NOTED OTHERWISE ON THE PLANS.
3. ALL TRENCH EXCAVATIONS SHALL BE SLOPED, SHORED, SHEETED, BRACED, OR OTHERWISE SUPPORTED IN COMPLIANCE WITH OSHA REGULATIONS AND LOCAL ORDINANCES.
4. IF ORGANIC MATERIAL IS ENCOUNTERED DURING UTILITY EXCAVATION, OVEREXCAVATE TRENCH TO INCREASE PIPE BEDDING DEPTH TO 18" OR MORE AS REQUIRED TO COMPACT BEDDING TO FIRM AND UNYIELDING CONDITION.

2 TRENCH SECTION
NOT TO SCALE

811 Know what's **below.** **Call** before you dig.

N

20 10 0 20 40
SCALE IN FEET

BUTTERWORTH SHORT PLAT
5330 BUTTERWORTH RD
MERCER ISLAND, WA 98040

PRELIMINARY SHORT PLAT

ETHOS CIVIL
Engineering Entitlement Project Management
ethosciv1.com info@ethosciv1.com 253.414.1989

ANDREW B. SISLEY — STATE OF WASHINGTON — 21... — REGISTERED PROFESSIONAL ENGINEER — 07/10/2023

DESIGNED JTB
CHECKED ABE
DRAWN DMW
CHECKED ABE

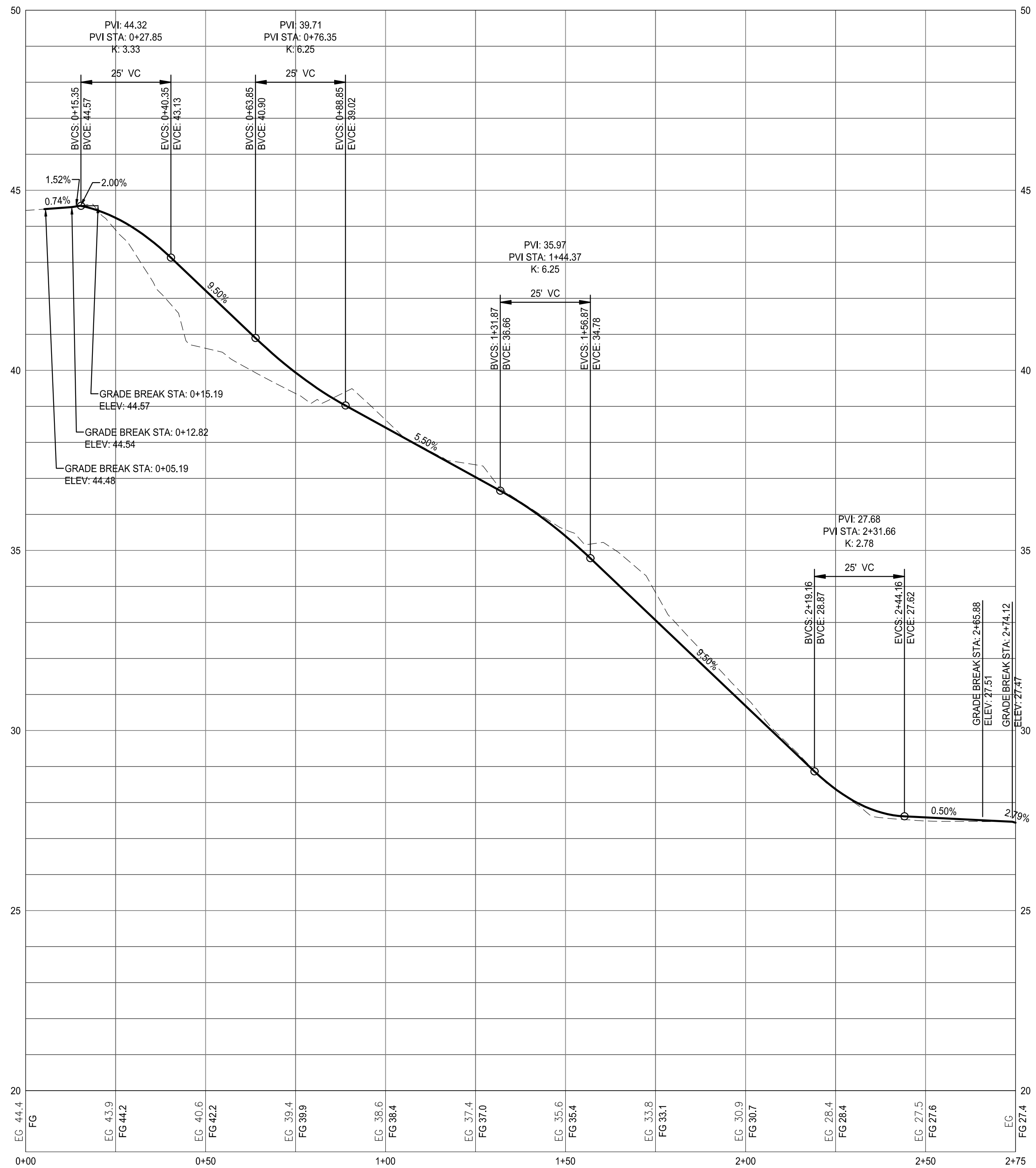
#	DATE	DESCRIPTION

24004
07/10/2024

UTILITY PLAN

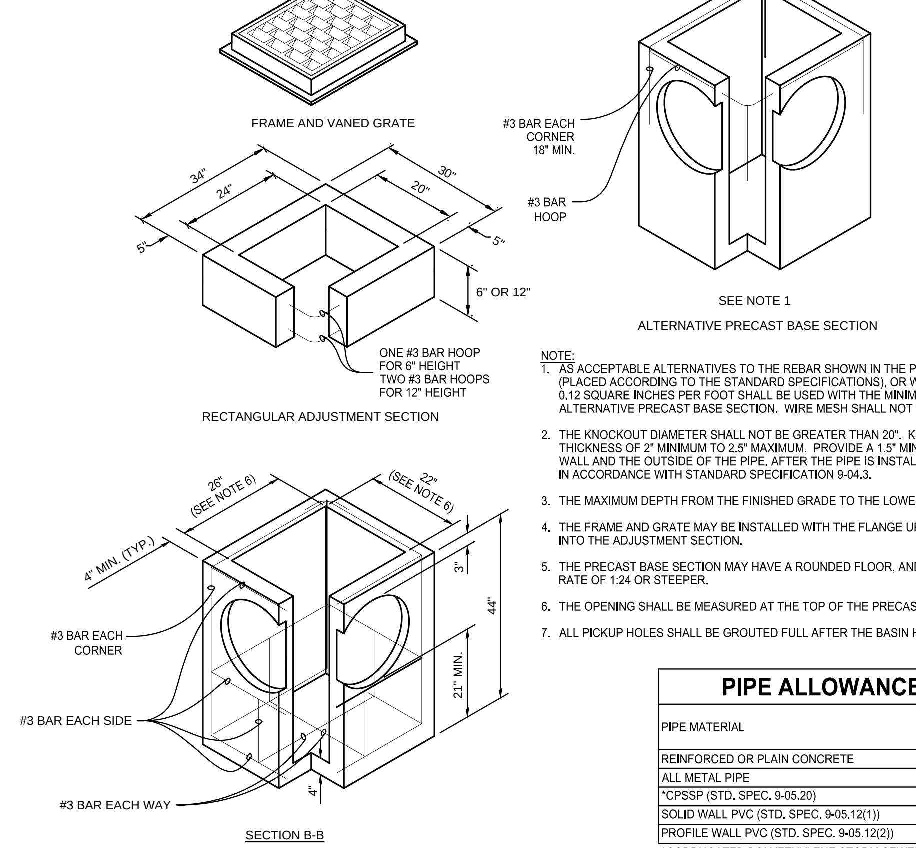
C3-0

PLOTTED: 7/10/2024 4:26:04 PM FILE: 24004-SHT-PLDWG LAST SAVED BY: JOHNBABB



1 SHARED ACCESS ROAD PROFILE

SCALE: 1"=20' HORIZ, 1"=2' VERT



NOTE:
1. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO THE STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20". KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH STANDARD SPECIFICATION 9-04.3.
3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5'.
4. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE UP OR DOWN. THE FRAME MAY BE CAST INTO THE ADJUSTMENT SECTION.
5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1:24 OR STEEPER.
6. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
7. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.

