BOTHELL
SURFACE WATER DESIGN MANUAL

City of Bothell
Public Works Department

2019

Prepared by
Parametrix

The City of Bothell has revised Chapters 1 and 2 and select forms from the King County *Surface Water Design Manual*; which are presented here with edits indicated in boxed text and removals indicated with ~~strikethrough~~ text. For Chapters 3 through 6, appendices, and references listed below, the City directly adopts the corresponding chapters, appendices, and references of the 2016 King County *Surface Water Design Manual.* For all definitions, refer to the *Bothell Design and Construction Standards*.

The City also directly adopts the latest version of the King County *Stormwater Pollution Prevention Manual – Best Management Practices for Commercial, Multi-Family and Residential Properties*, prepared by the King County Department of Natural Resources and Parks, Water and Land Resources Division, Stormwater Services Section, including supporting documentation referenced or incorporated in the manual, describing best management practices and procedures for eliminating or reducing surface, storm, and ground water contamination from existing facilities and existing and new activities not covered by the Surface Water Design Manual.

INTRODUCTION

The City of Bothell's surface water features are a significant part of our natural beauty and rich heritage. Spawning salmon, meandering rivers, and clean water are important natural resources which must be managed wisely to protect their values.

As development of the City's landscape occurs and changes the quantity and quality of surface and storm water runoff, great care must be taken to minimize the impacts of these changes to natural resources, public safety, and property. This necessitates the provision of surface and storm water management systems that not only mitigate such impacts but must comply with the City's National Pollutant Discharge Elimination System (NPDES) General Municipal Stormwater Permit issued by the Washington State Department of Ecology pursuant to the Clean Water Act.

This manual contains the requirements and standards for designing such surface and storm water management systems in the City of Bothell. As part of the permit approval process for certain types of permits for proposed development projects, the City of Bothell requires the construction of surface and storm water management systems to mitigate the impacts of new development and redevelopment on natural and existing man-made drainage systems.

This manual regulates proposed projects through a mixture of requirements, performance standards, and design standards. These requirements and standards are primarily enforced by the City, which is responsible for the drainage review and approval of engineering plans and inspection of development projects during construction. This responsibility and how it is carried out is governed not only by City of Bothell Municipal Code but to some extent by the City's NPDES municipal stormwater permit, which contains specific requirements for drainage review and inspection of development projects. In addition to the Surface Water Design Manual, the City is also responsible for enforcement of all other City of Bothell regulations governing development.

The Surface Water Management Group (SWM) of the City of Bothell Public Works Department is responsible for developing the requirements and standards, which includes publishing, updating and providing the technical support for the Surface Water Design Manual. SWM also reviews requests for experimental design adjustments and blanket adjustments as described in Chapter 1, Section 1.4.

The chapters of this manual are organized as follows:

Chapter 1 - DRAINAGE REVIEW AND REQUIREMENTS

Describes the basic drainage requirements that implement City-adopted surface water runoff policies and explains how these requirements are applied to proposed projects through the drainage review process.

Chapter 2 - DRAINAGE PLAN SUBMITTAL

Describes the requirements and specifications for submittal of design plans for drainage review, including report and plan formats, and scopes.

Chapter 3 - HYDROLOGIC ANALYSIS AND DESIGN

Presents the acceptable methods of hydrologic analysis used to estimate runoff and design flow control, conveyance, and water quality facilities.

Chapter 4 - CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Presents the acceptable methods, details, and criteria for analysis and design of conveyance systems.

Chapter 5 - FLOW CONTROL DESIGN

Presents the acceptable methods, details, and criteria for analysis and design of flow control facilities.

Chapter 6 - WATER QUALITY DESIGN

Presents the acceptable methods, details, and criteria for analysis and design of water quality facilities.

DEFINITIONS - A comprehensive list of the words, terms, and abbreviations accompanied bytheir meaning as applied in this manual. Refer to the *Bothell Design and Construction Standards* for all definitions.

APPENDIX A - MAINTENANCE REQUIREMENTS FOR FLOW CONTROL, CONVEYANCE, AND WQ FACILITIES

Contains the thresholds and standards for maintenance of all flow control facilities and BMPs, conveyance systems, and water quality facilities required in this manual.

APPENDIX B - MASTER DRAINAGE PLAN OBJECTIVES, CRITERIA AND COMPONENTS AND REVIEW PROCESS

Describes in a general outline, the objectives, criteria, components and review process for Master Drainage Plans prepared for Urban Planned Developments and very large projects.

APPENDIX C - SIMPLIFIED DRAINAGE REQUIREMENTS
(Separate Detached Publication)

Describes, the simplified drainage requirements for smaller projects that qualify for Simplified Drainage Review.

APPENDIX D - CONSTRUCTION STORMWATER POLLUTION PREVENTION STANDARDS
(Separate Detached Publication)

Describes, the required measures to be implemented during construction to prevent discharges of sediment-laden runoff from the project site. It also describes effective management practices for spill control and chemical pollutants used during construction that may be needed to supplement the required erosion and sedimentation control measures.

REFERENCE - Includes materials that are strictly for reference only and have not been adopted by the public rule adopting this manual. The applicant is responsible to ensure that the most current materials are used in preparing a permit application.

CHAPTER 1
DRAINAGE REVIEW AND REQUIREMENTS

BOTHELL, WASHINGTON

SURFACE WATER DESIGN MANUAL

Drainage Review

Projects Requiring Drainage Review

Drainage Review Types and Requirements

Drainage Review Required by Other Agencies

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Adjustment Process

Adjustment Authority

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CHAPTER 1
DRAINAGE REVIEW AND REQUIREMENTS

This chapter describes the drainage review procedures and types, the drainage requirements, and the adjustment procedures necessary to implement surface water runoff policies codified in Chapter 18.04 of the Bothell Municipal Code (BMC). It also provides direction for implementing the more detailed procedures and design criteria found in subsequent chapters of this manual.

Chapter Organization

The information presented in Chapter 1 is organized into four main sections as follows:

- Section 1.1, "Drainage Review"
- Section 1.2, "Core Requirements"
- Section 1.3, "Special Requirements"
- Section 1.4, "Adjustment Process."

Formatting of Chapter Text

The text of Chapter 1 and subsequent chapters has been formatted using the following conventions to aid the user in finding, understanding, and properly applying the thresholds, requirements, and procedures contained in this manual:

- Outline is used to highlight text added by the City of Bothell that supersedes text found in the King County Surface Water Design Manual, which was used as a template for this manual.
- Strikethrough is used to highlight requirements or legal references found in the King County Surface Water Design Manual that are not included as part of this manual.
- **Italic** is used to highlight the following: (a) terms when they are first introduced and defined within the same paragraph; (b) special notes that supplement or clarify thresholds, requirements, and procedures; (c) sentences considered important for purposes of understanding thresholds, requirements, and procedures; and (d) titles of publications.
- **Bold italic** is used to highlight terms considered key to understanding and applying drainage review thresholds, requirements, and procedures. These are called "key terms" and are defined below. This convention applies after the key term is defined and does not necessarily apply to tables and figures.
- **Bold** is used to highlight words and phrases that are not key terms but are considered important to emphasize for purposes of finding and properly applying thresholds, requirements, and procedures.

Key Terms and Definitions

Proper application of the drainage review and requirements in this chapter requires an understanding of key terms and their definitions, as presented in the *Bothell Design and Construction Standards*. All such key terms are highlighted in **bold italic** throughout the manual. Other important terms that are not key terms are defined in the text when they are first introduced. These are highlighted in italic when they are first introduced but are not highlighted throughout the manual.

1.1 DRAINAGE REVIEW

Drainage review is the evaluation by City of Bothell staff of a proposed project's compliance with the drainage requirements of this manual. Drainage review by the City is an integral part of its permit review process for development projects. This section describes when and what type of drainage review is required for a proposed project and how to determine which drainage requirements apply.

The section covers the following topics related to drainage review:

- "Projects Requiring Drainage Review," Section 1.1.1
- "Drainage Review Types and Requirements," Section 1.1.2
- "Drainage Review Required By Other Agencies," Section 1.1.3
- "Drainage Design Beyond Minimum Compliance," Section 1.1.4

Guide to Using Section 1.1

The following steps are recommended for efficient use of Section 1.1:

1. Determine whether your proposed project is subject to the requirements of this manual by seeing if it meets any of the **thresholds for drainage review** specified in Section 1.1.1. Making this determination requires an understanding of the key terms defined at the beginning of this sub-chapter.
2. If drainage review is required per Section 1.1.1, use the flow chart in Figure 1.1.2.A to determine what **type of drainage review** will be conducted by the City. The type of drainage review defines the scope of drainage requirements that will apply to your project as summarized in Table 1.1.2.A.
3. Check the more detailed threshold information in Section 1.1.2 to verify that you have determined the correct type of drainage review.
4. After verifying the type of drainage review, use the information in Section 1.1.2 to determine which **core requirements** (found in Section 1.2) and which **special requirements** (found in Section 1.3) must be evaluated for compliance by your project. To determine how to comply with each applicable core and special requirement, see the more detailed information on these requirements contained in Sections 1.2 and 1.3 of this sub-chapter.

Note: For Steps 2 through 4, it is recommended that you arrange a predesign meeting with the City permit review staff to confirm the type of drainage review and scope of drainage requirements that apply to your proposed project.

1.1.1 PROJECTS REQUIRING DRAINAGE REVIEW

Drainage review is required for any proposed project (except those proposing only **maintenance**) that is subject to a City **development** permit or approval, including but not limited to those listed at right, AND that meets any one of the following conditions:

1. The project adds or will result in 2,000 square feet[5] or more of ***new impervious surface***, ***replaced impervious surface***, or ***new*** plus ***replaced impervious surface***, OR
2. The project proposes 7,000 square feet[1] or more of ***land disturbing activity***, OR
3. The project proposes to ***construct or modify*** a drainage pipe/ditch that is 12 inches or more in size/depth, or receives storm water runoff or surface water from a drainage pipe/ditch that is 12 inches or more in size/depth, OR
4. The project contains or is adjacent to a ***flood hazard area***, OR
5. The project is located within a ***Critical Drainage Area.***[2] OR
6. The project is a ***redevelopment project*** proposing $100,000[3] or more of improvements to an existing ***high-use site***.

If drainage review is required for the proposed project, the type of drainage review must be determined based on project and site characteristics as described in Section 1.1.2. The type of drainage review defines the scope of drainage requirements that must be evaluated for compliance with this manual.

Permits and Approvals
City of Bothell Capital Project
Building Permit
Conditional Use Permit
Grading Permit
Land Use Plat Permit
Land Use Short Plat Permit
Right-of-Way Permit
Shoreline Substantial Development*

**Note: If the proposed project will require subsequent permits subject to drainage review, then the City may allow the drainage review to be deferred until application for the later permits.*

1.1.2 DRAINAGE REVIEW TYPES AND REQUIREMENTS

For most projects resulting in 2,000 square feet or more of ***new*** plus ***replaced impervious surface***, the full range of core and special requirements contained in Sections 1.2 and 1.3 must be evaluated for compliance through the drainage review process. However, for some types of projects, the scope of requirements applied is narrowed to allow more efficient, customized review. Each of the following drainage review types tailors the review process and application of drainage requirements to a project's size, location, type of development, and anticipated impacts to the local and regional surface water system:

[1] The thresholds for ***new impervious surface, replaced impervious surface,*** and ***land disturbing activity*** shall be applied by ***project site*** and in accordance with the definitions of these surfaces and activities.

[2] See ~~Reference Section 3 for a list~~ Section 1.3.1 for discussion of ***Critical Drainage Areas***.

[3] This is the "project valuation" as declared on the permit application submitted to the City. The dollar amount of this threshold is considered to be as of January 8, 2001 and may be adjusted on an annual basis using the local consumer price index (CPI). *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*

- Simplified Drainage Review, Section 1.1.2.1
- Targeted Drainage Review, Section 1.1.2.2
- ~~Directed Drainage Review, Section 1.1.2.3 (p. 1-21)~~
  (Not used by the City of Bothell. These projects fall under a Full Drainage Review.)
- Full Drainage Review, Section 1.1.2.4
- ~~Large Project Drainage Review, Section 1.1.2.5 (p. 1-23).~~
  (Not used by the City of Bothell. These projects fall under a Full Drainage Review.)

Each project requires only one of the above drainage review types, with the single exception that a project that qualifies for Simplified Drainage Review may also require one or more categories of Targeted Drainage Review. Figure 1.1.2.A can be used to determine which drainage review type is required. However, this may entail consulting the more detailed thresholds for each review type specified in the above-referenced sections.

Table 1.1.2.A can be used to quickly identify which requirements are applied in each type of drainage review. The applicant must evaluate the requirements "checked" for a particular drainage review type to determine what is necessary for compliance.