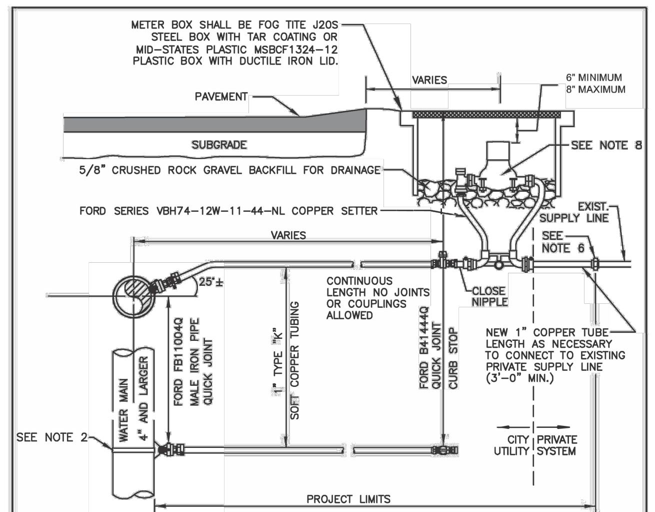
PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
*CPSSP (STD. SPEC. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. 9-05.12(2))	15"

*CORRUGATED POLYETHYLENE STORM SEWER PIPE

2 CATCH BASIN - TYPE 1

NOT TO SCALE



NOTES
1. WATER SERVICES SHALL COMPLY WITH THE REDUCTION OF LEAD IN DRINKING WATER ACT DATED 01/04/2014.
2. ON EXISTING WATER MAINS USE NYLON COATED D.I. SADDLE WITH STAINLESS STEEL DOUBLE STRAPS, ROMAC 202NS, OR APPROVED EQUAL.
3. MINIMUM DISTANCE BETWEEN CORP STOPS SHALL BE 18". MINIMUM DISTANCE BETWEEN TAPS, BETWEEN CORP STOP AND PIPE ENDS SHALL BE 24", ALL HORIZONALLY STAGGERED.
4. PLASTIC METER BOXES SHALL NOT BE INSTALLED WITHIN ROADWAY, SIDEWALK, OR DRIVEWAYS.
5. UPON CITY ENGINEER'S APPROVAL, METER BOXES ARE ALLOWED TO BE INSTALLED IN PORTLAND CEMENT CONCRETE PAVEMENT OR SIDEWALK.
6. WHEN CONNECTING TO EXISTING PRIVATE SUPPLY LINE CONTAINING FERROUS METAL, PROVIDE INSULATING COUPLING (DB SERIES WITH C21 SERIES ADAPTERS) AND PROVIDE REDUCER AS NECESSARY TO MATCH EXISTING PRIVATE SUPPLY LINE DIAMETER.
7. SERVICE LINE SHALL BE PERPENDICULAR TO THE WATER MAIN AND STRAIGHT TO WATER METER, UNLESS OTHERWISE APPROVED BY CITY ENGINEER. PROVIDE WINDING SLACK IN THE SERVICE LINE BETWEEN THE MAIN AND WATER METER.
8. WATER METER SUPPLIED BY CITY.
9. ALL FITTINGS TO BE BRASS COMPRESSION TYPE, FORD QUICK JOINT OR EQUAL.
10. NO SERVICE CONNECTIONS BETWEEN BLOW-OFF AND END OF MAIN.

CITY OF MERCER ISLAND
STANDARD DETAILS
WATER

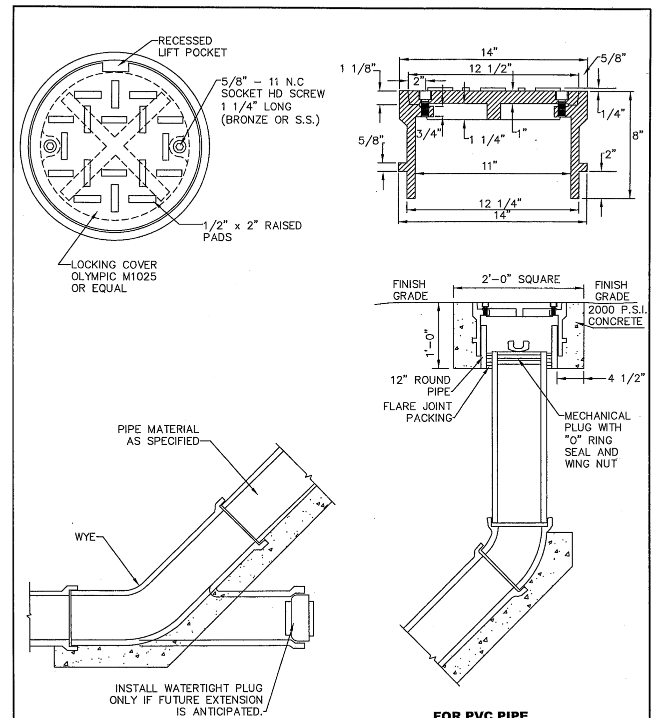
1" WATER METER INSTALLATION

05-02-2023	NO SCALE	W-13

REV DATE						APPROVED

3 1-INCH WATER METER

NOT TO SCALE



NOTES
1. SEE S-27 FOR INSTALLATION DETAILS.

CITY OF MERCER ISLAND
STANDARD DETAILS
SEWER

CLEAN OUT DETAIL

6-5-2009	NO SCALE	S-19

REV DATE					APPROVED

4 CLEANOUT

NOT TO SCALE

Know what's **below.**
Call before you dig.

BUTTERWORTH SHORT PLAT

5330 BUTTERWORTH RD
MERCER ISLAND, WA 98040

PRELIMINARY SHORT PLAT

ETHOS CIVIL
Engineering Entitlement Project Management
ethoscivil.com info@ethoscivil.com 253.414.1989

07/10/2023

DESIGNED JTB
CHECKED ABE
DRAWN DMW
CHECKED ABE

#	DATE	DESCRIPTION

24004
07/10/2024

ROAD PROFILE AND UTILITY DETAILS

C4-0

Appendix C

Stormwater Facility Maintenance Schedule
SMMWW Maintenance Standards

Butterworth Short Plat
Inspection Frequencies

Asset	Preferred Month	Interval
Storm Catch Basins/Yard Drains/Cleanouts		Annually
Manufactured Treatment Device		Annually
Storm Drainage Pipes		Annually
Landscaping	March – April September – October	Semi-annually

Butterworth Short Plat
Maintenance Activity Log

Storm Drainage Pipes

Date	Initials	Current Condition	Action Taken	Condition After Maintenance

Maintenance to be performed:

- Sediment shall be removed from pipes annually.

Result expected when maintenance performed:

- Pipe contains no sediment.

To be performed by: On or before:

Butterworth Short Plat
Maintenance Activity Log

Catch Basin

Date	Initials	Current Condition	Action Taken	Condition After Maintenance

Maintenance to be performed:

- Sediment shall be removed from basin annually.
- Trash or debris shall be removed from basin annually.
- Grout cracks and adjust frame to sit flush with surface.
- Remove vegetation growing across or blocking basin opening and inlet/outlet pipes.

Result expected when maintenance performed:

- No sediment in the catch basin.
- No trash or debris in the catch basin.
- Pipes and top slab are secure and free from cracks. Frame is flush with the surface.
- No vegetation blocking opening to basin.

To be performed by: On or before:

Butterworth Short Plat
Maintenance Activity Log

Manufactured Treatment Device

Date	Initials	Current Condition	Action Taken	Condition After Maintenance

Maintenance to be performed:

- Sediment shall be removed from basin annually.
- Trash or debris shall be removed from basin annually.
- Grout cracks and adjust frame to sit flush with surface.
- Remove vegetation growing across or blocking basin opening and inlet/outlet pipes.
- Cartridge Filters shall be replaced annually.

Result expected when maintenance performed:

- No sediment in the catch basin.
- No trash or debris in the catch basin.
- Pipes and top slab are secure and free from cracks. Frame is flush with the surface.
- No vegetation blocking opening to basin.
- Cartridges Filters are installed and working properly.

To be performed by: On or before:

Table V-A.5: Maintenance Standards - 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%. 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. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. 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). 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	Top slab is free of holes and cracks. 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. 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.	Basin replaced or repaired to design standards. 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. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	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, meets the design standards, and is installed and aligned with the flow path.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault			compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Oldcastle Infrastructure™
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PERKFILTER™

Inspection and Maintenance Guide

Water

PerkFilter™ Media Filtration System

Description

The PerkFilter is a stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The PerkFilter is a media-filled cartridge filtration device designed to capture and retain sediment, gross solids, metals, nutrients, hydrocarbons, and trash and debris. As with any stormwater treatment system, the PerkFilter requires periodic maintenance to sustain optimum system performance.

Function

The PerkFilter is a water quality treatment system consisting of three chambers: an inlet chamber, a filter cartridge treatment chamber, and an outlet chamber (Figure 1). Stormwater runoff enters the inlet chamber through an inlet pipe, curb opening, or grated inlet. Gross solids are settled out, and floating trash and debris are trapped in the inlet chamber. Pretreated flow is then directed to the treatment chamber through an opening in the baffle wall between the inlet chamber and treatment chamber. The treatment chamber contains media-filled filter cartridges (Figure 2) that use physical and chemical processes to remove pollutants. During a storm event, runoff pools in the treatment chamber before passing radially through the cylindrical cartridges from the outside surface, through the media for treatment, and into the center of the cartridge. At the center of the cartridge is a center tube assembly designed to distribute the hydraulic load evenly across the surface of the filter cartridge and control the treatment flow rate. The center tube assembly discharges treated flow through the false floor and into the outlet chamber. A draindown feature built into each cartridge allows the treatment chamber to dewater between storm events.