FIGURE 1.1.2.A FLOW CHART FOR DETERMINING TYPE OF DRAINAGE REVIEW REQUIRED

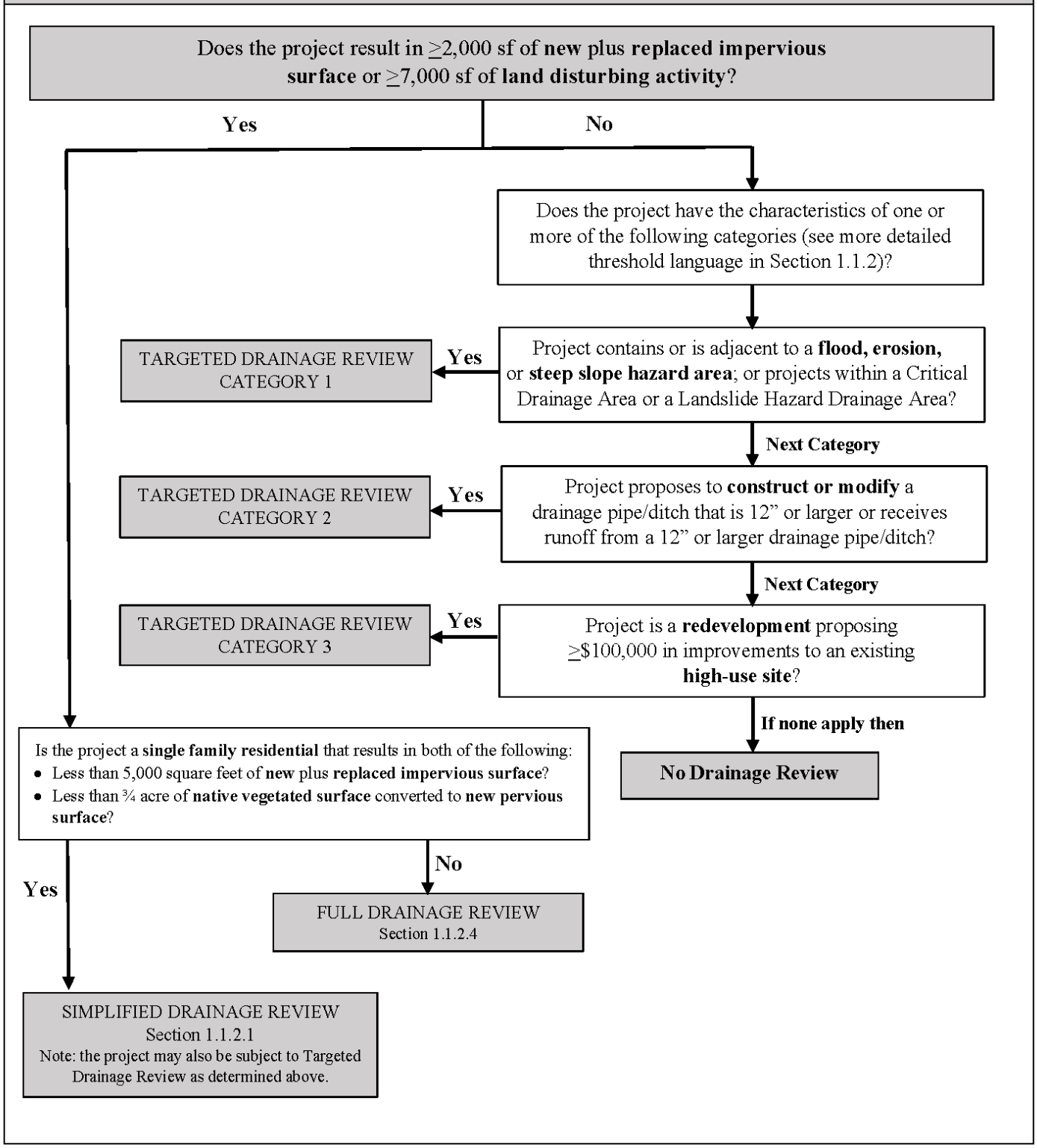


TABLE 1.1.2.A REQUIREMENTS APPLIED UNDER EACH DRAINAGE REVIEW TYPE

REQUIREMENTS TRIGGERED FOR EACH DRAINAGE REVIEW TYPE	DRAINAGE REVIEW TYPE				
	Simplified	Targeted (3)			Full
		Category 1	Category 2	Category 3	
Simplified Drainage Requirements	SEE NOTE 4				
CORE 1. Discharge at Natural Location	✓(4)	✱(2)	✓		✓
CORE 2. Offsite Analysis	✓(4)	✱(2)	✓(3)		✓(3)
CORE 3. Flow Control	✓(4)	✱(2)			✓(3)
CORE 4. Conveyance System	✓(4)	✱(2)	✓		✓
CORE 5. Erosion & Sediment Control	✓(4)	✓	✓	✓	✓
CORE 6. Maintenance & Operations	✓(4)	✱(2)	✓	✓	✓
CORE 7. Financial Guarantees &	✓(4)	✱(2)	✓(3)	✓(3)	✓(3)
CORE 8. Water Quality	✓(4)	✱(2)			✓(3)
CORE 9. Flow Control BMPs	✓(4)				✓
SPECIAL 1. **Other Adopted Requirements**	✓(4)	✓(3)			✓(3)
SPECIAL 2. **Flood Hazard Area Delineation**	✓(4)	✓(3)			✓(3)
SPECIAL 3. **Flood Protection Facilities**	✓(4)	✓(3)			✓(3)
SPECIAL 4. **Source Control**	✓(4)	✓(3)	✓(3)	✓(3)	✓(3)
SPECIAL 5. **Oil Control**	✓(4)			✓(3)	✓(3)

(1) Category 3 projects installing oil controls that construct or modify a 12-inch pipe/ditch are also Category 2 projects.
(2) May be applied by the City based on project or ***site***-specific conditions. Documentation of compliance required.
(3) These requirements have exemptions or thresholds that may preclude or limit their application to a specific project.
(4) A proposed project subject to Simplified Drainage Review that complies with the Simplified drainage requirements detailed in Appendix C is presumed to comply with all the core and special requirements in Sections 1.2 and 1.3 except those requirements that would apply to the project if it is subject to Targeted Drainage Review as specified in Section 1.1.2.2.

1.1.2.1 SIMPLIFIED DRAINAGE REVIEW

Simplified Drainage Review is for small residential building projects~~, clearing projects or small ***agricultural projects***~~ that meet the threshold requirements below. The core and special requirements applied under Full Drainage Review are replaced with simplified drainage requirements that can be applied by a non-engineer. These requirements include simple stormwater dispersion, infiltration, and ***site*** design techniques called flow control Best Management Practices (BMPs), which provide the necessary mitigation of flow and water quality impacts for small projects. Also included are simple measures for erosion and sediment control (ESC). This simplified form of drainage review acknowledges that drainage impacts for many small project proposals can be effectively mitigated without construction of costly flow control and water quality facilities.

The Simplified Drainage Review process minimizes the time and effort required to design, submit, review, and approve drainage facilities for these proposals. In most cases, the requirements can be met with submittals prepared by contractors, architects, or homeowners without the involvement of a ***civil engineer***.

Note: some projects subject to Simplified Drainage Review may also require Targeted Drainage Review if they meet any of the threshold criteria in Section 1.1.2.2.

Threshold

THRESHOLD

Simplified Drainage Review is required for any ***single family residential project*** ~~or ***agricultural project***~~ that will result in 2,000 square feet[4] or more of ***new impervious surface***, ***replaced impervious surface***, or ***new*** plus ***replaced impervious surface***, or 7,000 square feet[8] or more of ***land disturbing activity***, AND that meets all of the following criteria:

1. The project will result in less than 5,000 square feet of new plus replaced pollution generating impervious surface;

2. The project will result in less than ¾ acre of new pollution generating pervious surfaces;

3. The project will result in less than 5,000 square feet of new plus replaced impervious surface; AND

4. The project will result in less than ¾ acre of new pervious surface.

~~5. The project meets the Basic Exemption from flow control in Core Requirement #3. Note the Basic Exemption thresholds are applied by project site.~~

~~6. For projects inside the Urban Growth Area on predominately till soils:~~

~~7. The project results in no more than 7,947 square feet of target impervious surfaces as defined below AND proposed pervious area is equal to or less than 14,941 – 1.88 x (total target impervious surfaces).~~

~~8. For projects inside the Urban Growth Area on predominately outwash soils:~~

~~9. The project results in no more than 6,872 square feet of target impervious surfaces as defined below AND proposed pervious area is equal to or less than 20,343 – 2.96 x (total target impervious surfaces).~~

~~10. For outside the Urban Growth Area on predominately till soils:~~

~~11. The project results in no more than 5,074 square feet of target impervious surfaces as defined below AND proposed pervious area is equal to or less than 11,570 – 2.28 x (total target impervious surfaces).~~

~~12. For outside the Urban Growth Area on predominately outwash soils:~~

~~13. The project results in no more than 4,000 square feet of target impervious surfaces as defined below AND proposed pervious area is equal to or less than 10,720 – 2.68 x (total target impervious surfaces).~~

~~14. For Agricultural Projects:~~

[4] The thresholds of 2,000 and 7,000 square feet shall be applied by project site. All other thresholds specified in terms of square feet of impervious or pervious surface shall be applied by threshold discharge area and in accordance with the definitions of these surfaces in Section 1.1. Note: the calculation of total impervious surface added on after January 8, 2001 may exclude any such added impervious surface that is confirmed by the City engineering staff to be already mitigated by a City-approved and inspected flow control facility or BMP.

~~15. The project is an agricultural project that qualifies for "Impervious Surface Percentage Exemption For Agricultural Projects" as cited in Core Requirement 3 (Flow Control Facilities).~~

~~Determination of target impervious surface~~

- ~~If the project is a New Development project,~~

  ~~then target impervious surfaces include new plus proposed replaced impervious surface plus existing impervious surface added on or after January 8, 2001.~~

- ~~If the project is a Redevelopment project where~~
  - ~~New impervious surface is less than 5,000 square feet or~~
  - ~~Valuation of improvements is less than 50% of the assessed value of the existing site improvements,~~

  ~~then target impervious surfaces include new impervious surface plus existing impervious added on or after January 8, 2001.~~

- ~~If the project is a Redevelopment project where~~
  - ~~New impervious surface is greater than or equal to 5,000 square feet and~~
  - ~~Valuation of improvements is greater than or equal to 50% of the assessed value of the existing site improvements,~~

  ~~then target impervious surfaces include new plus proposed replaced impervious surface plus existing impervious surface added on or after January 8, 2001.~~

~~Note: for the purposes applying this threshold to a proposed single family residential subdivision (i.e., plat or short plat project), the impervious surface coverage assumed on each created lot shall be 4,000 square feet (8,000 square feet if the site is zoned as RA) or the maximum allowed by KCC 21A.12.030, whichever is less. A lower impervious surface coverage may be assumed for any lot in which the lower impervious surface coverage is set as the maximum through a declaration of covenant recorded for the lot. Also, the new pervious surface assumed on each created lot shall be the entire lot area, except the assumed impervious portion and any portion in which native conditions are preserved by a clearing limit per KCC 16.82, a covenant or easement recorded for the lot, or a tract dedicated by the proposed subdivision.~~

Scope of Requirements

REQMT

IF Simplified Drainage Review is required, THEN the proposed project must comply with the simplified project submittal and drainage design requirements detailed in *Simplified Drainage Requirements* adopted as Appendix C to this manual. These requirements include simplified BMPs/measures for flow control and erosion and sediment control.

Presumption of Compliance with Core and Special Requirements

The simplified drainage requirements applied under Simplified Drainage Review are considered sufficient to meet the overall intent of the core and special requirements in Sections 1.2 and 1.3, except under certain conditions when a proposed project has characteristics that trigger Targeted Drainage Review (see the threshold for Targeted Drainage Review in Section 1.1.2.2) and may require the involvement of a ***civil engineer***. Therefore, any proposed project that is subject to Simplified Drainage Review as determined above and complies with the Simplified drainage requirements detailed in Appendix C is presumed to comply with all the core and special requirements in Sections 1.2 and 1.3 **except** those requirements that would apply to the project if it is subject to Targeted Drainage Review as specified in Section 1.1.2.2.

1.1.2.2 TARGETED DRAINAGE REVIEW

Targeted Drainage Review (TDR) is an abbreviated evaluation by the City permit review staff of a proposed project's compliance with selected core and special requirements. Projects subject to this type of drainage review are typically Simplified Drainage Review proposals or other small projects that have ***site***-specific or project-specific drainage concerns that must be addressed by a ***civil engineer*** or the City engineering review staff. Under Targeted Drainage Review, engineering costs associated with drainage design and review are kept to a minimum because the review includes only those requirements that would apply to the particular project.

Threshold

THRESHOLD

Targeted Drainage Review is required for any proposed project that is subject to drainage review as determined in Section 1.1.1, but is not subject to Directed, Full or Large Project Drainage Review as determined in Sections 1.1.2.3, 1.1.2.4 and 1.1.2.5, AND that has the characteristics of one or more of the following project categories:

- **TDR Project Category #1:** Projects that contain or are adjacent to a **flood hazard area**, **erosion hazard area**, or **steep slope hazard area**; projects located within a **Critical Drainage Area** or **Landslide Hazard Area**. Note: at the discretion of *the City*, this category may also include any project in Simplified Drainage Review that has a design or **site**-specific issue that must be addressed by a **civil engineer**.
- **TDR Project Category #2:** Projects that propose to ***construct or modify*** a drainage pipe/ditch that is 12 inches or more in size/depth or receives surface and storm water runoff from a drainage pipe/ditch that is 12 inches or more in size/depth.
- **TDR Project Category #3:** ***Redevelopment projects*** that propose $100,000 or more of improvements to an existing ***high-use site***.

Scope of Requirements

REQMT

IF Targeted Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the selected core and special requirements corresponding to the project category or categories that best match the proposed project. The project categories and applicable requirements for each are described below and summarized in Table 1.1.2.A.

Note: If the proposed project has the characteristics of more than one project category, the requirements of each applicable category shall apply.

Compliance with these requirements requires the submittal of engineering plans and calculations stamped by a ***civil engineer***, unless deemed unnecessary by the City. The engineer need only demonstrate compliance with those core and special requirements that have been predetermined to be applicable based on specific project characteristics as detailed below. The procedures and requirements for submitting engineering plans and calculations can be found in Section 2.3.

TDR Project Category #1

REQUIREMENTS

This category includes projects that are too small to trigger application of most core requirements, but may be subject to ***site***-specific floodplain or drainage requirements related to certain critical areas, or other area-specific drainage requirements adopted by the City. Such projects primarily include ***single family residential projects*** and ***agricultural projects*** in Simplified Drainage Review.

IF the proposed project meets the characteristics of TDR Project Category #1, THEN the applicant must demonstrate that the project complies with the following five requirements:

- Core Requirement #5: Construction Stormwater Pollution Prevention, Section 1.2.5
- Special Requirement #1: Other Adopted Area-Specific Requirements, Section 1.3.1
- Special Requirement #2: Floodplain/Floodway Analysis, Section 1.3.2
- Special Requirement #3: Flood Protection Facilities, Section 1.3.3
- Special Requirement #4: Source Control, Section 1.3.4

In addition, the City **may require** the applicant to demonstrate compliance with any one or more of the **remaining seven core requirements** in Section 1.2 based on project or ***site***-specific conditions. For example, if the proposed project discharges to an ***erosion*** or ***steep slope hazard area***, the City may require compliance with "Core Requirement #1: Discharge at the Natural Location" (Section 1.2.1). This may in turn require compliance with "Core Requirement #2: Offsite Analysis" (Section 1.2.2) if a tightline is required by Core Requirement #1. If a tightline is found to be infeasible, the City may instead require a flow control facility per "Core Requirement #3: Flow Control" (Section 1.2.3). If a tightline is feasible, "Core Requirement #4: Conveyance System" (Section 1.2.4) would be required to ensure proper size and design. Any required flow control facility or tightline system may also trigger compliance with "Core Requirement #6: Maintenance and Operations" (Section 1.2.6), "Core Requirement #7: Financial Guarantees and Liability" (Section 1.2.7), and possibly "Core Requirement #8, Water Quality" (Section 1.2.8) if runoff from ***pollution-generating impervious surfaces*** is collected.

The applicant may also need to address compliance with any applicable critical areas requirements in BMC 14.04 as determined by the City.

TDR Project Category #2

This category is intended to apply selected core and special requirements to those projects that propose to ***construct or modify*** a drainage system of specified size, but are not adding sufficient impervious surface to trigger Full Drainage Review.

REQUIREMENTS

IF the proposed project meets the characteristics of TDR Project Category #2, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #1: Discharge at the Natural Location, Section 1.2.1
- Core Requirement #2: Offsite Analysis, Section 1.2.2
- Core Requirement #4: Conveyance System, Section 1.2.4
- Core Requirement #5: Construction Stormwater Pollution Prevention, Section 1.2.5
- Core Requirement #6: Maintenance and Operations, Section 1.2.6
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7
- Special Requirement #4: Source Control, Section 1.3.4.

TDR Project Category #3

REQMTS

This category is intended to improve water quality by applying source control and oil control requirements to ***redevelopment projects*** located on the most intensively used ***sites*** developed prior to current water quality requirements. These are referred to as ***high-use sites***.

IF the proposed project meets the characteristics of TDR Project Category #3, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #5: Construction Stormwater Pollution Prevention, Section 1.2.5
- Core Requirement #6: Maintenance and Operations, Section 1.2.6
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7
- Special Requirement #4: Source Control, Section 1.3.4
- Special Requirement #5: Oil Control, Section 1.3.5.

*Note: In some cases, the City may determine that application of these requirements does not require submittal of engineering plans and calculations stamped by a **civil engineer**. For example, if catch basin inserts are proposed to meet oil control requirements, engineered plans and calculations may not be necessary. A plot plan showing catch basin locations may suffice.*

1.1.2.3 DIRECTED DRAINAGE REVIEW

The King County Directed Drainage Review is not used by the City of Bothell. These projects fall under a Full Drainage Review.