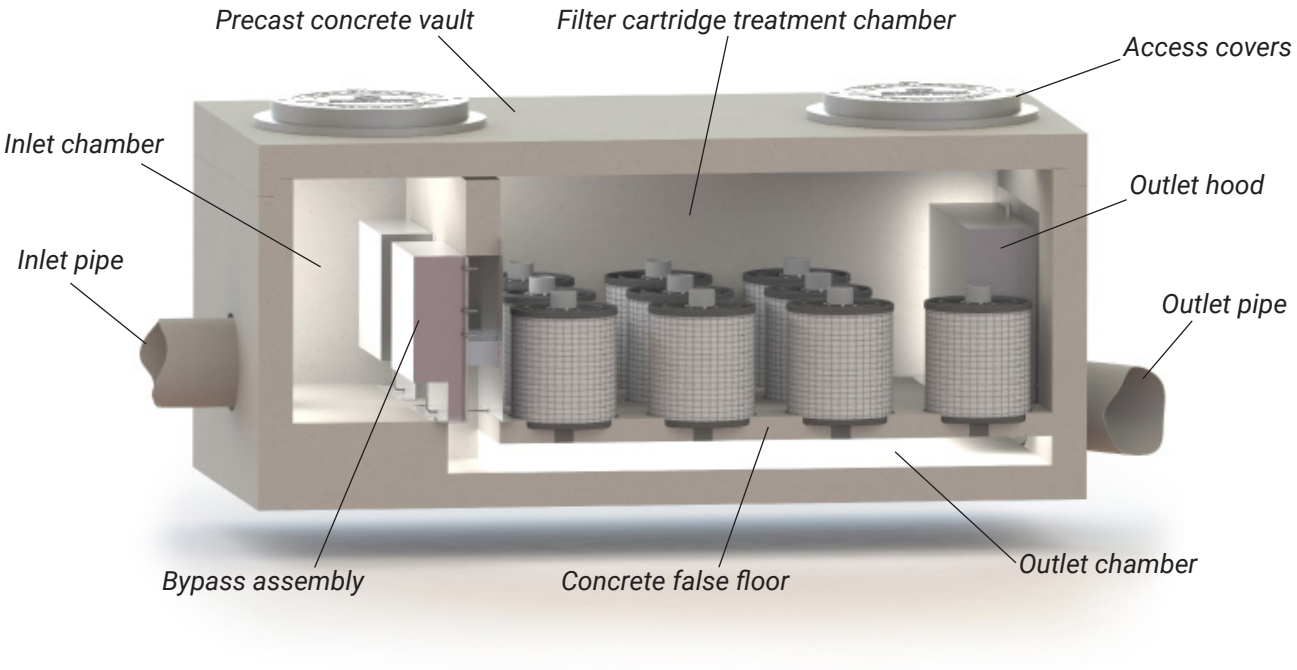


Figure 1. Schematic of the PerkFilter system.

All PerkFilter systems include a high-flow bypass assembly to divert flow exceeding the treatment capacity of the filter cartridges around the treatment chamber. The bypass assembly routes peak flow from the inlet chamber directly to the outlet chamber, bypassing the treatment chamber to prevent sediment and other captured pollutants from being scoured and re-entrained by high flow. Treated flow and bypass flow merge in the outlet chamber for discharge by a single outlet pipe.

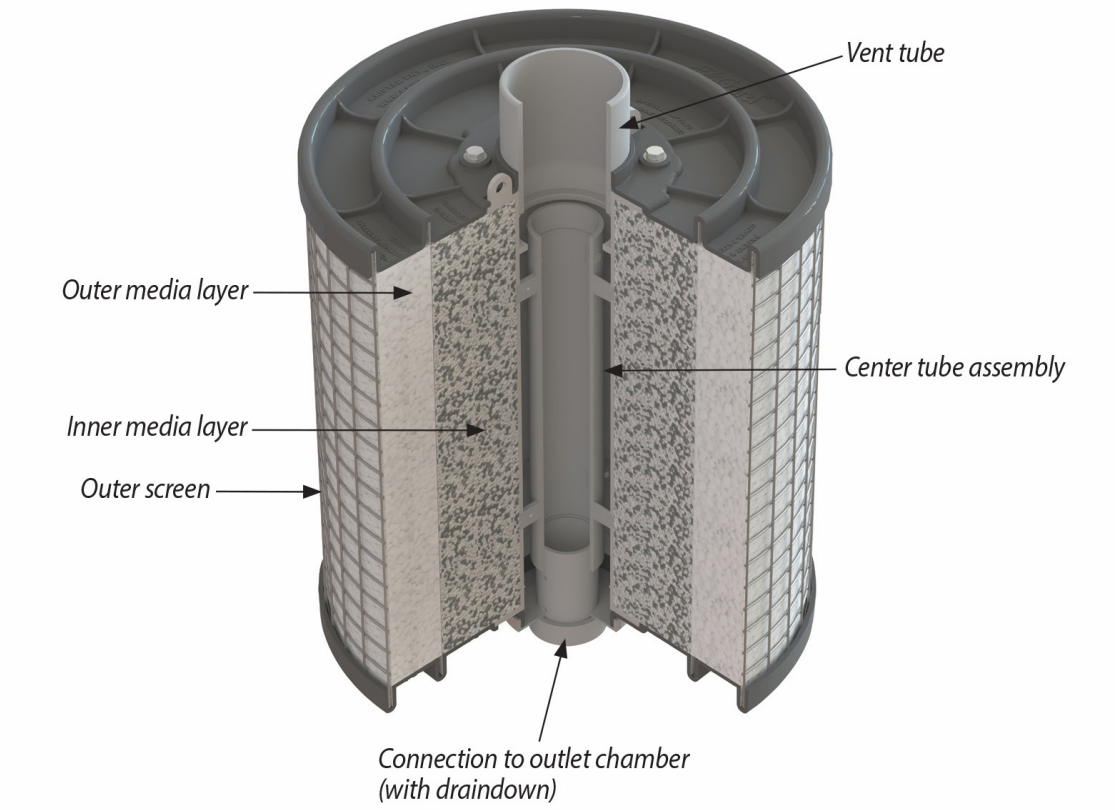


Figure 2. Schematic of PerkFilter cartridge.

Configuration

The PerkFilter structure may consist of a vault, manhole, or catch basin configuration. Catch basin units may be fabricated from concrete or steel. Internal components including the PerkFilter cartridges are manufactured from durable plastic and stainless steel components and hardware. All cartridges are 18 inches in diameter and are available in two heights: 12-inch and 18-inch. Cartridges may be used alone or may be stacked (Figure 3) to provide 24-inch and 30-inch combinations. The capacity of each cartridge or cartridge combination is dictated by the allowable operating rate of the media and the outer surface area of the cartridge. Thus, taller cartridges have greater treatment capacity than shorter cartridges, but they also require more hydraulic drop across the system. Cartridges may be filled with various media depending on the target pollutants and desired treatment rate, among other factors.

Access to an installed PerkFilter system is typically provided by ductile iron castings or hatch covers. The location and number of access appurtenances is dependent on the size and configuration of the system.

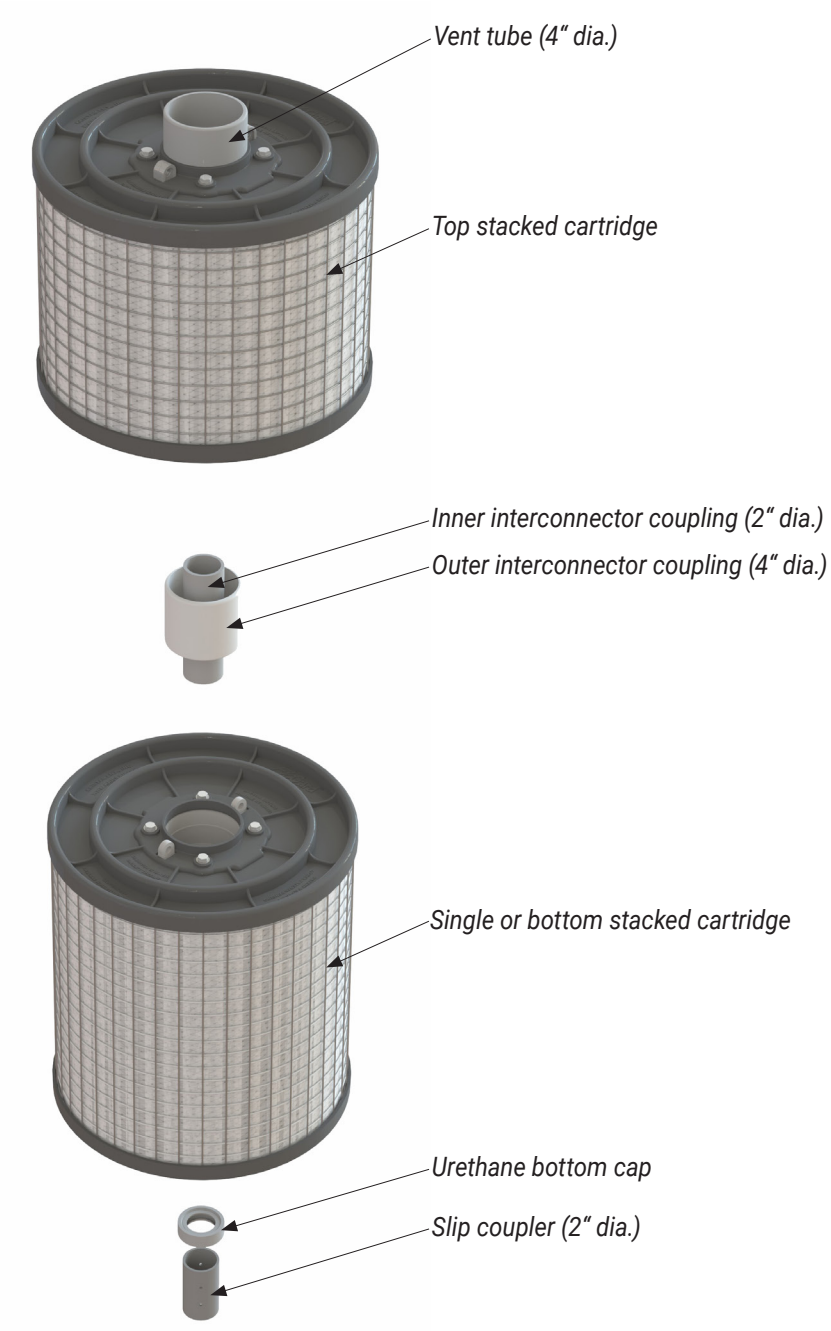


Figure 3. Schematic of stacked cartridges and connector components.

Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. Maintenance prevents excessive pollutant buildup that can limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Inspection and Maintenance Frequency

The PerkFilter should be inspected on a periodic basis, typically twice per year, and maintained as required. Initially, inspections of a new system should be conducted more frequently to help establish an appropriate site-specific inspection frequency. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. In most cases, the optimum maintenance interval will be one to three years. Inspection and maintenance activities should be performed only during dry weather periods.

Inspection Equipment

The following equipment is helpful when conducting PerkFilter inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

PerkFilter inspections are visual and may be conducted from the ground surface without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Infrastructure at (800) 579-8819 to determine appropriate corrective action.
- Note whether the inlet pipe is blocked or obstructed. The outlet pipe is covered by a removable outlet hood and cannot be observed without entering the unit.
- Observe, quantify and record the accumulation of floating trash and debris in the inlet chamber. The significance of accumulated floating trash and debris is a matter of judgment. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of floating oils or settled sediment is not yet warranted.

- Observe, quantify and record the accumulation of oils in the inlet chamber. The significance of accumulated floating oils is a matter of judgment. However, if there is evidence of an oil or fuel spill, immediate maintenance by appropriate certified personnel is warranted.
- Observe, quantify and record the average accumulation of sediment in the inlet chamber and treatment chamber. A calibrated dipstick, tape measure, or sludge sampler may be used to determine the amount of accumulated sediment in each chamber. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the PerkFilter to the top of the accumulated sediment, and the measurement from the rim of the PerkFilter to the bottom of the PerkFilter structure. Finding the top of the accumulated sediment below standing water takes some practice and a light touch, but increased resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
- Finally, observe, quantify and record the amount of standing water in the treatment chamber around the cartridges. If standing water is present, do not include the depth of sediment that may have settled out below the standing water in the measurement.

Maintenance Triggers

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Internal components are broken or missing.
- Inlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the inlet chamber is significant.
- There is more than 6” of accumulated sediment in the inlet chamber.
- There is more than 4” of accumulated sediment in the treatment chamber.
- There is more than 4” of standing water in the treatment chamber more than 24 hours after end of rain event.
- A hazardous material release (e.g. automotive fluids) is observed or reported.
- The system has not been maintained for 3 years (wet climates) to 5 years (dry climates).

Maintenance Equipment

The following equipment is helpful when conducting PerkFilter maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- 9/16” socket and wrench to remove hold-down struts and filter cartridge tops
- Replacement filter cartridges
- Vacuum truck with water supply and water jet

Contact Oldcastle Infrastructure at (800) 579-8819 for replacement filter cartridges. A lead time of four weeks is recommended.

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is necessary to maintain vault and manhole PerkFilter configurations. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Confined space entry is not required for catch basin PerkFilter configurations. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Infrastructure.

PerkFilter
Inspection and Maintenance Log

Location_____

Structure Configuration and Size:

Inspection Date_____

☐ Vault _____feet x _____feet
☐ Manhole _____feet diameter
☐ Catch Basin _____feet x _____feet

Number and Height of Cartridge Stacks:

Count____each ☐12" ☐ 18" ☐ 24" ☐ 30"

Media Type:

☐ ZPC ☐ Perlite ☐ Other_____

Condition of Internal Components ☐ Good ☐ Damaged ☐ Missing	Notes:
Inlet or Outlet Blockage or Obstruction ☐ Yes ☐ No	Notes:
Floating Trash and Debris ☐ Significant ☐ Not Significant	Notes:
Floating Oils ☐ Significant ☐ Not Significant ☐ Spill	Notes:
Sediment Depth in Inlet Chamber ☐ Inches of Sediment:_____	Notes:
Sediment Depth in Treatment Chamber ☐ Inches of Sediment:_____	Notes:
Standing Water in Treatment Chamber ☐ Inches of Standing Water:_____	Notes:

Maintenance Required

☐ **Yes - Schedule Maintenance** ☐ **No - Inspect Again in _____ Months**

PERKFILTER™

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Appendix D

Engineering Calculations

D-1

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Stormfilters

Site Name:	
Site Address:	5330 Butterworth Rd
City:	Mercer Island
Report Date:	7/4/2024
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2023/01/27
Version:	4.2.19

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	0.171
Pervious Total	0.171
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.171

Mitigated Land Use

1

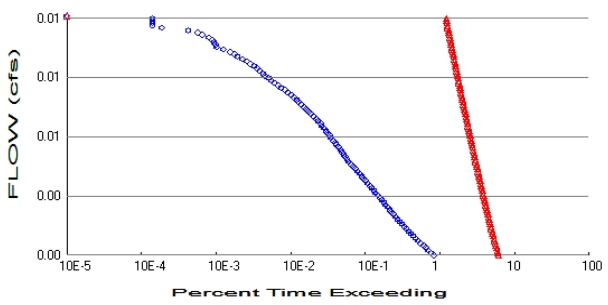
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS MOD	0.171
Impervious Total	0.171
Basin Total	0.171

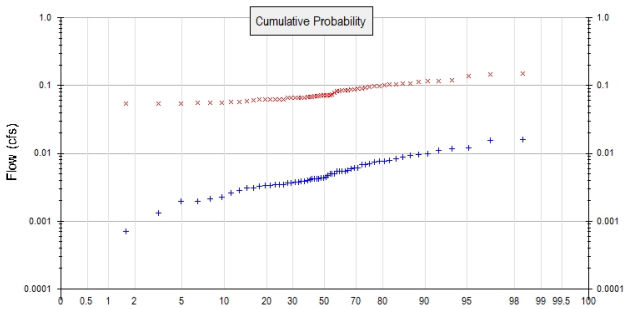
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.171
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.171

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.005028
5 year	0.007896
10 year	0.009522
25 year	0.011244
50 year	0.012309
100 year	0.013216

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.075922
5 year	0.096398
10 year	0.110365
25 year	0.128541
50 year	0.14249
100 year	0.156809

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.005	0.096
1950	0.006	0.100
1951	0.011	0.057
1952	0.003	0.050
1953	0.003	0.059
1954	0.004	0.061
1955	0.007	0.073
1956	0.005	0.069
1957	0.004	0.071
1958	0.005	0.062

1959	0.004	0.068
1960	0.007	0.065
1961	0.004	0.063
1962	0.003	0.055
1963	0.004	0.065
1964	0.005	0.066
1965	0.003	0.074
1966	0.003	0.054
1967	0.007	0.087
1968	0.004	0.117
1969	0.004	0.069
1970	0.003	0.069
1971	0.004	0.084
1972	0.008	0.084
1973	0.004	0.055
1974	0.004	0.078
1975	0.006	0.084
1976	0.004	0.063
1977	0.000	0.063
1978	0.003	0.093
1979	0.002	0.112
1980	0.008	0.116
1981	0.003	0.073
1982	0.006	0.104
1983	0.005	0.086
1984	0.003	0.056
1985	0.002	0.071
1986	0.009	0.062
1987	0.008	0.098
1988	0.003	0.066
1989	0.002	0.103
1990	0.016	0.120
1991	0.010	0.107
1992	0.004	0.056
1993	0.004	0.071
1994	0.001	0.062
1995	0.006	0.066
1996	0.012	0.085
1997	0.010	0.066
1998	0.002	0.071
1999	0.009	0.152
2000	0.004	0.070
2001	0.001	0.088
2002	0.004	0.089
2003	0.005	0.090
2004	0.007	0.147
2005	0.005	0.058
2006	0.006	0.054
2007	0.012	0.139
2008	0.015	0.098
2009	0.008	0.108

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0161	0.1517
2	0.0154	0.1474
3	0.0120	0.1388

4	0.0118	0.1202
5	0.0111	0.1166
6	0.0098	0.1161
7	0.0097	0.1122
8	0.0092	0.1078
9	0.0087	0.1065
10	0.0082	0.1041
11	0.0078	0.1026
12	0.0077	0.1002
13	0.0076	0.0983
14	0.0075	0.0980
15	0.0070	0.0961
16	0.0069	0.0931
17	0.0068	0.0901
18	0.0062	0.0894
19	0.0060	0.0876
20	0.0060	0.0874
21	0.0056	0.0863
22	0.0055	0.0847
23	0.0055	0.0841
24	0.0054	0.0840
25	0.0054	0.0835
26	0.0050	0.0784
27	0.0050	0.0744
28	0.0049	0.0727
29	0.0047	0.0726
30	0.0044	0.0715
31	0.0043	0.0712
32	0.0043	0.0709
33	0.0043	0.0708
34	0.0043	0.0700
35	0.0042	0.0691
36	0.0042	0.0688
37	0.0041	0.0685
38	0.0040	0.0684
39	0.0039	0.0664
40	0.0039	0.0659
41	0.0037	0.0657
42	0.0037	0.0655
43	0.0037	0.0654
44	0.0036	0.0651
45	0.0035	0.0632
46	0.0035	0.0630
47	0.0034	0.0630
48	0.0034	0.0625
49	0.0033	0.0619
50	0.0033	0.0618
51	0.0031	0.0608
52	0.0030	0.0594
53	0.0028	0.0577
54	0.0026	0.0571
55	0.0022	0.0560
56	0.0021	0.0556
57	0.0020	0.0550
58	0.0020	0.0546
59	0.0013	0.0539
60	0.0007	0.0536
61	0.0005	0.0496