1.1.2.4 FULL DRAINAGE REVIEW

Full Drainage Review is the evaluation by City staff of a proposed project's compliance with the full range of core and special requirements in this chapter. This review addresses the impacts associated with changing land cover on typical ***sites***.

THRESHOLD

Threshold

Full Drainage Review is required for any proposed project, including a ***redevelopment project***, that is subject to drainage review as determined in Section 1.1.1, OR that meets one or more of the following criteria:

- The project will result in 2,000 square feet[5] or more of ***new impervious surface***, ***replaced impervious surface***, or ***new*** plus ***replaced impervious surface*** but is not subject to Simplified Drainage Review as determined in Section 1.1.2.1, OR
- The project will result in 7,000 square feet or more of ***land disturbing activity*** but is not subject to Simplified Drainage Review as determined in Section 1.1.2.1.

REQMT

Scope of Requirements

IF Full Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- All nine core requirements in Section 1.2
- All five special requirements in Section 1.3

Engineering plans and calculations stamped by a ***civil engineer*** must be submitted to demonstrate compliance with these requirements. The procedures and requirements for submittal of engineering plans and calculations are found in Section 2.3.

[5] The thresholds of 2,000, 5,000, and 7,000 square feet shall be applied by project site.

1.1.2.5 LARGE PROJECT DRAINAGE REVIEW

The King County Large Project Drainage Review is not used by the City of Bothell. These projects fall under a Full Drainage Review.

1.1.3 DRAINAGE REVIEW REQUIRED BY OTHER AGENCIES

Drainage review for a proposed project's impact on surface and storm waters may be addressed by processes or requirements apart from the City of Bothell's. Agencies such as those listed below may require some form of drainage review and impose drainage requirements that are separate from and in addition to the City of Bothell's drainage requirements. The applicant is responsible for coordinating with these agencies and resolving any conflicts in drainage requirements.

Agency	Permit/Approval
King County Department of Public Health	Onsite Sewage Disposal and Well permits
Washington State	Developer/Local Agency Agreement
Department of Transportation	Hydraulic Project Approval
Department of Fish and Wildlife	Short Term Water Quality Modification Approval
Department of Ecology	Dam Safety permit
Department of Natural Resources	NPDES Stormwater permit
United States Army Corps of Engineers	Forest Practices Class IV permit
	Sections 10, 401, and 404 permits

1.1.4 DRAINAGE DESIGN BEYOND MINIMUM COMPLIANCE

This manual presents the City's minimum standards for engineering and design of drainage facilities. While the City believes these standards are appropriate for a wide range of development proposals, compliance solely with these requirements does not relieve the professional engineer submitting designs of his or her responsibility to ensure drainage facilities are engineered to provide adequate protection for natural resources and public and private property.

Compliance with the standards in this manual does not necessarily mitigate all probable and significant environmental impacts to aquatic biota. Fishery resources and other living components of aquatic systems are affected by a complex set of factors. While employing a specific flow control standard may prevent stream channel erosion or instability, other factors affecting fish and other biotic resources (e.g., increases in stream flow velocities) are not directly addressed by this manual. Likewise, some wetlands, including bogs, are adapted to a very constant hydrologic regime. Even the most stringent flow control standard employed by this manual does not prevent increases in runoff volume, which can adversely affect wetland plant communities by increasing the duration and magnitude of water level fluctuations. Thus, compliance with this manual should not be construed as mitigating all probable and significant stormwater impacts to aquatic biota in streams and wetlands; additional mitigation may be required.

In addition, the requirements in this manual target the types of impacts associated with the most typical land development projects occurring in the lowland areas of the City. Applying these requirements to vastly different types of projects, such as rock quarries or dairy farms, or in different climatic situations, such as ski areas, may result in poorer mitigation of impacts. Therefore, different mitigation may be required.

Additional mitigation may also be required to compensate for loss of critical area habitat functions associated with reducing standard buffer widths and clearing restrictions.

1.2 CORE REQUIREMENTS

This section details the following nine core requirements:

- "Core Requirement #1: Discharge at the Natural Location," Section 1.2.1
- "Core Requirement #2: Offsite Analysis," Section 1.2.2
- "Core Requirement #3: Flow Control," Section 1.2.3
- "Core Requirement #4: Conveyance System," Section 1.2.4
- "Core Requirement #5: Construction Stormwater Pollution Prevention," Section 1.2.5
- "Core Requirement #6: Maintenance and Operations," Section 1.2.6
- "Core Requirement #7: Financial Guarantees and Liability," Section 1.2.7
- "Core Requirement #8: Water Quality," Section 1.2.8
- "Core Requirement #9: Flow Control BMPs," Section 1.2.9.

1.2.1 CORE REQUIREMENT #1: DISCHARGE AT THE NATURAL LOCATION

REQUIREMENT

All storm water runoff and surface water from a project must be discharged at the natural location so as not to be diverted onto or away from downstream properties. The manner in which stormwater runoff and surface water are discharged from the ***project site*** must not create a significant adverse impact to downhill properties or drainage facilities (see "Discharge Requirements" below). Drainage facilities as described above means a constructed or engineered feature that collects, conveys, stores, treats, or otherwise manages surface water or stormwater runoff. "Drainage facility" includes, but is not limited to, a constructed or engineered stream, lake, wetland, or closed depression, or a pipe, channel, ditch, gutter, flow control facility, flow control BMP, water quality facility, erosion and sediment control facility, and any other structure and appurtenance that provides for drainage. *Note: Projects that do not discharge all **project site** runoff at the natural location will require an approved adjustment of this requirement (see Section 1.4). The City may waive this adjustment, however, for projects in which only a small portion of the **project site** does not discharge runoff at the natural location and the runoff from that portion is unconcentrated and poses no significant adverse impact to downstream properties.*

Intent: To prevent adverse impacts to downstream properties caused by diversion of flow from one flowpath to another, and to discharge in a manner that does not significantly impact downhill properties or drainage systems. Diversions can cause greater impacts (from greater runoff volumes) than would otherwise occur from new development discharging runoff at the natural location. Diversions can also impact properties that rely on runoff water to replenish wells and ornamental or fish ponds.

❑ DISCHARGE REQUIREMENTS

Proposed projects must comply with the following discharge requirements (1, 2, and 3) as applicable:

1. Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:
   a) IF the 100-year peak discharge[6] is less than or equal to 0.2 cfs under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, THEN the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.

[6] Peak discharges for applying this requirement are determined using the approved runoff model with 15-minute time steps as detailed in Sub-Chapter 3.

b) IF the 100-year peak discharge is less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, THEN the concentrated runoff may be discharged through a dispersal trench or other dispersal system provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.

c) IF the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, or if a significant adverse impact to downhill properties or drainage systems is likely, THEN a conveyance system must be provided to convey the concentrated runoff across the downstream properties to an acceptable discharge point.[7] Drainage easements for this conveyance system must be secured from downstream property owners and recorded prior to engineering plan approval.

2. IF a proposed project, or any ***natural discharge area*** within a project, is located within a ***Landslide Hazard Area*** and drains over the erodible soils of a ***landslide hazard area*** with slopes steeper than 15%, THEN a **tightline system must be provided** through the ***landslide hazard area*** to an acceptable discharge point unless one of the following exceptions applies. The tightline system must comply with the design requirements in Core Requirement #4 and in Section 4.2.2 unless otherwise approved by the City. Drainage easements for this system must be secured from downstream property owners and recorded prior to engineering plan approval.

   Exceptions: A tightline is not required for any ***natural discharge location*** where the City approves an alternative system based on a geotechnical evaluation/recommendation from a licensed geotechnical engineer that considers cumulative impacts on the hazard area under built out conditions AND one of the following conditions can be met:

   a) Less than 2,000 square feet of ***new impervious surface*** will be added within the ***natural discharge area***, OR

   b) The developed conditions runoff from the ***natural discharge area*** is less than 0.1 cfs for the 100- year runoff event and will be infiltrated for runoff events up to and including the 100-year event, OR

   c) The *developed conditions runoff volume*[8] from the ***natural discharge area*** is less than 50% of the existing conditions runoff volume from other areas draining to the location where runoff from the ***natural discharge area*** enters the ***landslide hazard area*** onto slopes steeper than 15%, AND the provisions of Discharge Requirement 1 are met, OR

   d) The City determines that a tightline system is not physically feasible or will create a significant adverse impact based on a soils report by a geotechnical engineer.

3. For projects adjacent to or containing a ***landslide***, ***steep slope***, or ***erosion hazard area***, the applicant must demonstrate that onsite drainage facilities and/or flow control BMPs will not create a significant adverse impact to downhill properties or drainage systems.

1.2.2 CORE REQUIREMENT #2: OFFSITE ANALYSIS

REQMT

All proposed projects must submit an offsite analysis report that assesses potential offsite drainage and water quality impacts associated with development of the ***project site,*** and that proposes appropriate mitigation of those impacts. The initial permit submittal shall include, at minimum, a **Level 1 downstream analysis** as described in Section 1.2.2.1 below. If impacts are identified, the proposed projects shall meet any applicable

[7] Acceptable discharge point means an enclosed drainage system (i.e., pipe system, culvert, or tightline) or open drainage feature (e.g., ditch, channel, swale, stream, river, pond, lake, or wetland) where concentrated runoff can be discharged without creating a significant adverse impact.

[8] For the purposes of applying this exception, the developed conditions runoff volume is the average annual runoff volume as computed per Sub-Chapter 3. The analysis is performed using the entire period of record. The total volume is divided by the number of full water years being analyzed to determine the annual average runoff volume. Any areas assumed not to be cleared when computing the developed conditions runoff volume must be set aside in an open space tract or covenant in order for the proposed project to qualify for this exception. Preservation of existing forested areas in Landslide Hazard Areas is encouraged.

problem-specific requirements specified in Section 1.2.2.2 for mitigation of impacts to drainage problems and Section 1.2.2.3 for mitigation of impacts to water quality problems.

Intent: To identify and evaluate offsite flooding, erosion, and water quality problems that may be created or aggravated by the proposed project, and to ensure appropriate measures are provided for preventing creation or aggravation of those problems. In addition, this requirement is intended to ensure appropriate provisions are made, as needed, to mitigate other identified impacts associated with the quantity and quality of surface and storm water runoff from the ***project site*** (e.g., impacts to the hydrology of a wetland).

The primary component of an offsite analysis report is the **downstream analysis**, which examines the drainage system within one-quarter mile downstream of the ***project site*** or farther as described in Section

1.2.2.1 below. It is intended to identify existing or potential/predictable downstream flooding, erosion, and water quality problems so that appropriate mitigation, as specified in Sections 1.2.2.2 and 1.2.2.3, can be provided to prevent aggravation of these problems. A secondary component of the offsite analysis report is an **evaluation of the upstream drainage system** to verify and document that significant flooding and erosion impacts will not occur as a result of the proposed project. The evaluation must extend upstream to a point where any backwater effects created bythe project cease.

❑ EXEMPTION FROM CORE REQUIREMENT #2

With the exception of:

- Projects that trigger Core Requirement #3 (Flow Control Facilities) which must at minimum perform offsite analysis sufficient to identify and address "Downstream Drainage Problems Requiring Special Attention (Section 1.2.2.1.1), Problem Type 4 (Potential Impacts to Wetland Hydrology problem)," and
- Projects that trigger Core Requirement # 8 (Water Quality Facilities) which must at minimum perform offsite analysis sufficient to identify and address "Downstream Water Quality Problems Requiring Special Attention (Section 1.2.2.1.2),"

a proposed project is exempt from Core Requirement #2 if any one of the following is true:

1. The City determines there is sufficient information for them to conclude that the project will not have a significant adverse impact on the downstream and/or upstream drainage system, OR
2. The project adds less than 2,000 square feet of ***new impervious surface***, AND less than ¾ acre of ***new pervious surface***, AND does not ***construct or modify*** a drainage pipe/ditch that is 12 inches or more in size/depth or that receives runoff from a drainage pipe/ditch that is 12 inches or more in size/depth, AND does not contain or lie adjacent to a ***landslide***, ***steep slope***, or ***erosion hazard area***, OR
3. The 100-year peak discharge from the project site is increased by no more than 0.1 cfs (modeled using 1-hour time steps) or no more than 0.15 cfs (modeled using 15-minute time steps, and the project does not change the ~~rate, volume, duration, or~~ location of discharges to and from the project site (e.g., where existing impervious surface is replaced with other impervious surface having similar runoff-generating characteristics, or where pipe/ditch modifications do not change existing discharge characteristics).

1.2.2.1 DOWNSTREAM ANALYSIS

The level of downstream analysis required depends on specific ***site*** and downstream conditions. Each project submittal must include at least a Level 1 downstream analysis. Upon review of the Level 1 analysis, the City may require a Level 2 or Level 3 analysis. If conditions warrant, additional, more detailed analysis may be required.

Projects draining to Little Swamp Creek are considered by the City to have a Severe Flooding Problem (Type 3), requiring Level 3 flow control.

The **Level 1 downstream analysis** is a qualitative survey of each downstream system and is the first step in identifying flooding problems, erosion problems, or potential impacts to wetland hydrology problems as described below under "Downstream Drainage Problems Requiring Special Attention." The Level 1 analysis also identifies water quality problems as described below under "Downstream Water Quality Problems Requiring Special Attention." Each Level 1 analysis is composed of four tasks at a minimum:

- **Task 1**: Define and map the study area
- **Task 2**: Review all available information on the study area
- **Task 3**: Field inspect the study area
- **Task 4**: Describe the drainage system, and its existing and predicted drainage and water quality problems.

Upon review of the Level 1 analysis, the City may require a Level 2 or 3 downstream analysis, depending on the presence of existing or predicted flooding, erosion, or nuisance problems identified in the Level 1 analysis.

Levels 2 and 3 downstream analysis quantify downstream flooding, erosion, or nuisance problems by providing information on the severity and frequency of an existing problem or the likelihood of creating a new problem. A Level 2 analysis is a rough quantitative analysis (non-survey field data, uniform flow analysis). Level 3 is a more precise analysis (e.g., survey field data, backwater analysis) of significant problems. If conditions warrant, additional, more detailed analysis may be required beyond Level 3. For Levels 2 and 3 downstream analyses, an additional **Task 5**, addressing mitigation of existing and potential flooding, erosion, or nuisance problems, will be required.

Extent of Downstream Analysis

The downstream analysis must consider the existing conveyance system(s) for a **minimum flowpath distance downstream** of one-quarter mile and beyond that, as needed, to reach a point where the ***project site*** area constitutes less than 15% of the tributary area. This minimum distance **may be increased** as follows:

- **Task 2** of a Level 1 downstream analysis (described in detail in Section 2.3.1.1) is a review of all available information on the downstream area and is intended to identify existing drainage and water quality problems. *In all cases, this information review shall extend one mile downstream of the* ***project site***. The existence of flooding or erosion problems further downstream may extend the one-quarter- mile/15% minimum distance for other tasks to allow evaluation of impacts from the proposed development upon the identified flooding or erosion problems. The existence of documented water quality problems beyond the one-quarter-mile/15% distance may in some cases require additional mitigation of impacts as determined necessary by the City based on the type and severity of problem.
- If a project's impacts to flooding or erosion problems are mitigated by improvements to the downstream conveyance system, the downstream analysis will extend a minimum of one-quarter mile beyond the improvement. This is necessary because many such improvements result in a reduction of stormwater storage or an increase in peak flows from the problem location.
- At their discretion, the City may extend the downstream analysis beyond the minimum distance specified above on the reasonable expectation of drainage or water quality impacts.

A detailed description of the scope of offsite analysis and submittal requirements is provided in Section 2.3.1.1. Hydrologic analysis methods and requirements for Levels 2 and 3 downstream analyses are contained in Chapter 3; hydraulic analysis methods are contained in Chapter 4.

1.2.2.1.1. SPECIAL DOWNSTREAM DRAINAGE

While the area-specific flow control facility requirement in Core Requirement #3 (Section 1.2.3.1) serves to minimize the creation and aggravation of many types of downstream drainage problems, there are some types that are more sensitive to creation/aggravation than others depending on the nature or severity of the problem and which flow control facility standard is being applied. In particular, there are four types of downstream drainage problems for which the City has determined that the nature and/or severity of the problem warrants additional attention through the downstream analysis and possibly additional mitigation to ensure no creation/aggravation:

1. ***Conveyance system nuisance problem***
2. ***Severe erosion problem***
3. ***Severe flooding problem.***
4. ***Potential Impacts to Wetland Hydrology problem.***

These four types of downstream drainage problem are further described below and precisely defined at the beginning of Chapter 1.

Conveyance System Nuisance Problem (Type 1)

Conveyance system nuisance problems are minor but chronic flooding or erosion problems that result from the overflow of a constructed conveyance system that is substandard or has become too small as a result of upstream development (see the *Bothell Design and Construction Standards* for a precise definition). Such problems warrant additional attention because of their chronic nature and because they result from the failure of a conveyance system to provide a minimum acceptable level of protection.

If a ***conveyance system nuisance problem*** is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Drainage Problem-Specific Mitigation Requirements." This may entail additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

For any other nuisance problem that may be identified downstream, this manual does not require mitigation beyond the area-specific flow control facility requirement applied in Core Requirement #3 (Section 1.2.3.1) because preventing aggravation of such problems (e.g., those caused by the elevated water surfaces of ponds, lakes, wetlands, and closed depressions or those involving downstream erosion) can require two to three times as much onsite detention volume, which is considered unwarranted for nuisance problems. However, if under some unusual circumstance, the aggravation of such a nuisance problem is determined by the City to be a significant adverse impact, additional mitigation may be required.

Severe Erosion Problem (Type 2)

Severe erosion problems can be caused by conveyance system overflows or the concentration of runoff into erosion-sensitive open drainage features (see the *Bothell Design and Construction Standards* for a precise definition). ***Severe erosion problems*** warrant additional attention because they pose a significant threat either to health and safety or to public or private property.

If a ***severe erosion problem*** is identified or predicted downstream, additional mitigation must be considered as specified in Section 1.2.2.2 under "Drainage Problem-Specific Mitigation Requirements." This may entail additional onsite flow control or other measures as needed to prevent creation or aggravation of the problem.

Severe Flooding Problem (Type 3)

Severe flooding problems (i.e., a ***severe building flooding problem*** or ***severe roadway flooding problem***) can be caused by conveyance system overflows or the elevated water surfaces of ponds, lakes, wetlands, or closed depressions (see the *Bothell Design and Construction Standards* for precise definitions). ***Severe flooding problems*** warrant additional attention because they pose a significant threat either to health and safety or to public or private property.

If a ***severe flooding problem*** is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Drainage Problem-Specific Mitigation Requirements." This may entail consideration of additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

Potential Impacts to Wetlands Hydrology Problem (Type 4)

Potential impacts to wetlands hydrology can be caused by changes in the rate, duration, and quantity of stormwater discharged from the project site to a wetland.

Where wetlands are identified on the site, the applicant shall submit a critical area report at a level determined by the City to adequately evaluate the proposal and probable impacts.

Where wetlands are identified off the site AND the project is not exempt from Core Requirement 3, the applicant shall submit a critical area report at a level determined by the City to adequately evaluate the proposal and probable impacts.

Based upon the critical area report, the City will determine if the quantity of surface and storm water runoff from a proposed project or ***threshold discharge area*** within a proposed project could significantly alter the hydrology of a wetland--in which case, the City will require (as described in Section 1.2.2.2 under “Drainage Problem-Specific Mitigation Requirements”), implementation of additional flow control or other measures to mitigate the adverse impacts of this alteration in accordance with the wetland hydrology protection guidelines in Reference Section 5.

1.2.2.1.2. SPECIAL DOWNSTREAM WATER QUALITY

Procedures related to “Downstream Water Quality Problems Requiring Special Attention” discussed in the 2016 King County Surface Water Design Manual are beyond the requirements equivalent with the 2014 Washington State Department of Ecology Surface Water Design Manual for Western Washington and are not included in the City of Bothell Surface Water Design Manual.

1.2.2.2 DRAINAGE PROBLEM IMPACT MITIGATION

*A proposed project must not significantly aggravate existing downstream drainage problems or create new problems as a result of developing the **site**.* This manual does not require development proposals to fix or otherwise reduce the severity of existing downstream drainage problems, although doing so may be an acceptable mitigation.

Principles of Impact Mitigation for Drainage Problems

Aggravation of an existing downstream drainage problem means increasing the frequency of occurrence and/or severity of the problem. Increasing peak flows at the location of a problem caused by conveyance system overflows can increase the frequency of the problem's occurrence. Increasing durations of flows at or above the overflow return frequency can increase the severity of the problem by increasing the depth and duration of flooding. Controlling peaks and durations through onsite detention can prevent aggravation of such problems by releasing the increased volumes from development at return frequencies below the conveyance overflow return frequency, which limits their effect to just causing the conveyance system to flow full for a longer period of time.

When a problem is caused by high water-surface elevations of a volume-sensitive water body, such as a lake, wetland, or closed depression, aggravation is the same as for problems caused by conveyance overflows. Increasing the volume of flows to a volume-sensitive water body can increase the frequency of the problem's occurrence. Increasing the duration of flows for a range of return frequencies both above and below the problem return frequency can increase the severity of the problem; mitigating these impacts requires control of flow durations for a range of return frequencies both above and below the problem return frequency. The net effect of this duration control is to release the increased volumes from development only at water surface elevations below that causing the problem, which in turn can cause an increase in these lower, but more frequently occurring, water surface elevations. This underscores an unavoidable impact of development upstream of volume-sensitive water bodies: the increased volumes generated by the development will cause some range of increase in water surface elevations, no matter what detention standard is applied.

Creating a new drainage problem means increasing peak flows and/or volumes so that after development, the frequency of conveyance overflows or water surface elevations exceeds the thresholds for the various problem types discussed in Section 1.2.2.1. For example, application of the Level 1 flow control standard requires matching the ***existing site conditions*** 2- and 10-year peak flows. The 100-year peak flow is only partially attenuated, and the flow increase may be enough to cause a ***severe flooding problem*** as described in Section 1.2.2. The potential for causing a new problem is often identified during the Level 1 downstream analysis, where the observation of a reduction in downstream pipe sizes, for example, may be enough to predict creation of a new problem. A Level 2 or 3 analysis will typically be required to verify the capacity of the system and determine whether 100-year flows can be safely conveyed.

Significance of Impacts to Existing Drainage Problems

The determination of whether additional onsite mitigation or other measures are needed to address an existing downstream drainage problem depends on the significance of the proposed project's predicted impact on that problem. For some identified problems, the City will make the determination as to whether the project's impact is significant enough to require additional mitigation. For Type 1, 2, and 3 downstream drainage problems described in Section 1.2.2.1.1, this threshold of significant impact or aggravation is defined below. For a Type 4, "***Potential Impacts to Wetland Hydrology problem,***" the City will make this determination based on required critical area report findings, the wetland hydrology protection guidelines found in Reference Section 5, the project's relative contribution to the identified wetland's hydrology, and the mitigation proposed in meeting other requirements (e.g. flow control facilities and flow control BMPs).

For ***conveyance system nuisance problems***, the problem is considered significantly aggravated if there is any increase in the project's contribution to the frequency of occurrence and/or severity of the problem for runoff events less than or equal to the 10-year event. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified in Table 1.2.3.A.*

For ***severe erosion problems***, the problem is considered significantly aggravated if there is any increase in the project's existing contribution to the *flow duration*[9] of peak flows ranging from 50% of the 2-year peak flow up to the full 50-year peak flow at the eroded area. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if Level 2 flow control or offsite improvements are provided as specified in Table 1.2.3.A.*

[9] Flow duration means the aggregate time that peak flows are at or above a particular flow rate (e.g., the amount of time over the last 50 years that peak flows were at or above the 2-year flow rate). Note: flow duration is not considered to be increased if it is within the tolerances specified in Sub-Chapter 3.

For ***severe building flooding problems***, the problem is considered significantly aggravated if there is any increase in the project's existing contribution[10] to the frequency, depth, or duration of the problem for runoff events less than or equal to the 100-year event.

For ***severe roadway flooding problems***, the problem is considered significantly aggravated if any of the following thresholds are exceeded and there is any increase in the project's existing contribution[19] to the frequency, depth, or duration of the problem for runoff events less than or equal to the 100-year event:

- The *existing flooding*[11] over all lanes of a **roadway** or overtopping the culverted section of a **sole access driveway** is predicted to increase in depth more than a quarter-inch or 10% (whichever is greater) for the 100-year runoff event.
- The existing flooding over all lanes of a **roadway** or severely impacting a **sole access driveway** is more than 6 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event. A **severely impacted sole access driveway** is one in which flooding overtops a culverted section of the driveway, posing a threat of washout or unsafe access conditions due to indiscernible driveway edges, or flooding is deeper than 6 inches on the driveway, posing a severe impediment to emergency access.
- The existing flooding over all lanes of a *sole access roadway*[12] is more than 3 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event or is at any depth for runoff events less than or equal to the 10-year event.

❑ DRAINAGE PROBLEM-SPECIFIC MITIGATION REQUIREMENTS

1. IF a proposed project or ***threshold discharge area*** within a project drains to one or more of Type 1, Type 2, or Type 3 downstream drainage problems described in Section 1.2.2.1 as identified through a downstream analysis, THEN the applicant must do one of the following:

   a) Submit a Level 2 or Level 3 downstream analysis per Section 2.3.1 demonstrating that the proposed project will not create or significantly aggravate the identified downstream drainage problem(s), OR

   b) Show that the ***natural discharge area*** or ***threshold discharge area*** draining to the identified problem(s) qualifies for an exemption from Core Requirement #3: Flow Control (Section 1.2.3) or an exception from the applicable area-specific flow control facility requirement per Section 1.2.3.1, OR

   c) Document that the applicable area-specific flow control facility requirement specified in Core Requirement #3 is adequate to prevent creation or significant aggravation of the identified downstream drainage problem(s) as indicated in Table 1.2.3.A with the phrase, "No additional flow control needed," OR

   d) Provide additional onsite flow control necessary to prevent creation or significant aggravation of the downstream drainage problem(s) as specified in Table 1.2.3.A and further detailed in Section 3.3.5, OR

   e) Provide offsite improvements necessary to prevent creation or significant aggravation of the identified downstream drainage problem(s) as detailed in Chapter 3 unless identified as not necessary in Table 1.2.3.A, OR

   f) Provide a combination of additional onsite flow control and offsite improvements sufficient to prevent creation or significant aggravation of the downstream drainage problem(s) as demonstrated by a Level 2 or Level 3 downstream analysis.

[10] Increases in the project's contribution are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified for severe flooding problems in Table 1.2.3.A. For severe flooding problems located within the mapped 100-year floodplain of a major receiving water (see Table 1.2.3.B) or the mapped 100-year floodplain of a major stream for which there is an adopted basin plan, increases in the project's contribution are considered negligible (zero) regardless of the flow control standard being applied, unless the City determines there is a potential for increased flooding separate from that associated with the existing 100-year floodplain.

[11] Existing flooding, for the purposes of this definition, means flooding over all lanes of the roadway or driveway has occurred in the past and can be verified by City records, City personnel, photographs, or other physical evidence.

[12] Sole access roadway means there is no other flood-free route for emergency access to one or more dwelling units.

2. IF it is identified that the manner of discharge from a proposed project may create a significant adverse impact as described in Core Requirement #1, THEN the City may require the applicant to implement additional measures or demonstrate that the impact will not occur.
3. IF it is identified through a critical area review as described under "**Potential Impacts to Wetlands Hydrology Problem (Type 4)"**, that the quantity of surface and storm water runoff from a proposed project or ***threshold discharge area*** within a proposed project could significantly alter the hydrology of a wetland (Type 4 problem), THEN the City shall require the applicant to implement additional flow control or other measures to mitigate the adverse impacts of this alteration in accordance with the wetland hydrology protection guidelines in Reference Section 5.

Intent: To ensure provisions are made (if necessary) to prevent creation or significant aggravation of the four types of downstream drainage problems requiring special attention by this manual, and to ensure compliance with the discharge requirements of Core Requirement #1.

In addressing downstream drainage problems per Problem-Specific Mitigation Requirement 1 above, additional onsite flow control will often be the easiest provision to implement. This involves designing the required onsite flow control facility to meet an additional set of performance criteria targeted to prevent significant aggravation of specific downstream drainage problems. To save time and analysis, a set of predetermined flow control performance criteria corresponding to each of the three types of downstream drainage problems is provided in Table 1.2.3.A and described in more detail in Chapter 3.

Note that in some cases the area-specific flow control facility requirement applicable to the proposed project per Section 1.2.3.1 is already sufficient to prevent significant aggravation of many of the defined downstream drainage problem types. Such situations are noted in Table 1.2.3.A as not needing additional onsite flow control or offsite improvements. For example, if the project is located within a Conservation Flow Control Area subject to the Level 2 flow control standard per Section 1.2.3.1.B, and a ***conveyance system nuisance problem*** is identified through offsite analysis per Core Requirement #2, no additional onsite flow control is needed, and no offsite improvements are necessary.

1.2.2.3 WATER QUALITY PROBLEM IMPACT MITIGATION

This section is not included in the City of Bothell Surface Water Design Manual.

1.2.3 CORE REQUIREMENT #3: FLOW CONTROL FACILITIES

REQUIREMENT

All proposed projects, including ***redevelopment projects***, must provide onsite flow control facilities to mitigate the impacts of storm and surface water runoff generated by ***new impervious surface***, ***new pervious surface***, and ***replaced impervious surface*** targeted for flow mitigation as specified in the following sections. **Flow control facilities** must be provided and designed to perform as specified by the area-specific flow control facility requirement in Section 1.2.3.1 and in accordance with the applicable flow control facility implementation requirements in Section 1.2.3.2.

Intent: To ensure the minimum level of control needed to protect downstream properties and resources from increases in peak, duration, and volume of runoff generated by new development. The level of control varies depending on location and downstream conditions identified under Core Requirement #2.

❑ EXEMPTION FROM CORE REQUIREMENT #3

There is a single exemption from the flow control provisions of Core Requirement #3:

Basic Exemption

A proposed project is exempt if it meets the following criteria:

a) Less than 5,000 square feet of ***new*** plus ***replaced impervious surface*** will be created if the project is NOT in a *Landslide Hazard Area*, OR less than 2,000 square feet of *new* plus *replaced impervious surface* will be created if the project is WITHIN a Landslide Hazard Area, AND

b) Less than ¾ acres of ***new pervious surface*** will be added.