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0025	17545	130557	744	Fail
0.0026	16168	127884	790	Fail
0.0027	14970	125231	836	Fail
0.0028	13856	122643	885	Fail
0.0029	12816	120248	938	Fail
0.0030	11811	117895	998	Fail
0.0031	10900	115585	1060	Fail
0.0032	10119	113254	1119	Fail
0.0033	9383	111115	1184	Fail
0.0034	8731	109040	1248	Fail
0.0035	8143	107051	1314	Fail
0.0036	7593	105105	1384	Fail
0.0037	7060	103115	1460	Fail
0.0038	6588	101255	1536	Fail
0.0039	6145	99437	1618	Fail
0.0040	5775	97661	1691	Fail
0.0041	5428	95972	1768	Fail
0.0042	5101	94325	1849	Fail
0.0043	4808	92678	1927	Fail
0.0044	4526	91031	2011	Fail
0.0045	4254	89362	2100	Fail
0.0046	4017	87758	2184	Fail
0.0047	3784	86240	2279	Fail
0.0048	3546	84742	2389	Fail
0.0049	3337	83288	2495	Fail
0.0050	3138	81855	2608	Fail
0.0051	2952	80465	2725	Fail
0.0052	2785	79139	2841	Fail
0.0053	2597	77812	2996	Fail
0.0054	2447	76486	3125	Fail
0.0055	2304	75289	3267	Fail
0.0056	2160	74005	3426	Fail
0.0057	2024	72743	3594	Fail
0.0058	1897	71546	3771	Fail
0.0059	1790	70433	3934	Fail
0.0060	1688	69278	4104	Fail
0.0061	1586	68187	4299	Fail
0.0062	1483	67054	4521	Fail
0.0063	1380	65963	4779	Fail
0.0064	1292	64894	5022	Fail
0.0065	1219	63781	5232	Fail
0.0066	1155	62733	5431	Fail
0.0067	1098	61685	5617	Fail
0.0068	1048	60659	5788	Fail
0.0069	997	59739	5991	Fail
0.0070	930	58776	6320	Fail
0.0071	883	57793	6545	Fail
0.0072	837	56894	6797	Fail
0.0073	789	55953	7091	Fail
0.0074	743	55076	7412	Fail
0.0075	713	54199	7601	Fail
0.0076	668	53408	7995	Fail
0.0077	630	52552	8341	Fail
0.0078	596	51697	8673	Fail

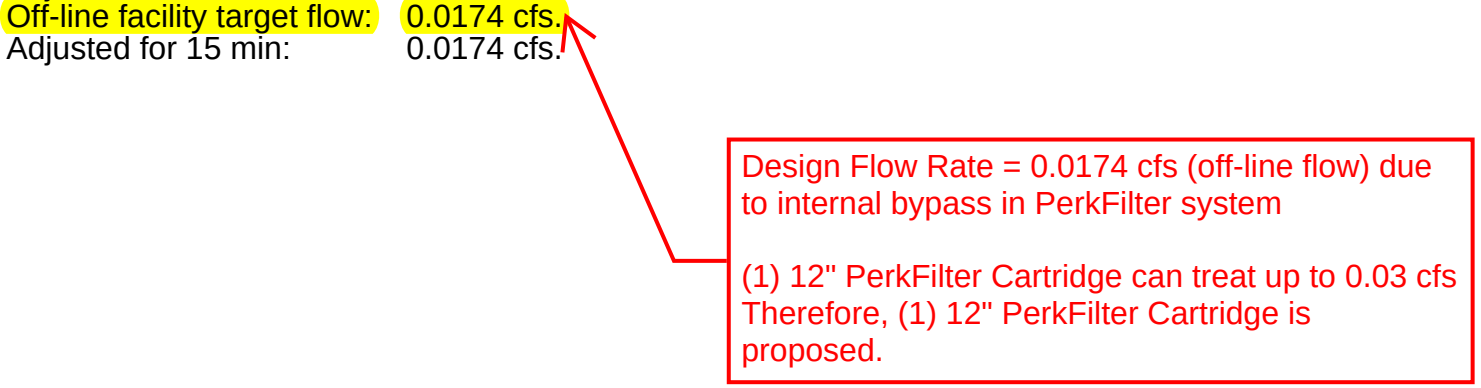
0.0079	565	50884	9006	Fail
0.0080	539	50093	9293	Fail
0.0081	496	49301	9939	Fail
0.0082	473	48531	10260	Fail
0.0083	434	47783	11009	Fail
0.0084	399	47077	11798	Fail
0.0085	366	46328	12657	Fail
0.0085	348	45622	13109	Fail
0.0086	323	44916	13905	Fail
0.0087	296	44253	14950	Fail
0.0088	272	43548	16010	Fail
0.0089	256	42906	16760	Fail
0.0090	235	42243	17975	Fail
0.0091	217	41623	19181	Fail
0.0092	195	40960	21005	Fail
0.0093	180	40382	22434	Fail
0.0094	158	39783	25179	Fail
0.0095	145	39184	27023	Fail
0.0096	129	38564	29894	Fail
0.0097	119	38008	31939	Fail
0.0098	109	37452	34359	Fail
0.0099	97	36853	37992	Fail
0.0100	91	36275	39862	Fail
0.0101	82	35719	43559	Fail
0.0102	76	35185	46296	Fail
0.0103	69	34671	50247	Fail
0.0104	62	34201	55162	Fail
0.0105	55	33709	61289	Fail
0.0106	48	33238	69245	Fail
0.0107	41	32746	79868	Fail
0.0108	38	32254	84878	Fail
0.0109	33	31805	96378	Fail
0.0110	27	31292	115896	Fail
0.0111	22	30821	140095	Fail
0.0112	21	30351	144528	Fail
0.0113	20	29944	149720	Fail
0.0114	19	29517	155352	Fail
0.0115	17	29067	170982	Fail
0.0116	14	28640	204571	Fail
0.0117	12	28212	235100	Fail
0.0118	9	27763	308477	Fail
0.0119	4	27356	683900	Fail
0.0120	3	26971	899033	Fail
0.0121	3	26586	886200	Fail
0.0122	3	26223	874100	Fail
0.0123	3	25880	862666	Fail

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

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0206 acre-feet
On-line facility target flow:	0.031 cfs.
Adjusted for 15 min:	0.031 cfs.
Off-line facility target flow:	0.0174 cfs.
Adjusted for 15 min:	0.0174 cfs.



LID Report

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

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 4

POC #4 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 5

POC #5 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 6

POC #6 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 7

POC #7 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 8

POC #8 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 9

POC #9 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

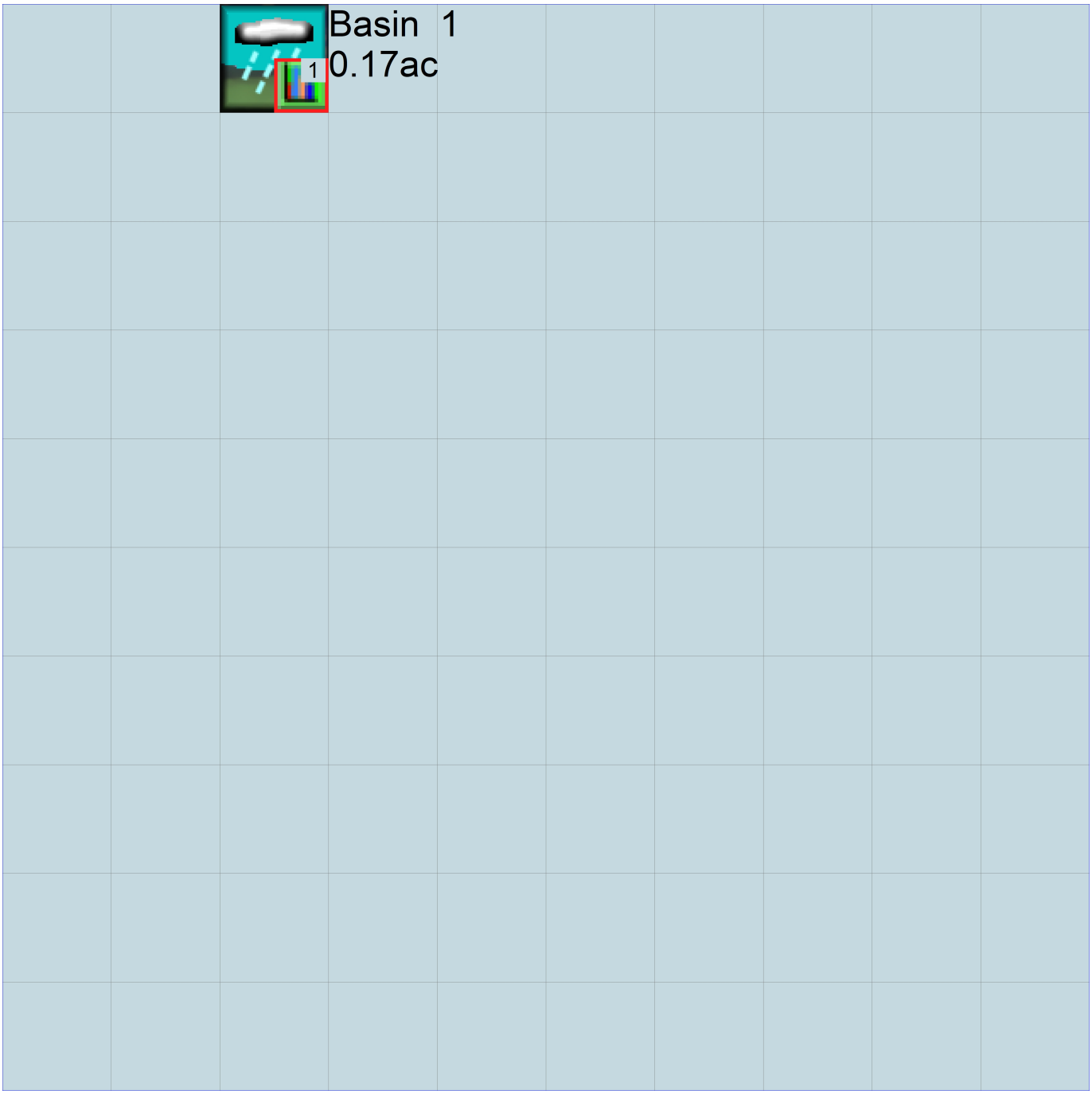
No PERLND changes have been made.