1.2.3.1 AREA-SPECIFIC FLOW CONTROL REQUIREMENTS

REQMT

Projects subject to Core Requirement #3 must provide flow control facilities that meet the Conservation Flow Control standard.~~as specified by the area- specific facility requirements and exceptions for the designated flow control area in which the proposed project or threshold discharge area of the proposed project is located as described in Subsections A, B, and C below.~~

Guide to Applying the ~~Area-Specific~~ Flow Control Facility Requirement

~~The flow control facility requirement varies across the county landscape according to the *flow control area* within which the project or a ***threshold discharge area*** of the project is located. Flow control areas are designated by the county to target the level of flow control performance to the broad protection needs of specific basins or subbasins. There are currently three such flow control areas, which are depicted on the Flow Control Applications Map adopted with this manual and found online at http://www.kingcounty.gov/environment/water-and-land/stormwater/documents/surface-water-design-manual.aspx or viewed via King County's iMap Interactive Mapping Tool at http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx .~~

~~These are the **Basic Flow Control Areas**, **Conservation Flow Control Areas**, and **Flood Problem Flow Control Areas**. Each flow control area has an area-specific set of minimum flow control facility performance criteria, design assumptions, surfaces that must be mitigated, and exceptions. These provisions all comprise what is referred to as the "area-specific flow control facility requirement."~~

Note that the minimum required performance of the facility as specified by this requirement may need to be increased to ensure that downstream drainage problems are not created or significantly aggravated as set forth in Section 1.2.2.2, "Drainage Problem-Specific Mitigation Requirements." Table 1.2.3.A provides a quick guide for selecting the flow control performance criteria necessary to meet both the area-specific flow control facility requirement and the problem-specific mitigation requirement. This is further explained in Step 4 below.

For efficient application of the flow control facility requirement, the following steps are recommended:

1. Check the Direct Discharge Exemption below to determine if and/or which portions of your project are exempt from the flow control facility requirement. If exempt from the flow control facility requirement, proceed to Step 6.
2. ~~Use the Flow Control Applications Map to determine the flow control area in which your project is located.~~
3. Consult the detailed requirement and exception language for Conservation Flow Control to determine if and how the flow control facility requirement applies to your project. This requirement and exception language is detailed on subsequent pages. ~~for each of the three flow control areas depicted on the Flow Control Applications Map. If a flow control facility is not applicable per the area-specific exceptions, proceed to Step 6.~~
4. If downstream drainage problems were identified through offsite analysis per Core Requirement #2 and are proposed to be addressed through onsite flow control, use Table 1.2.3.A to determine if and what additional flow control performance is necessary to mitigate impacts (i.e., to prevent creation or aggravation of the identified problems).
5. Use Section 1.2.3.2 to identify the applicable requirements for implementing the flow control facility requirement. These requirements cover facility siting, analysis and design, unusual situations, and other site-specific considerations.
6. Use Core Requirement 9 to identify the flow control BMPs that must be applied to your ***project site*** regardless of whether a flow control facility is required.

TABLE 1.2.3.A	
IDENTIFIED PROBLEM	**FLOW CONTROL FACILITY REQUIREMENT**
DOWNSTREAM	**Conservation Flow Control**
No Problem Identified Apply the minimum area- specific flow control performance criteria.	Apply the ***historic site conditions*** Level 2 flow control standard, which matches historic durations for 50% of 2-yr through 50-year peaks AND matches historic 2- and 10- year peaks
Type 1 Drainage Problem: ***Conveyance System Nuisance Problem***	*No additional flow control or other mitigation is needed*
Type 2 Drainage Problem: ***Severe Erosion Problem***	*No additional flow control is needed, but other mitigation may be required*(4)
Type 3 Drainage Problem: ***Severe Flooding Problem***	Additional Flow Control Apply the ***historic site conditions*** Level 3 flow control standard. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions"(3)(5)
Type 4 Potential Impact to Wetland Hydrology as Determined through a Critical Area Review per BMC 14.04.160 or Offsite Analysis	Additional Flow Control The City may require design adjustments per the wetland hydrology protection guidelines in Reference Section 5

Notes:

(1) More than one set of problem-specific performance criteria may apply if two or more downstream drainage problems are identified through offsite analysis per Core Requirement #2. If this happens, the performance goals of each applicable problem-specific criterion must be met. This can require extensive, time-consuming analysis to implement multiple sets of outflow performance criteria if additional onsite flow control is the only viable option for mitigating impacts to these problems. In these cases, it may be easier and more prudent to implement the ***historic site conditions*** Level 3 flow control standard in place of the otherwise required area-specific standard. Use of the historic Level 3 flow control standard satisfies the specified performance criteria for all the area-specific and problem-specific requirements except if adjustments are required per the special provision for closed depressions described below in Note 5.

(2) ~~Overflow T_r is the return period of conveyance system overflow. To determine T_r requires a minimum Level 2 downstream analysis as detailed in Section 2.3.1.1. To avoid this analysis, a T_r of 2 years may be assumed.~~

(3) Offsite improvements may be implemented in lieu of or in combination with additional flow control as allowed in Section 1.2.2.2 and detailed in Section 3.3.5.

(4) A tightline system may be required regardless of the flow control standard being applied if needed to meet the discharge requirements of Core Requirement #1 or the outfall requirements of Core Requirement #4, or if deemed necessary by the City where the risk of severe damage is high.

(5) **Special Provision for Closed Depressions with a Severe Flooding Problem:**

IF the proposed project discharges by overland flow or conveyance system to a closed depression experiencing a ***severe flooding problem*** AND the amount of ***new impervious surface*** area proposed by the project is greater than or equal to 10% of the 100-year water surface area of the closed depression, THEN use the "point of compliance analysis technique" described in Section 3.3.6 to verify that water surface levels are not increasing for the return frequencies at which flooding occurs, up to and including the 100-year frequency. If necessary, iteratively adjust onsite flow control performance to prevent increases. *Note: The point of compliance analysis relies on certain field measurements taken directly at the closed depression (e.g., soils tests, topography, etc.). If permission to enter private property for such measurements is denied, the City may waive this provision and apply the* ***existing site conditions*** *Level 3 flow control standard with a mandatory 20% safety factor on the storage volume.*

❑ DIRECT DISCHARGE EXEMPTION

Any onsite **natural drainage area** is exempt from the flow control facility requirement if the area drains to one of the ***major receiving waters*** listed in Table 1.2.3.B[13] at right, AND meets the following criteria for *direct discharge*[14] to that receiving water:

TABLE 1.2.3.B MAJOR RECEIVING WATER
Sammamish River
*Note: The **major receiving water** does not include side adjacent or associated channels, spring- or groundwater-fed streams, or wetlands.*

a) The **flowpath** from the ***project site*** discharge point to the edge of the 100-year floodplain of the major receiving water will be **no longer than a quarter mile**, AND

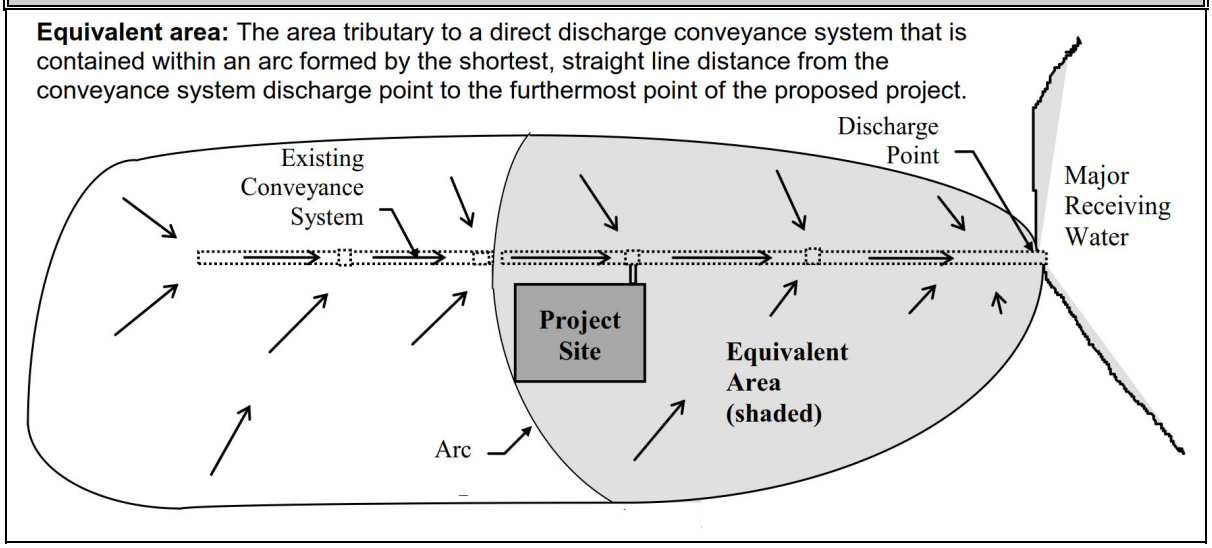
b) The conveyance system between the ***project site*** and the ***major receiving water*** will extend to the ordinary high water mark, and will be **comprised of manmade conveyance elements** (pipes, ditches, etc.) and will be within public right-of-way or a public or private drainage easement, AND

c) The conveyance system will have **adequate capacity**[15] per Core Requirement #4, Conveyance System, for the entire contributing drainage area, assuming **build-out conditions** to current zoning for the *equivalent area* portion (defined in Figure 1.2.3.A, below) and existing conditions for the remaining area, AND

d) The conveyance system will be adequately **stabilized to prevent erosion**, assuming the same basin conditions as assumed in Criteria (c) above, AND

e) The direct discharge proposal will not **divert flows** from or increase flows to an **existing wetland or stream** sufficient to cause a significant adverse impact.

FIGURE 1.2.3.A EQUIVALENT AREA DEFINITION AND ILLUSTRATION



[13] Projects discharging directly to the Sammamish River must infiltrate runoff to the extent feasible before discharge to the River.

[14] Direct discharge means undetained discharge from a proposed project to a major receiving water.

[15] Note: If the conveyance system is an existing City of Bothell-owned system, the City may charge a special use fee.

~~❑ IMPERVIOUS SURFACE PERCENTAGE EXEMPTION FOR AGRICULTURAL PROJECTS~~

~~For agricultural projects located within an Agricultural Production District (APD), Farmland Preservation Program (FPP), or site zoned A, any onsite threshold discharge area is exempt from the flow control facility requirement if it meets all of the following conditions:~~

~~a) The total (new, replaced, and existing) amount of impervious surface that is not fully dispersed per the criteria on page 1-46 must be no more than 4% of the threshold discharge area, AND~~

~~b) New impervious surfaces and new pervious surfaces must not disturb, impact, or replace native vegetation, AND~~

~~c) Flow control BMPs must be applied to new impervious surfaces as specified in Core Requirement 9, AND~~

~~d) All impervious surface area, except 10,000 square feet of it, must be set back from its natural location of discharge from the site at least 100 feet for every 10,000 square feet of total impervious surface and its runoff must be discharged in an unconcentrated manner that promotes infiltration and evapotranspiration, AND~~

~~e) Increased runoff from the new impervious surface and new pervious surface must not significantly impact a critical area, severe flooding problem, or severe erosion problem, AND~~

~~f) The manner in which runoff is discharged from the project site must not create a significant adverse impact per core requirement #1.~~

A. ~~BASIC FLOW CONTROL AREAS~~

Not used.

B. CONSERVATION FLOW CONTROL

REQMT

Within Conservation Flow Control Areas, required flow control facilities must comply with the following minimum requirements for facility performance and mitigation of targeted surfaces, except where such requirements or the facility requirement itself is waived or reduced by the area-specific exceptions at the end of this subsection.

Minimum Required Performance

Facilities in Bothell must comply with the following flow control performance standard and assumptions unless modified by offsite analysis per Core Requirement #2 (see Table 1.2.3.A):

Level 2 Flow Control: Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. Also match developed peak discharge rates to predeveloped peak discharge rates for the 2- and 10- year return periods. Assume ***historic site conditions*** as the predeveloped condition.

Intent

The Level 2 flow control standard assuming ***historic site conditions*** is intended to limit the amount of time that erosive flows are at work generating erosion and sedimentation within natural and constructed drainage systems. Such control is effective in preventing development-induced increases in natural erosion rates and reducing existing erosion rates where they may have been increased by past development of the ***site***. This is accomplished by maintaining at historic predevelopment levels the aggregate time that developed flows exceed an erosion-causing threshold (i.e., 50% of the historic 2-year peak flow). Maintaining natural erosion rates within streams and their tributary areas is important for preventing increases in stream channel erosion and sediment loading that are detrimental to salmonid habitat and production.

Effectiveness in Addressing Downstream Drainage Problems

While the Level 2 flow control standard assuming ***historic site conditions*** provides a reasonable level of protection for preventing most development-induced problems, it does not necessarily prevent increases in ***existing site conditions*** 100-year peak flows that can aggravate ***severe flooding problems*** as described in Core Requirement #2, nor does it necessarily prevent aggravation of all ***severe erosion problems***. Consequently, if one or more of these problems are identified through offsite analysis per Core Requirement #2, additional onsite flow control and/or offsite improvements will likely be required (see "Drainage Problem-Specific Mitigation Requirements" in Section 1.2.2.2).

Target Surfaces

Facilities must mitigate (either directly or in effect) the runoff from the following target developed surfaces within the ***threshold discharge area*** for which the facility is required:[16]

1. ***New impervious surface*** that is **not *fully dispersed*** per the criteria in Section 1.2.3.2 or not farmland dispersed as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new impervious surface*** shall be assumed as specified in Chapter 3. *Note, any **new impervious surface** such as a bridge or boardwalk that spans the ordinary high water of a stream, pond, or lake may be excluded as a target surface if the runoff from such span is conveyed to the ordinary high water area in accordance with Criteria (b), (c), (d), and (e) of the "Direct Discharge Exemption."*
2. ***New pervious surface*** that is **not *fully dispersed*** or not farmland dispersed as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new pervious surface*** shall be assumed to be the entire lot area, except the assumed impervious portion and any portion in which native conditions are preserved by covenant, tract, or easement. In addition, the ***new pervious surface*** on individual lots shall be assumed to be 100% grass ~~if located within the Urban Growth Area (UGA) and 50% grass/50% pasture if located outside the UGA.~~
3. **Existing impervious surface** added since January 8, 2001 that is **not *fully dispersed*** ~~or not farmland dispersed as specified in Appendix C~~, and not yet mitigated with a City-approved flow control facility or flow control BMP. *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*
4. ***Replaced impervious surface*** that is **not *fully dispersed*** ~~or not farmland dispersed as specified in Appendix C~~ on a non-redevelopment project in which the total of new plus replaced impervious surface is 5,000 square feet or more, OR new pervious surface is ¾ acre or more.
5. ***Replaced impervious surface*** that is **not *fully dispersed*** on a ***transportation redevelopment project*** in which ***new impervious surface*** is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
6. ***Replaced impervious surface*** that is **not *fully dispersed*** ~~or not farmland dispersed as specified in Appendix C~~, on a **parcel *redevelopment project*** in which the total of new plus ***replaced impervious surface*** is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing ***site*** improvements.

Exceptions

The following exceptions apply:

1. The ***historic site conditions*** **assumption** for application of Level 2 flow control may be reduced through a basin plan or study approved by the City of Bothell and the Washington State Department of Ecology. One possible reduction is to an assumption of 75% forest, 15% grass, and 10% impervious surface (75/15/10

[16] ~~Note: Any **threshold discharge area** that appears to be located within a Conservation Flow Control Area according to the Flow Control Applications Map but drains entirely by non-erodible manmade conveyance to a **major receiving water** is considered to be located within a Basic Flow Control Area.~~

conditions) or ***existing site conditions***, whichever generates the lowest 100-year peak flow. Another possible change that could be made through a City- and Ecology- approved basin plan or study is to the lowest peak flow (50% of the 2-year peak flow) above which discharge durations must be matched. This peak flow, known as the geomorphic threshold of bed load movement, may be changed based on the actual channel conditions necessary to protect or allow for restoration of water body beneficial uses and habitat functions essential to salmonids.

2. The facility requirement is waived for any ***threshold discharge area*** in which there is **no more than a 0.15-cfs difference** (when modeled using 15 minute time steps) or **no more than a 0.1-cfs difference** (when modeled using 1 hour time steps) in the sum of developed 100-year peak flows for those target surfaces subject to this requirement and the sum of ***historic site conditions*** 100-year peak flows (modeled using same time step unit (e.g. hourly or 15 minute) used to calculate the developed flow) for the same surface areas. ~~Agricultural zoned projects in current agricultural use may use ***existing site conditions*** as the predeveloped condition for purposes of this exception calculation.~~ *Note: for the purposes of this calculation, target surfaces served by flow control BMPs per Appendix C may be modeled in accordance with the flow control BMP facility sizing credits in Core Requirement 9, Table 1.2.9.A.*

3. The facility requirement in Conservation Flow Control Areas may be reduced or waived for any ***threshold discharge area*** where a **plan or study** approved by the City and Ecology shows that a lower standard (e.g., Level 1 flow control) is sufficient or no facility is necessary to protect or allow for restoration of water body beneficial uses and habitat functions essential to salmonids.

4. The facility requirement as applied to ***replaced impervious surface*** may be waived if the City has adopted a plan and implementation schedule approved by state Department of Ecology for fulfilling this requirement in **regional facilities**.

5. The facility requirement as applied to ***replaced impervious surface*** may be reduced by the City using the procedures detailed in Sections 1.4.3 and 1.4.4 of the adjustment process, if the **cost of flow control facilities** to mitigate all target surfaces exceeds that necessary to mitigate only for ***new impervious surface*** plus ***new pervious surface*** and also exceeds $^1/_3$ of the valuation of proposed improvements (including interior improvements) or twice the cost of a facility to mitigate equivalent surfaces on a new ***development site***, whichever is less.

   The amount of reduction shall be limited such that the **cost of flow control facilities** is at least equal to that necessary to mitigate only for ***new impervious surface*** plus ***new pervious surface***, and beyond this amount, is no greater than $^1/_3$ of the valuation of proposed improvements (including interior improvements) or twice the cost of a facility to mitigate equivalent surfaces on a new ***development site***, whichever is less.

C. FLOOD PROBLEM FLOW CONTROL AREAS

Not used.

1.2.3.2 FLOW CONTROL IMPLEMENTATION REQUIREMENTS

Flow control facilities shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. ONSITE VS. OFFSITE IMPLEMENTATION

All required flow control facilities must be implemented onsite except where the requirements below can be met by direct discharge to a regional or shared facility constructed to provide flow control for the proposed project. Regional facilities are typically constructed as part of a City-approved plan or study (e.g., basin plan, stormwater compliance plan, or master drainage plan). Shared facilities may be constructed under a City-developed shared facility drainage plan or under an agreement between two or more private developers.

1. The regional or shared facility must be of adequate size and design to meet the **current** flow control requirements for the proposed project. *Note: the current flow control requirements are those specified by Core Requirement #3 of this manual unless superseded by other adopted area-specific flow control requirements per Special Requirement #1 (see Section 1.3.1).* In some cases where the current flow control requirements differ from those used to originally design the regional or shared facility, additional analysis and possible retrofitting of the facility may be required to ensure adequate size and design. In other cases where the current flow control requirements are not significantly different or are less stringent, adequate size and design may already be documented by an adopted City of Bothell basin plan or master drainage plan, an approved shared facility drainage plan, or a detailed drainage analysis approved by the City for a separate permitted development.

2. The regional or shared facility must be fully operational at the time of construction of the proposed project. In the case of a shared facility, the proposed project must comply with the terms and conditions of all contracts, agreements, and permits associated with the shared facility. If the offsite facility is an existing City of Bothell-owned facility, the City may charge a special use fee equal to or based on the property value of the detention capacity being used.

3. The conveyance system between the ***project site*** and the regional facility must meet the same criteria specified for direct discharge to a ***major receiving water*** except for Criterion (a) (see "Direct Discharge Exemption" in Section 1.2.3.1). In the case of a shared facility, the criteria are the same, except the conveyance system need only have adequate capacity and erosion protection for buildout of the *participating portion*[17] of the contributing drainage area.

B. METHODS OF ANALYSIS AND DESIGN

Flow control facilities must be analyzed and designed using a continuous flow simulation method such as HSPF (Hydrologic Simulation Program FORTRAN) or the simplified HSPF-based runoff files method. An overview of the runoff files method is found in Chapter 3. Specifications for use of the approved modeling software is provided in the software documentation and augmented with limited SWDM-specific guidance in Reference 6-D. Detailed design specifications for flow control facilities are found in Chapter 5.

C. SIZING CREDITS FOR FULLY DISPERSED SURFACES

A ***fully dispersed*** surface (either impervious or non-native pervious) is one that conforms to the BMP strategy for "full dispersion" detailed in Appendix C, Section C.2.1. This strategy calls for minimizing the area of onsite developed surface relative to ***native vegetated surface***, together with the application of dispersion techniques that utilize the natural retention/detention capacity of the ***native vegetated surface*** to mitigate the runoff effects of the developed surfaces. Developed surfaces conforming to this strategy are considered to have a negligible impact downstream, and therefore, may be modeled as forest and are not subject to the area-specific flow control facility requirement (Section 1.2.3.1) or the area-specific water quality facility requirement (Section 1.2.8.1). In order for developed surfaces to qualify as ***fully dispersed***, they must meet the basic criteria listed below and further detailed in Appendix C, Section C.2.1.

Criteria for Fully Dispersed Surfaces

1. The **total area of impervious surface** being ***fully dispersed*** must be no more than 15% of the total area of ***native vegetated surface*** being preserved by a ~~clearing limit per KCC 16.82 or by~~ recorded tract, easement, or covenant within the same ***threshold discharge area***. The total area of impervious surface plus *non-native pervious surface*[18] being ***fully dispersed*** must be no more than 35% of a ***threshold discharge area***.

[17] The participating portion includes those properties that have agreements for use of the shared facility.
[18] Non-native pervious surface means a pervious surface that does not meet the definition of a native vegetated surface.

2. The runoff from a ***fully dispersed*** surface must be discharged using one of the following **dispersion devices** in accordance with the design specifications and maximum area of ***fully dispersed*** surface for each device set forth in Appendix C, Section C.2.1:

   a) Splash blocks

   b) Rock pads

   c) Gravel filled trenches

   d) Sheet flow

   *Note: The dispersion device must be situated so as to discharge within the same **threshold discharge area** of the surface it serves.*

3. A **native vegetated flowpath segment** of at least 100 feet in length (25 feet for sheet flow from a non-native pervious surface) must be available along the flowpath that runoff would follow upon discharge from a dispersion device listed in Minimum Requirement 2 above. The native vegetated flowpath segment **must meet all of the following criteria:**

   a) The flowpath segment must be over ***native vegetated surface***.

   b) The flowpath segment must be **onsite or an offsite tract or easement area** reserved for such dispersion.

   c) The **slope** of the flowpath segment must be **no steeper than 15%** for any 20-foot reach of the flowpath segment.

   d) The flowpath segment must be located **between the dispersion device and any downstream drainage feature** such as a pipe, ditch, stream, river, pond, lake, or wetland.

   e) The flowpath segments for adjacent dispersion devices must comply with the **minimum spacing requirements** in Appendix C, Section C.2.1. These requirements do not allow overlap of flowpath segments, except in the case where **sheet flow from a non-native pervious surface** overlaps with the flowpath of any dispersion device listed in Minimum Requirement 2 above. In this case, the longer of the two overlapping flowpath segments must be extended at least 1 foot for every 3 feet of distance along the most representative path that runoff would travel from the upstream end to the discharge end of the non-native pervious surface.

4. On ***sites*** **with septic systems**, the discharge of runoff from dispersion devices must not be upgradient of the drainfield. This requirement may be waived by the City if ***site*** topography clearly prohibits flows from intersecting the drainfield.

5. The dispersion of runoff must not create **flooding or erosion impacts** as determined by the City. If runoff is proposed to be discharged toward a ***landslide hazard area***, ***erosion hazard area***, ***or steep slope hazard area*** (i.e., slopes steeper than 20%), the City may require the applicant to have the proposal evaluated by a geotechnical engineer, engineering geologist, or the City staff geologist.

D. SIZING CREDITS FOR USE OF FLOW CONTROL BMPs

Projects that implement flow control BMPs as detailed in Core Requirement 9 and Appendix C, whether required or optional, may use the flow control BMP modeling credits as described and allowed in Section 1.2.9.4 and Table 1.2.9.A.

E. MITIGATION OF TARGET SURFACES THAT BYPASS FACILITY

On some ***sites***, topography may make it difficult or costly to collect all target surface runoff for discharge to the onsite flow control facility. Therefore, some project runoff subject to flow control may bypass required onsite flow control facilities provided that all of the following conditions are met:

1. The **point of convergence** for runoff discharged from the bypassed target surfaces and from the project's flow control facility must be within **a quarter-mile downstream**[19] of the facility's ***project site*** discharge point, AND

2. The increase in the ***existing site conditions*** **100-year peak discharge** from the area of bypassed target surfaces must not exceed 0.4 cfs, AND

3. Runoff from the bypassed target surfaces **must not create a significant adverse impact** to downstream drainage systems, salmonid habitat, or properties as determined by the City, AND

4. **Water quality requirements** applicable to the bypassed target surfaces must be met, AND

5. **Compensatory mitigation by a flow control facility** must be provided so that the net effect at the point of convergence downstream is the same with or without the bypass. This mitigation may be waived if the ***existing site conditions*** 100-year peak discharge from the area of bypassed target surfaces is increased by no more than 0.1 cfs (modeled using 1 hour time steps) or no more than 0.15 cfs (modeled using 15 minute time steps) and **flow control BMPs** as detailed in Appendix C are applied to all impervious surfaces within the area of bypassed target surfaces. One or combination of the following methods may be used to provide compensatory mitigation by a flow control facility subject to permission/approvals from other parties as deemed necessary by the City:

   a) Design the project's flow control facility or retrofit an existing offsite flow control facility as needed to achieve the desired effect at the point of convergence, OR

   b) Design the project's flow control facility or provide/retrofit an offsite flow control facility to mitigate an existing developed area (either onsite or offsite) that has runoff characteristics (i.e., peak flow and volume) equivalent to those of the bypassed target surfaces but is currently not mitigated or required to be mitigated to the same flow control performance requirement as the bypassed target surfaces.

F. BYPASS OF RUNOFF FROM NON-TARGET SURFACES

The performance of flow control facilities can be compromised if the contributing area, beyond that which must be mitigated by the facility, is too large. Therefore, IF the existing 100-year peak flow rate from any upstream area (not targeted for mitigation) is greater than 50% of the 100-year developed peak flow rate (undetained) for the area that must be mitigated, THEN the runoff from the upstream area must bypass the facility. The bypass of upstream runoff must be designed so that all of the following conditions are met:

1. Any existing contribution of flows to an **onsite wetland** must be maintained, AND

2. Upstream flows that are **naturally attenuated** by natural detention on the ***project site*** under predeveloped conditions must remain attenuated, either by natural means or by providing additional onsite detention so that peak flows do not increase, AND

3. Upstream flows that are **dispersed or unconcentrated** on the ***project site*** under predeveloped conditions must be discharged in a safe manner as described in Core Requirement #1 under "Discharge Requirements."

[19] Note: The City may allow this distance to be extended beyond a quarter mile to the point where the project site area constitutes less than 15% of the tributary area.

G. MITIGATION TRADES

A project's flow control facility may be designed to mitigate an existing developed non-target surface area (either onsite or offsite) in trade for not mitigating part or all of the project's target surface area, provided that all of the following conditions are met:

1. The **existing developed non-target surface area** (i.e., an area of existing impervious surface and/or non-native pervious surface) must have runoff discharge characteristics (i.e., peak flow and volume) equivalent to those of the target surface area for which mitigation is being traded and must not be currently mitigated to the same flow control performance requirement as the target surface area, AND

2. Runoff from both the target surface area being traded and the flow control facility **must converge prior to discharge** of the runoff from the target surface area being traded onto private property without an easement or through any area subject to erosion, AND

3. The **net effect** in terms of flow control at the point of convergence downstream must be the same with or without the mitigation trade, AND

4. The undetained runoff from the target surface area being traded **must not create a significant adverse impact** to downstream drainage systems, salmonid habitat, or properties prior to convergence with runoff from the flow control facility.

H. MANIFOLD DETENTION FACILITIES

A *manifold detention facility* is a single detention facility designed to take the place of two or more otherwise required detention facilities. It combines the runoff from two or more onsite drainage areas having separate ***natural discharge locations*** and redistributes the runoff back to the ***natural discharge locations*** following detention. Because manifold detention facilities divert flows from one ***natural discharge location*** to another and then back, they are not allowed except by an approved adjustment (see Section 1.4).

I. FACILITY REQUIREMENT IN LANDSLIDE HAZARD DRAINAGE AREAS

Proposed projects subject to Discharge Requirement 2 in Core Requirement #1 (see Section 1.2.1) must provide a tightline system except where the City approves an alternative system based on a geotechnical analysis that considers cumulative impacts from the project and surrounding areas under full built- out conditions, AND one of the following conditions can be met:

a) Less than 2,000 square feet of ***new impervious surface*** will be added within the ***natural discharge area***, OR

b) The developed conditions runoff from the ***natural discharge area*** is less than 0.1 cfs for the 100- year runoff event and will be infiltrated for runoff events up to and including the 100-year event, OR

c) The *developed conditions runoff volume*[20] from the ***natural discharge area*** is less than 50% of the existing conditions runoff volume from other areas draining to the location where runoff from the ***natural discharge area*** enters the ***landslide hazard area*** onto slopes steeper than 15%, AND the provisions of Discharge Requirement 1 are met, OR

d) The City determines that a tightline system is not physically feasible or will create a significant adverse impact based on a soils report by a geotechnical engineer.

[20] For the purposes of applying this exception, the developed conditions runoff volume is the average annual runoff volume as computed with the approved model per Sub-Chapter 3. The total volume is divided by the number of full water years being analyzed to determine the annual average runoff volume. Any areas assumed not to be cleared when computing the developed conditions runoff volume must be set aside in an open space tract or covenant in order for the proposed project to qualify for this exception. Preservation of existing forested areas in Landslide Hazard Areas is encouraged

Systems proposed as an alternative to the required tightline must meet all of the following requirements:

1. Approval by the City shall be based on a geotechnical analysis that considers cumulative impacts from the project and surrounding areas under full built-out conditions.

2. Proposed facilities, FCBMPs, and dispersal systems must meet all applicable feasibility and setback requirements contained in the SWDM.

3. Facility outflows must meet the discharge dispersal requirements specified in Discharge Requirement 1 of Core Requirement #1.

4. The geotechnical analysis and proposed system design must address facility overflows and recommend additional measures, factors of safety in facility design, etc. based on an evaluation of risk of slope instability or failure and potential impacts to life, structures, and property.