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   Stormfilters.wdm
MESSU       25   PreStormfilters.MES
            27   PreStormfilters.L61
            28   PreStormfilters.L62
            30   POCStormfilters1.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                       0.171     COPY   501     12
PERLND  10                       0.171     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   Stormfilters.wdm
MESSU      25   MitStormfilters.MES
           27   MitStormfilters.L61
           28   MitStormfilters.L62
           30   POCStormfilters1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        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           ***
  END GEN-INFO
  *** Section PWATER***

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

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

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

```
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  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
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL     *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2               0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND
```

```
SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
1***
IMPLND   2                       0.171     COPY   501     15

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    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     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       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

D-2

Conveyance Calculation for 8-inch Pipe - 25-year, 24-hour Storm

Rational Method

Q=CIA

I = 3.2 in/hr (Provided by King County Isopluvials – See Attached)

$A_{impervious}$ = 23,725 sf (All Proposed Impervious Areas on Site plus existing roof area - worst case scenario)

$A_{impervious}$ = 0.54 acres

$C_{impervious}$ = 0.90 (pavement/roofs)

$Q_{impervious}$ = (0.90 x 3.2 x 0.22)

Q_{total} = 1.56 cfs

Manning's Equation: (for pipe flowing full)

$Q = (1.49/n)(A)(D/4)^{2/3}(S)^{1/2}$

8-inch Pipe Conveying Flows From the Entire Site (worst case scenario):

A = 8/12 ft

S = 0.02 (ft/ft)

n = 0.011 (PVC)

$Q = (1.49/0.011)\ (\pi/4)(8/12)^2\ ((8/12)/4)^{2/3}\ (0.02)^{1/2}$

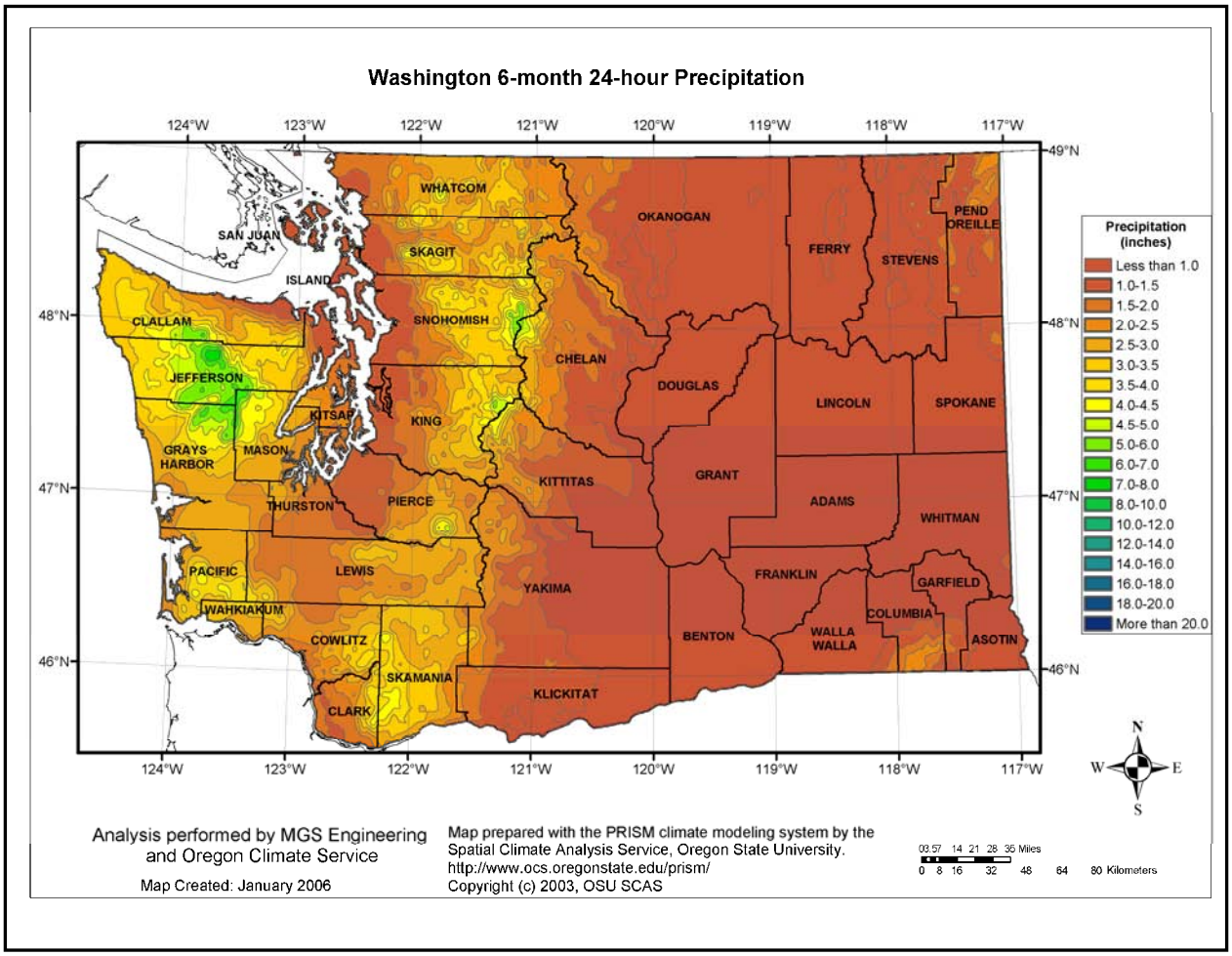
Q = 2.02 cfs

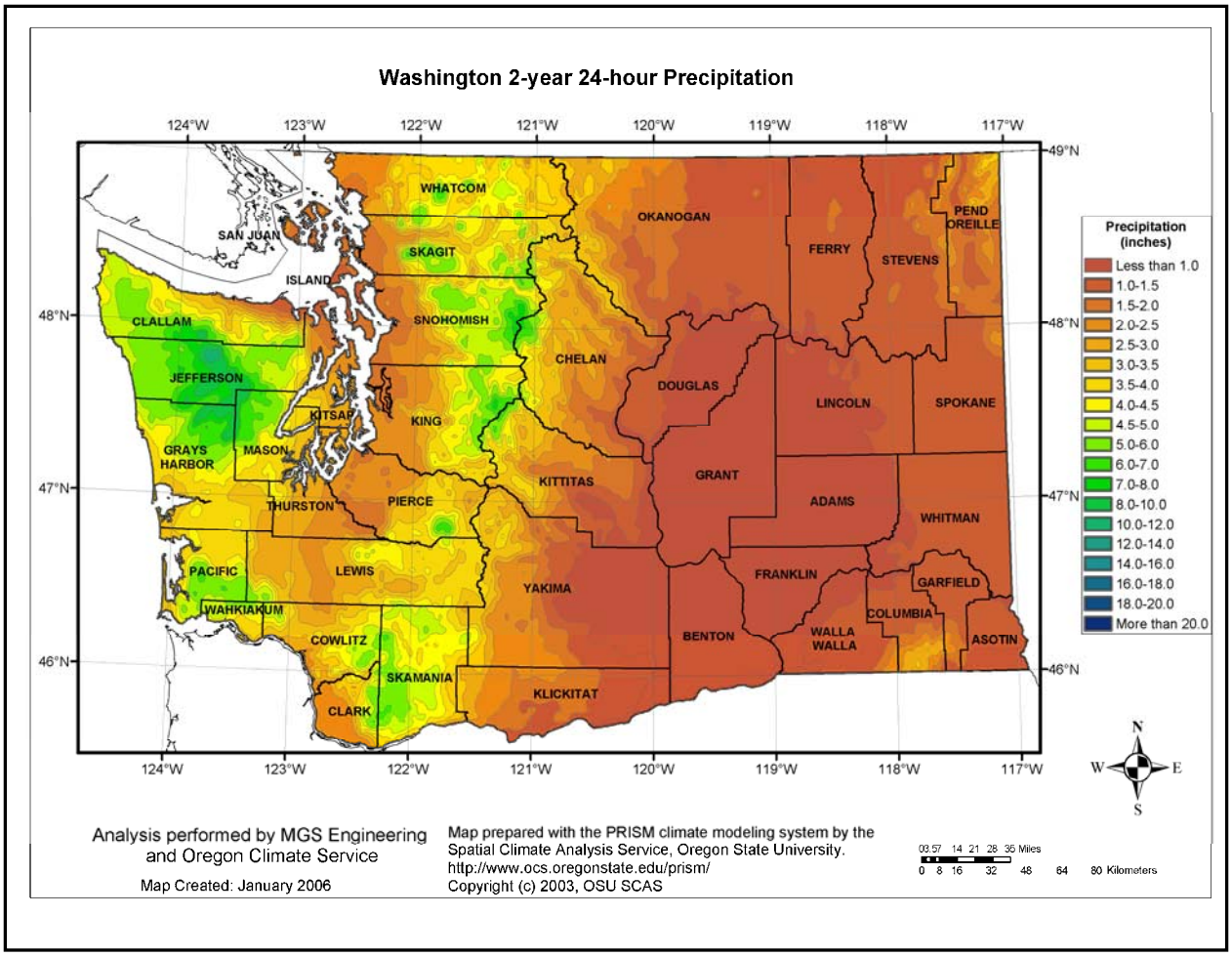
Q_{actual} = 1.56 cfs (sizing is okay)

Washington 24-hour Isopluvial Maps

Statewide update on January 2006

Also available on the Environmental Workbench in ArcView




Washington 2-year 24-hour Precipitation
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
49°N
48°N
47°N
46°N
WHATCOM
SAN JUAN
ISLAND
SKAGIT
SNOHOMISH
CLALLAM
JEFFERSON
KITSAP
KING
GRAYS HARBOR
MASON
THURSTON
PIERCE
PACIFIC
LEWIS
WAHKIAKUM
COWLITZ
SKAMANIA
CLARK
OKANOGAN
CHELAN
DOUGLAS
KITTITAS
YAKIMA
KLICKITAT
FERRY
STEVENS
PEND OREILLE
LINCOLN
SPOKANE
GRANT
ADAMS
WHITMAN
FRANKLIN
GARFIELD
COLUMBIA
BENTON
WALLA WALLA
ASOTIN
Precipitation (inches)
Less than 1.0
1.0-1.5
1.5-2.0
2.0-2.5
2.5-3.0
3.0-3.5
3.5-4.0
4.0-4.5
4.5-5.0
5.0-6.0
6.0-7.0
7.0-8.0
8.0-10.0
10.0-12.0
12.0-14.0
14.0-16.0
16.0-18.0
18.0-20.0
More than 20.0
N
W
E
S
0 8 16 32 48 64 80 Kilometers
0 3.5 7 14 21 28 35 Miles
Analysis performed by MGS Engineering and Oregon Climate Service
Map Created: January 2006
Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
http://www.ocs.oregonstate.edu/prism/
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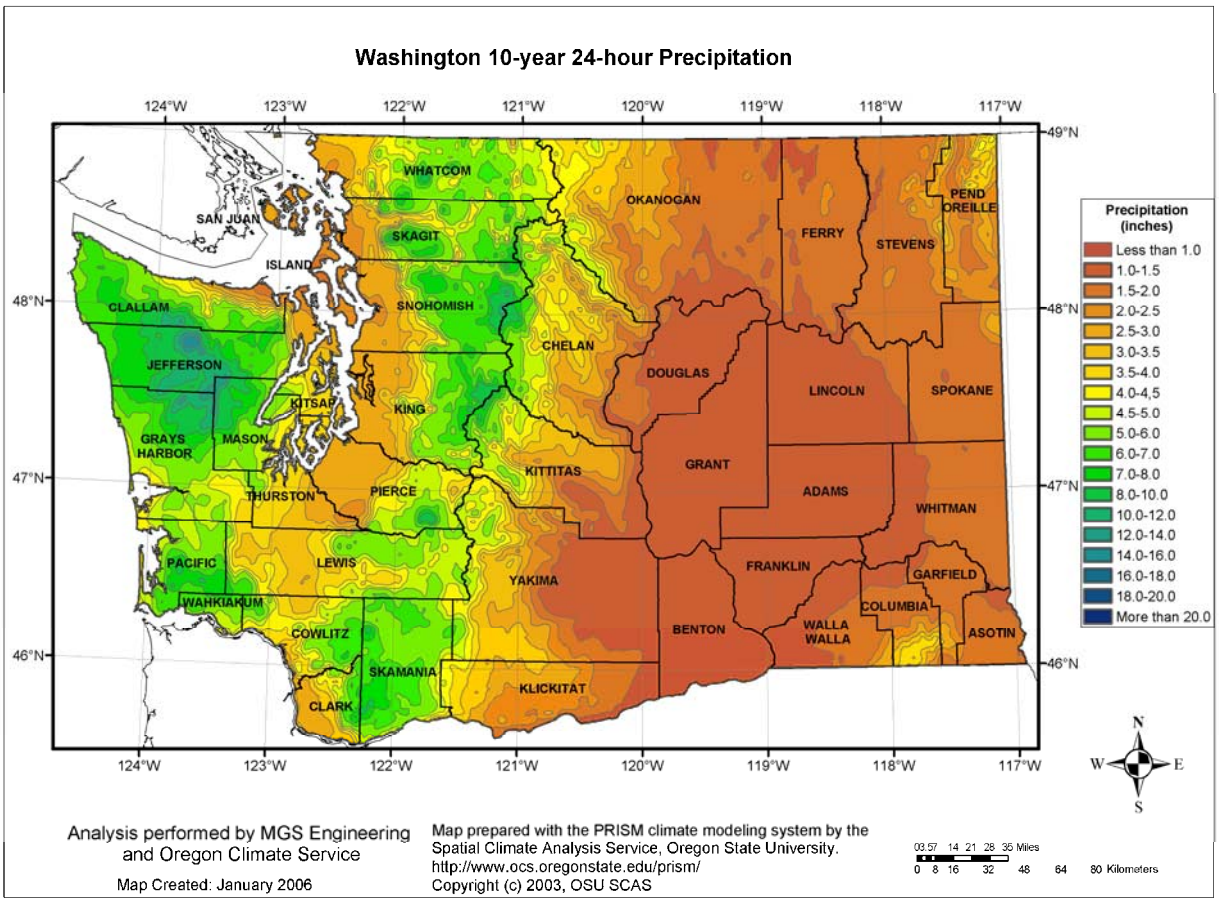
Washington 10-year 24-hour Precipitation
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
49°N
48°N
47°N
46°N
WHATCOM
SAN JUAN
ISLAND
SKAGIT
OKANOGAN
FERRY
PEND OREILLE
STEVENS
CLALLAM
SNOHOMISH
CHELAN
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LINCOLN
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JEFFERSON
KITSAP
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GRAYS HARBOR
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GARFIELD
WAHKIAKUM
COLUMBIA
COWLITZ
BENTON
WALLA WALLA
ASOTIN
SKAMANIA