5. For projects adjacent to or containing a ***landslide***, ***steep slope***, or ***erosion hazard area***, the applicant must demonstrate that onsite drainage facilities and/or flow control BMPs will not create a significant adverse impact to downhill properties or drainage systems.

1.2.4 CORE REQUIREMENT #4: CONVEYANCE SYSTEM

REQUIREMENT

All engineered conveyance system elements for proposed projects must be analyzed, designed, and constructed to provide a minimum level of protection against overtopping, flooding, erosion, and structural failure as specified in the following groups of requirements:

- "Conveyance Requirements for New Systems," Section 1.2.4.1
- "Conveyance Requirements for Existing Systems," Section 1.2.4.2
- "Conveyance System Implementation Requirements," Section 1.2.4.3

Intent: To ensure proper design and construction of engineered conveyance system elements. *Conveyance systems* are natural and engineered drainage facilities that provide for the collection and transport of surface water or stormwater runoff. This core requirement applies to the engineered elements of conveyance systems (primarily pipes, culverts, and ditches/channels).

1.2.4.1 NEW CONVEYANCE SYSTEMS

All *new conveyance system elements*[21] both onsite and offsite, shall be analyzed, designed, and constructed according to the following requirements. Also see Section 4.1 for route design and easement requirements.

Pipe Systems

1. New pipe systems shall be designed with sufficient capacity to convey and contain (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.

2. Pipe system structures may overtop for runoff events that exceed the 25-year design capacity, provided the overflow from a 100-year runoff event does not create or aggravate a ***severe flooding problem*** or ***severe erosion problem*** as described in Core Requirement #2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the ***project***

[21] New conveyance system elements are those that are proposed to be constructed where there are no existing constructed conveyance elements.

site. In residential subdivisions, this overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.

3. The upstream end of a pipe system that receives runoff from an open drainage feature (pond, ditch, etc.) shall be analyzed and sized as a culvert as described below.

Culverts

1. New culverts shall be designed with sufficient capacity to meet the headwater requirements in Section

   4.3.1 and convey (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.

2. New culverts must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a ***severe flooding problem*** or ***severe erosion problem*** as described in Core Requirement

   #2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the ***project site***. In residential subdivisions, this overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of- way.

3. New culverts proposed in streams with salmonids shall be designed to provide for fish passage as detailed in Section 4.3.2. *Note: The City's critical areas regulations (BMC 14.04) or the state Department of Fish and Wildlife may require a bridge to facilitate fish passage.*

Ditches/Channels

1. New ditches/channels shall be designed with sufficient capacity to convey and contain, at minimum, the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.

2. New ditches/channels must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a ***severe flooding problem*** or ***severe erosion problem*** as described in Core Requirement #2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the ***project site***. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.

Tightline Systems Traversing Steep Slopes

New tightline conveyance systems traversing slopes that are steeper than 15% and greater than 20 feet in height, or are within a ***steep slope hazard area***, shall be designed with sufficient capacity to convey and contain (at minimum) the 100-year peak flow, assuming *full build-out conditions*[22] for all tributary areas, both onsite and offsite. Tightline systems shall be designed as detailed in Section 4.2.2.

Bridges

New bridges shall be designed to accommodate the 100-year peak flow as specified in Section 4.3.3 and in accordance with the floodplain development standards in BMC 14.04.

1.2.4.2 EXISTING CONVEYANCE SYSTEMS

The following conveyance requirements for existing systems are less rigorous than those for new systems to allow some salvaging of existing systems that are in useable condition. Existing systems may be utilized if they are capable of providing a minimum level of protection as-is or with minor modifications.

[22] Full build-out conditions means the tributary area is developed to its full zoning potential except where there are existing sensitive areas, open space tracts, and/or native growth protection easements/covenants.

Existing Onsite Conveyance Systems

No Change in Flow Characteristics: Existing onsite conveyance systems that will not experience a change in flow characteristics (e.g., peak flows or volume of flows) as a result of the proposed project need not be analyzed for conveyance capacity.

Change in Flow Characteristics: Existing onsite conveyance systems that will experience a change in flow characteristics as a result of the proposed project must comply with the following conveyance requirements:

4. The existing system must be analyzed and shown to have sufficient capacity to convey and contain (at minimum) the 10-year peak flow assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.

5. The applicant must demonstrate that the 100-year peak flow to the existing system will not create or aggravate a ***severe flooding problem*** or ***severe erosion problem*** as described in Core Requirement #2, Section 1.2.2.

6. Minor modifications may be made to the conveyance system to achieve the required capacity stated above. Examples of minor modifications include raising a catch-basin rim, replacing or relaying a section of pipe to match the capacity of other pipes in the system, improving a pipe inlet, or enlarging a short, constricted reach of ditch or channel.

7. Modifications to an existing conveyance system or element that acts to attenuate peak flows, due to the presence of detention storage upstream, shall be made in a manner that does not significantly increase peak flows downstream. For example, if water is detained in a pond upstream of a restrictive road culvert, then installing an overflow system for the culvert should prevent overtopping of the road without significantly reducing existing detention storage.

Existing Offsite Conveyance Systems

1. Existing offsite conveyance systems need not be analyzed for conveyance capacity except as required by Core Requirement #2, or if offsite improvements or direct discharge are proposed per Core Requirement #3.

2. Improvements made to existing offsite conveyance systems to address the drainage problem-specific mitigation requirements in Section 1.2.2.2 need only change existing conveyance capacity sufficient to prevent aggravation of the drainage problem(s) being addressed.

3. Existing offsite conveyance systems proposed to be used for direct discharge to a ***major receiving water*** per Core Requirement #3 shall meet the same conveyance requirements specified in Section 1.2.4.1 for new systems.

1.2.4.3 CONVEYANCE SYSTEM IMPLEMENTATION

Conveyance systems shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. METHODS OF ANALYSIS AND DESIGN

Properly sized conveyance elements provide sufficient hydraulic capacity to convey peak flows of the return frequencies indicated in Sections 1.2.4.1 and 1.2.4.2. Conveyance capacity shall be demonstrated using the methods of analysis detailed in Chapter 4. Design flows for sizing conveyance systems shall be determined using the appropriate runoff computation method specified in Section 3.2.

B. COMPOSITION

Where feasible, conveyance systems shall be constructed of vegetation-lined channels, as opposed to pipe systems. Vegetative channels shall generally be considered feasible if all of the following conditions are present:

1. The channel gradient generally does not exceed 5 percent, AND
2. No modifications to currently adopted standard roadway cross sections in the City of Bothell *Design and Construction Standards and Specifications* are necessitated by the channel, AND
3. The channel will be accessible for maintenance (see Section 1.2.6), AND
4. The channel will not be subject to erosion.

Exceptions: The following are exceptions to the requirement for vegetative channels:

- Conveyance systems proposed under roadways, driveways, or parking areas
- Conveyance systems proposed between houses in urban-zoned plats and short plats
- Conveyance systems conveying roof runoff only.

C. INTERFLOW AND INTERCEPTION

Interflow is near-surface groundwater that moves laterally through the soil horizon following the hydraulic gradient of underlying relatively impermeable soils. When interflow is expressed on the surface, it is termed a *spring* or *seepage*. Any significant springs or seepage areas that impact a roadway or structure proposed by the project must be intercepted and directed into a conveyance system. Where roadways may impede the passage of interflow to downstream wetlands or streams, provision for passage of unconcentrated flows must be made.

D. PROVISION FOR LOT DRAINAGE WITHIN SUBDIVISIONS

Within *subdivision projects*,[23] provision must be made for the safe conveyance of runoff from the discharge location of each lot to the subdivision's main conveyance system or road drainage system. This may include, but is not limited to, **provisional stub-outs** from an enclosed roadway drainage system to the edge of the road right-of-way at each created lot, or lot-line pipes or ditches that collect lot drainage and convey it to the subdivision's main conveyance system or road drainage system.

E. OUTFALLS

An *outfall* is defined as a point where collected and concentrated surface and storm water runoff is discharged from a pipe system or culvert.

Energy Dissipation: At a minimum, rock erosion protection is required at outfalls from all drainage systems and elements except where the City determines that erosion protection is being provided by other means or is not needed. Details on outfall structures are included in Section 4.2.2.

New Point Discharges Over Steep Slopes: Proposed outfalls that will discharge runoff in a location where the natural (existing) discharge is unconcentrated over a slope steeper than 15% and greater than 20 feet in height, or over a ***steep slope hazard area***, must meet the following criteria:

[23] For purposes of this requirement, the term subdivision project refers to any project that creates a short plat, plat, or binding site plan.

- A tightline conveyance system must be constructed to convey the runoff to the bottom of the slope unless other measures are approved by the City based on an evaluation/report by a licensed geotechnical engineer.

- The geotechnical analysis must consider cumulative impacts from the project and surrounding areas under full built-out conditions.

- Tightline systems must be designed so that existing baseflow conditions are not significantly changed and adequate energy dissipation is provided at the bottom of the slope.

- Where alternative measures (e.g., dispersal trench) to the tightline system are approved upstream of a ***landslide hazard area*** or ***steep slope hazard area***, they may be placed no closer than 50 feet from the top of the hazard area slope based on an evaluation/report by a licensed geotechnical engineer.

~~F. OUTFALLS TO THE GREEN RIVER~~

~~New stormwater outfalls or modifications to existing stormwater outfalls discharging to the Green River between River Mile 6 (South Boeing Access Road) and SR 18 are **allowed only through the adjustment process**. These outfalls must comply with requirements of the *Green River Pump Operations Procedure Plan*, which establishes storage volumes and release rate criteria for developments proposing to ***construct or modify*** outfalls. Copies of the plan are available from DNRP.~~

G. SPILL CONTROL

Projects proposing to construct or replace onsite conveyance system elements that receive runoff from non-roof-top ***pollution-generating impervious surface*** must provide a spill control device as detailed in Section 4.2.1.1 prior to discharge from the ***site*** or into a *natural onsite drainage feature.*[24] More specifically, this requirement applies whenever a proposed project does either of the following:

- Constructs a new onsite conveyance system that receives runoff from non-roof-top ***pollution- generating impervious surface***, OR

- Removes and replaces an existing onsite conveyance system element that receives runoff from 5,000 square feet or more of non-roof-top ***pollution-generating impervious surface*** onsite.

The intent of this device is to temporarily detain oil or other floatable pollutants before they enter the downstream drainage system in the event of an accidental spill or illegal dumping. It may consist of a tee section in a manhole or catch basin, or an equivalent alternative as specified in Section 4.2.1.1. *Note that in addition to this spill control requirement to protect offsite and natural drainage systems, there are other spill control requirements in this manual for discharges to certain water quality facilities and all infiltration facilities (see the design criteria for water quality facilities in Chapter 6 and the general requirements for infiltration facilities in Section 5.2). The application of these requirements must be such that all stated intents are satisfied.*

H. GROUNDWATER PROTECTION

Any reach of new ditch or channel proposed by a project in which the untreated runoff from 5,000 square feet or more of ***pollution-generating impervious surface*** or ¾ acre or more of pollution-generating pervious surface comes into direct contact with an outwash soil must be **lined** with either:

a) a **low permeability liner** or a **treatment liner** consistent with the specifications for such liners in Section 6.2.4, OR

b) an imported soil **compacted till liner** meeting the following specifications:

[24] Natural onsite drainage feature means a natural swale, channel, stream, closed depression, wetland, or lake.

- Liner thickness shall be 18 inches after compaction.
- Imported soils must meet the gradation listed for compacted till liner in Section 6.2.4.
- Soil should be placed in 6-inch lifts.
- Soil shall be compacted to no less than 95% minimum dry density, modified proctor method (ASTM D-1557).

The intent of this requirement is to reduce the likelihood that pollutants will be discharged to groundwater when untreated runoff is conveyed in ditches or channels constructed in soils with high infiltration rates.

I. PUMP SYSTEMS

Pump systems may be used to convey water from one location or elevation to another within the ***project site*** provided they meet the design criteria specified for such systems in Section 4.2.3 and will be privately owned and maintained.

Pump systems discharging flows from the ***project site*** that would not have discharged by gravity flow under ***existing site conditions*** will require an approved adjustment to Core Requirement #1 (see Section 1.4, "Adjustment Process"). These pump systems will be considered only when they are necessary to prevent creation or aggravation of a flooding or erosion problem as specified in Section 1.2.2. Pump systems discharging to the Green River between River Mile 6 (South Boeing Access Road) and SR 18 must also comply with the *Green River Pump Operations Procedure Plan*.

J. FISH PASSAGE CULVERTS

Project proponents shall refer to Bothell Municipal Code (BMC) 14.04 for local fish passage culvert requirements. Conveyance standards detailed above may need to be changed to accommodate fish passage pursuant to BMC 14.04.

K. STORM SEWER CLOSED CIRCUIT TELEVISION INSPECTION

Before the City will issue final acceptance of the project, all new storm lines 12 inches or larger or in the public right-of-way must be inspected by Closed Circuit Television (CCTV) camera and footage provided to the City in DVD format. The City does not accept VHS tapes. CCTV operators must have Pipeline Assessment Certification Program (PACP) qualifications in order to upload data to the City's geographic information system (GIS).

The CCTV camera must have zoom capability and a swivel head lens capable of turning and rotating 180 degrees to provide inspection of lateral connections.

Each individual storm main inspection, from catch basin to catch basin, must be recorded on one digital file. The City will accept multiple digital files for a single pipe only when the pipe reach cannot be recorded to one digital file due to extreme pipe length or obstructions in the pipe. The City will not accept multiple storm main inspections recorded on a single digital file.

The City will not accept dirty, blurry, foggy, submerged, or otherwise non-viewable inspections.

Prior to inspection, the Contractor must have completed the manhole channeling, catch basin grouting, trench backfill, compaction, and final restoration of the street or easement. The City must have accepted the invert elevations and record drawings. All storm mains and laterals must be cleaned. All lines not clean must be re-flushed, cleaned, and re-inspected.

At least two days prior to the inspection, the Contractor must contact the City to inform the Inspector when and which lines will be inspected.

Immediately preceding the CCTV inspection, water must be poured into the system and must be visible on the DVD recording.

At the beginning of each storm main inspection, the information listed below must be electronically generated and displayed on the CCTV footage. These data must be continuously updated, and displayed on the CCTV footage, during the inspection.

1. Date of inspection
2. Contractor company name
3. Operator name
4. Upstream catch basin number to downstream catch basin number
5. Direction of inspection (upstream or downstream)
6. Pipe material and size

A 1-inch ball must be placed immediately in front of the camera, mounted such that the ball is visible and contacts the pipe bottom at all times. CCTV inspection cannot be paused once it begins. Only continuous inspections are acceptable. Pipe joints, catch basins, and lateral connections into catch basins must be thoroughly inspected by panning the entire connection, including manhole risers. Zooming inspection of all lateral connections is required.

The Contractor must bear all costs incurred in correcting any deficiencies found during the CCTV inspection, including the cost of any additional CCTV inspections that may be required by the City to verify that deficiencies have been corrected.