KLICKITAT
CLARK
Precipitation (inches)
Less than 1.0
1.0-1.5
1.5-2.0
2.0-2.5
2.5-3.0
3.0-3.5
3.5-4.0
4.0-4,5
4.5-5.0
5.0-6.0
6.0-7.0
7.0-8.0
8.0-10.0
10.0-12.0
12.0-14.0
14.0-16.0
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More than 20.0
N
W
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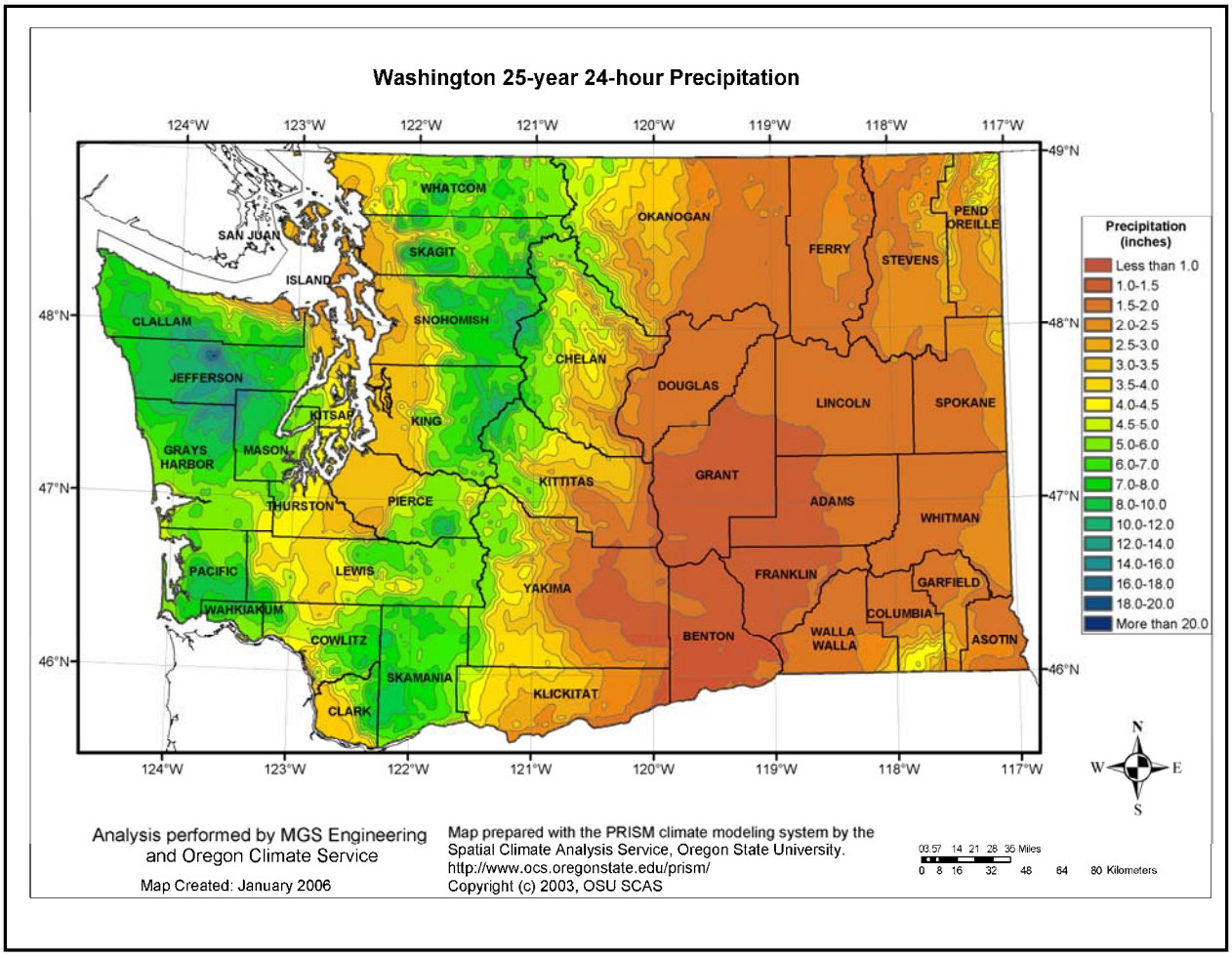
Washington 25-year 24-hour Precipitation
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
49°N
48°N
47°N
46°N
WHATCOM
SAN JUAN
ISLAND
SKAGIT
SNOHOMISH
CLALLAM
JEFFERSON
KITSAP
KING
GRAYS HARBOR
MASON
THURSTON
PIERCE
PACIFIC
LEWIS
WAHKIAKUM
COWLITZ
SKAMANIA
CLARK
OKANOGAN
CHELAN
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YAKIMA
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SPOKANE
GRANT
ADAMS
WHITMAN
FRANKLIN
GARFIELD
COLUMBIA
BENTON
WALLA WALLA
ASOTIN
KLICKITAT
Precipitation (inches)
Less than 1.0
1.0-1.5
1.5-2.0
2.0-2.5
2.5-3.0
3.0-3.5
3.5-4.0
4.0-4.5
4.5-5.0
5.0-6.0
6.0-7.0
7.0-8.0
8.0-10.0
10.0-12.0
12.0-14.0
14.0-16.0
16.0-18.0
18.0-20.0
More than 20.0
N
W
E
S
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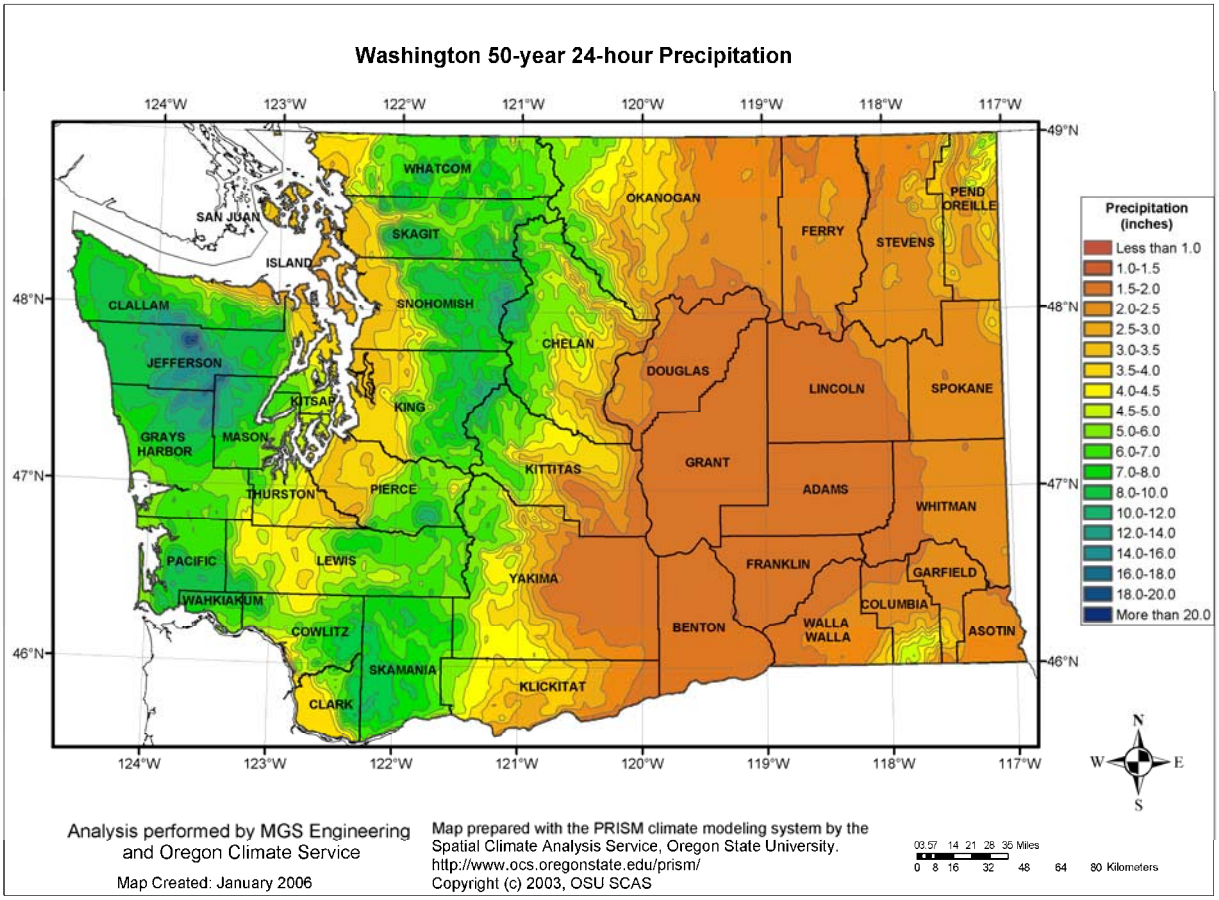
Copyright (c) 2003, OSU SCAS
0 3.5 7 14 21 28 35 Miles
0 8 16 32 48 64 80 Kilometers


Washington 50-year 24-hour Precipitation
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
49°N
48°N
47°N
46°N
WHATCOM
SAN JUAN
SKAGIT
ISLAND
SNOHOMISH
CLALLAM
JEFFERSON
KITSAP
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GRAYS HARBOR
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WHITMAN
YAKIMA
FRANKLIN
GARFIELD
COLUMBIA
BENTON
WALLA WALLA
ASOTIN
KLICKITAT
Precipitation (inches)
Less than 1.0
1.0-1.5
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7.0-8.0
8.0-10.0
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16.0-18.0
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N
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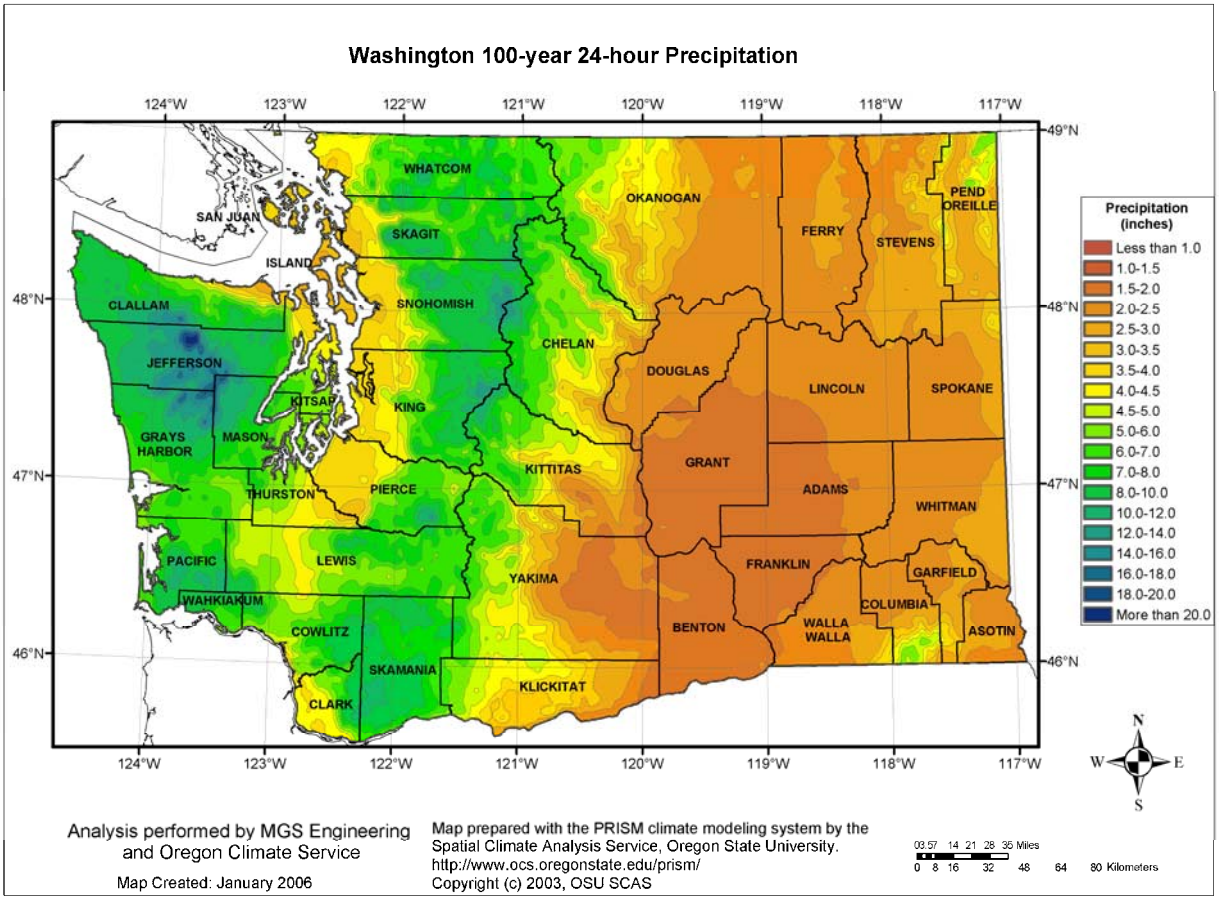
0 8 16 32 48 64 80 Kilometers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