1.2.5 CORE REQUIREMENT #5: CONSTRUCTION STORMWATER POLLUTION PREVENTION

REQUIREMENT

All proposed projects that will clear, grade, or otherwise disturb the ***site*** must provide erosion and sediment controls to prevent, to the maximum extent practicable, the transport of sediment from the ***project site*** to downstream drainage facilities, water resources, and adjacent properties. All proposed projects that will conduct construction activities onsite or offsite must provide stormwater pollution prevention and spill controls to prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses. To prevent sediment transport and pollutant discharges as well as other impacts related to land-disturbing and construction activities, **Erosion and Sediment Control (ESC)** measures and **Stormwater Pollution Prevention and Spill Control (SWPPS)** measures that are appropriate to the ***project site*** must be applied through a comprehensive **Construction Stormwater Pollution Prevention (CSWPP) plan** as described in Sections 1.2.5.1 and 1.2.5.3 and shall perform as described in Section 1.2.5.2. In addition, these measures, both temporary and permanent, shall be implemented consistent with the requirements in Section 1.2.5.3 that apply to the proposed project.

Intent:

- To prevent the transport of sediment and other impacts, like increased runoff, related to land disturbing activities. Erosion of disturbed areas on construction sites can result in excessive sediment transport to adjacent properties and to surface waters. This sediment can result in major adverse impacts, such as

flooding from obstructed drainage ways, smothering of salmonid spawning beds, algal blooms in lakes, and exceedances of state water quality standards for turbidity. These impacts can also result from the increased runoff generated by land disturbing activities on construction sites.

- To prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses from construction-related activities such as materials delivery and storage, onsite equipment fueling and maintenance, demolition of existing buildings and disposition of demolition materials and other waste, and concrete handling, washout and disposal.

1.2.5.1 CSWPP MEASURES

Construction Stormwater Pollution Prevention (CSWPP) measures include **Erosion and Sediment Control (ESC)** measures and **Stormwater Pollution Prevention and Spill (SWPPS)** measures.

ESC MEASURES

Each of the following categories of ESC measures must be considered for application to the ***project site*** as detailed in the *Erosion and Sediment Control (ESC) Standards*. The ESC standards are located in the City of Bothell *Construction Stormwater Pollution Prevention Standards* adopted as Appendix D of this manual:

1. Clearing Limits
2. Cover Measures
3. Perimeter Protection
4. Traffic Area Stabilization
5. Sediment Retention
6. Surface Water Collection
7. Dewatering Control
8. Dust Control
9. Flow Control
10. Control Pollutants (also see SWPPS Measures below)
11. Protect Existing and Proposed Flow Control BMPs
12. Maintain BMPs
13. Manage the Project

SWPPS MEASURES

Each of the following categories of SWPPS measures must be considered for application to the ***project site*** as detailed in the *Stormwater Pollution Prevention and Spill Control (SWPPS) Standards*. The SWPPS standards are located in the City of Bothell *Construction Stormwater Pollution Prevention Standards* adopted as Appendix D of this manual:

- Follow effective pollutant handling and disposal procedures.
- Provide cover and containment for materials, fuel and other pollutants.
- Manage the project site to maximize pollutant control and minimize pollutant sources.
- Protect from spills and drips of petroleum products and other pollutants.
- Avoid over-application or untimely application of chemicals and fertilizers.

- Prevent or treat contamination of stormwater runoff by pH modifying sources.

1.2.5.2 CSWPP PERFORMANCE AND COMPLIANCE

The changing conditions typical of construction sites call for frequent field adjustments of existing ESC and SWPPS measures or additional ESC and SWPPS measures in order to meet required performance. In some cases, strict adherence to specified measures may not be necessary or practicable based on ***site*** conditions or project type. In other cases, immediate action may be needed to avoid severe impacts.

Therefore, careful attention must be paid to ESC and SWPPS performance and compliance in accordance with the following provisions:

A. CSWPP SUPERVISOR

For projects in Targeted or Full Drainage Review, the **applicant must designate a CSWPP supervisor** who shall be responsible for the performance, maintenance, and review of ESC and SWPPS measures and for compliance with all permit conditions relating to CSWPP as described in the *CSWPP Standards*. The applicant's selection of a CSWPP supervisor must be approved by the City. This approval may be rescinded for non-compliance, requiring the applicant to select another CSWPP supervisor and obtain City approval prior to continuing work on the project site. For projects that disturb one acre or more of land, the CSWPP supervisor must be a **Certified Professional in Erosion and Sediment Control** (see www.cpesc.net for more information) or a **Certified Erosion and Sediment Control Lead** whose certification is recognized by the City of Bothell.[25] The City may also require a certified ESC professional for sites smaller than one acre of disturbance if DDES determines that onsite ESC measures are inadequately installed, located, or maintained.

For larger, more sensitive sites, the City may require a certified ESC professional with several years of experience in construction supervision/inspection and a background in geology, soil science, or agronomy (See Appendix D, Section D.2.3.1 for more information).

B. MONITORING OF DISCHARGES

The CSWPP supervisor shall have a turbidity meter onsite and shall use it to monitor surface and storm water discharges from the ***project site*** and into onsite wetlands, streams, or lakes whenever runoff occurs from onsite activities and during storm events. If the ***project site*** is subject to a NPDES general permit for construction issued by the Washington State Department of Ecology (*Ecology*), then the project must comply with the monitoring requirements of that permit.

The CSWPP supervisor shall also use the specific SWPPS control BMP procedures for monitoring surface and stormwater discharge for pollutants and acceptable discharge levels. The CSWPP supervisor shall keep logs as required by the procedures of all measurements taken onsite and make them available to the City on request.

C. ESC PERFORMANCE

ESC measures shall be applied/installed and maintained to prevent, to the maximum extent practicable, the transport of sediment from the ***project site*** to downstream drainage systems or surface waters or into onsite wetlands, streams, or lakes or onto adjacent properties. This performance is intended to be achieved through proper selection, installation, and operation of the above ESC measures as detailed in the *CSWPP Standards* (detached Appendix D) and approved by the City. However, the CSWPP supervisor or the City may determine at any time during construction that the approved measures are not sufficient and that additional action is required based on one of the following criteria:

[25] The City of Bothell recognition of certification means that the individual has taken the City of Bothell-approved third-party training program and has passed the City of Bothell-approved test for that training program.

1. IF a turbidity test of surface and storm water discharges leaving the ***project site*** is greater than the benchmark value of 25 NTU (nephelometric turbidity units) set by the Washington State Department of Ecology, but less than 250 NTU, the CSWPP Supervisor shall do all of the following:

   a) Review the ESC plan for compliance and make appropriate revisions within 7 days of the discharge that exceeded the benchmark of 25 NTU, AND

   b) Fully implement and maintain appropriate ESC measures as soon as possible but no later than 10 days after the discharge that exceeded the benchmark, AND

   c) Document ESC implementation and maintenance in the ***site*** log book.

2. IF a turbidity test of surface or storm water entering onsite wetlands, streams, or lakes indicates a turbidity level greater than 5 NTU above background when the background turbidity is 50 NTU or less, or 10% above background when the background turbidity is greater than 50 NTU, then corrective actions and/or additional measures beyond those specified in Section 1.2.5.1 shall be implemented as deemed necessary by the City inspector or onsite CSWPP supervisor.

3. IF discharge turbidity is 250 NTU or greater, the CSWPP Supervisor shall do all of the following:

   a) Notify the City by telephone, AND

   b) Review the ESC plan for compliance and make appropriate revisions within 7 days of the discharge that exceeded the benchmark of 25 NTU, AND

   c) Fully implement and maintain appropriate ESC measures as soon as possible but no later than 10 days after the discharge that exceeded the benchmark, AND

   d) Document ESC implementation and maintenance in the ***site*** log book. AND

   e) Continue to sample discharges until turbidity is 25 NTU or lower, or the turbidity is no more than 10% over background turbidity.

4. IF the City determines that the condition of the construction site poses a **hazard to adjacent property** or may **adversely impact drainage facilities or water resources**, THEN additional measures beyond those specified in Section 1.2.5.1 may be required by the City.

D. SWPPS PERFORMANCE

SWPPS measures shall be applied/installed and maintained so as to prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses or onto adjacent properties. This performance is intended to be achieved through proper selection, installation, and operation of the above SWPPS measures as detailed in the *CSWPP Standards* (detached Appendix D) and approved by the City. However, the CSWPP supervisor designated per Section 1.2.5.2.A or the City may determine at any time during construction that such approved measures are not sufficient and additional action is required based on the criteria described in the specific SWPPS BMP standard and/or conditions of an approved adjustment:

E. FLEXIBLE COMPLIANCE

Some projects may meet the intent of Core Requirement #5 while varying from specific CSWPP requirements contained here and in the *CSWPP Standards*. If a project is designed and constructed to meet the intent of this core requirement, the City may determine that strict adherence to a specific ESC requirement is unnecessary; an approved adjustment (see Section 1.4) is not required in these circumstances. Certain types of projects are particularly suited to this greater level of flexibility, for instance, projects on relatively flat, well drained soils, projects that are constructed in closed depressions, or projects that only

disturb a small percentage of a forested site may meet the intent of this requirement with very few ESC measures. However, SWPPS requirements may actually be emphasized on well- drained soils, particularly in groundwater or well-protection protection areas, or in close proximity to water bodies. More information on intent and general ESC and SWPPS principles is contained in the *CSWPP Standards* in Appendix D.

F. ROADS AND UTILITIES

Road and utility projects often pose difficult erosion control challenges because they frequently cross surface waters and are long and narrow with limited area available to treat and store sediment-laden water. Because of these factors, road and utility projects are allowed greater flexibility in meeting the intent of Core Requirement #5 as described in the *CSWPP Standards*.

G. ALTERNATIVE AND EXPERIMENTAL MEASURES

All measures proposed for erosion and sediment control shall conform to the details and specifications in the *CSWPP Standards* unless an alternative is approved by the City, and if the alternative is a new technology, it must also be approved through Ecology's CTAPE program (see "Alternative and Experimental Measures" in the *CSWPP Standards*, detached Appendix D).

1.2.5.3 CSWPP IMPLEMENTATION

Proposed projects must identify, install, and maintain required erosion and sediment control and stormwater pollution prevention and spill control measures consistent with the following requirements:

A. CSWPP PLAN

As specified in Chapter 2, all proposed projects must submit a **CSWPP plan** for implementing CSWPP measures. The CSWPP plan is comprised of the **ESC plan and the SWPPS plan**. The **ESC plan** must show the location and details of all ESC measures as specified in Chapter 2 and the *CSWPP Standards* and shall include a **CSWPP report**, which contains additional directions and supporting information like a detailed construction sequence as proposed by the design engineer and any calculations or information necessary to size ESC measures and demonstrate compliance with Core Requirement #5. The CSWPP plan shall also contain plan notes that outline specific permit conditions as outlined in Appendix D Section D.4.2 Standard ESC and SWPPS Plan Notes. The City may require large, complex projects to phase construction and to submit multiple ESC plans for the different stages of construction. New CSWPP plans are not required for changes that are necessary during construction, unless required by the City inspector.

B. WET SEASON CONSTRUCTION

During the wet season (October 1 to April 30) any ***site*** with exposed soils shall be subject to the "Wet Season Requirements" contained in the *ESC Standards*. In addition to the ESC cover measures, these provisions include covering any newly-seeded areas with mulch and seeding as much disturbed area as possible during the first week of October to provide grass cover for the wet season. Other ESC measures such as baker tanks and portable sand filters may be required for use during the wet season. A separate "Wet Season" ESC plan shall be submitted and approved by the City before continuing work on any ***site*** during the wet season.

C. CONSTRUCTION WITHIN CRITICAL AREAS AND BUFFERS

Any construction that will result in disturbed areas on or within a stream or associated buffer, within a wetland or associated buffer, or within 50 feet of a lake shall be subject to the "Critical Area Restrictions" contained in the *CSWPP Standards*. These provisions include phasing the project whenever possible so that construction in these areas is limited to the dry season.

D. MAINTENANCE

All ESC and SWPPS measures shall be maintained and reviewed on a regular basis as prescribed in the *CSWPP Standards*.

E. FINAL STABILIZATION

Prior to obtaining final construction approval, the ***site*** shall be stabilized, structural ESC and SWPPS measures (such as silt fences, sediment traps and concrete waste collection pits) shall be removed, and drainage facilities shall be cleaned as specified in the *CSWPP Standards*. A separate ESC plan describing final stabilization may be required by the City prior to implementation.

F. CONSIDERATION OF OTHER REQUIRED PERMITS

Consideration should be given to the requirements and conditions that may be applied by other agencies as part of other permits required for land-disturbing activities. In particular, the following permits may be required and should be considered when implementing CSWPP measures:

- A **Class IV Special Forest Practices Permit** is required by the Washington State Department of Natural Resources for projects that will clear more than two acres of forest or 5,000 board feet of timber. All such clearing is also subject to the State Environmental Policy Act (RCW 43.21C) and will require SEPA review. The City of Bothell assumes lead agency status for Class IV permits, and the application may be consolidated with the associated City of Bothell development permit or approval.

- A **NPDES General Permit for Construction** (pursuant to the Washington State Department of Ecology's Construction Stormwater General Permit) is required for projects that will disturb one or more acres for purposes of constructing or allowing for construction of a development, or projects disturbing less than one acre that are part of a *larger common plan of sale*[26] that will ultimately disturb one or more acres

1.2.6 CORE REQUIREMENT #6: MAINTENANCE AND OPERATIONS

REQMT

Maintenance and operation of all drainage facilities is the responsibility of the ~~applicant or~~ property owner or facility owner.~~, except those facilities for which King County assumes maintenance and operation as described below and in KCC 9.04.115 and KCC 9.04.120.~~ Per BMC 18.04.270, drainage facilities must be maintained and operated in accordance with the maintenance standards in Appendix A of this manual, or other maintenance standards as approved by the City.

Intent: To ensure that the maintenance responsibility for drainage facilities is clearly assigned and that these facilities will be properly maintained and operated in perpetuity.

Drainage Facilities to be Maintained by the City of Bothell

The City of Bothell will assume maintenance and operation of certain conveyance systems and drainage facilities. Conveyance systems and drainage facilities to be maintained and operated by the City of Bothell must be located in a drainage easement, tract, or right-of-way granted to the City of Bothell. The City of Bothell will assume maintenance and operation of these through the right-of-way dedication, easement or

[26] Common plan of development or sale means a site where multiple separate and distinct construction activities may take place at different times or on different schedules, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g. a development where lots are sold to separate builders); 2) a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; and 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility.

tract processes. Note: *The City of Bothell* does not normally assume maintenance responsibility for *facilities or* conveyance systems that are outside of improved public road right-of-way.

~~King County will assume maintenance and operation of the following drainage facilities[27] for any residential subdivision with two or more lots, and any similar development where at least two-thirds of the developed contributing area is from single family or townhouse residential structures on individual lots, except where King County grants an adjustment per Section 1.4, allowing the facilities to be maintained by the homeowners association:~~

- Flow control and water quality facilities within a tract or right-of-way dedicated to King County.
- Flow control BMP devices within a tract or right-of-way dedicated to King County.
- Where serving public improvements, flow control BMP vegetated flow paths for full dispersion within an easement that includes provisions for access and maintenance. King County maintenance of these vegetated flow paths will be limited to their FCBMP functionality. All other maintenance shall remain the responsibility of the owner(s).

~~The conveyance system within improved public road right-of-way.~~

~~*Note: King County may assume maintenance of facilities serving any mix of developments as part of a shared facilities plan. See Reference Section 4-D for further guidance regarding the County's assumption of maintenance responsibility for shared facilities.*~~

~~King County **will assume maintenance** and operation of these facilities **two years after final construction approval** by DPER and an inspection by the County to ensure the facilities have been properly maintained and are operating as designed.~~

~~**Flow control and water quality facilities** and **flow control BMP devices** to be maintained and operated by King County must be located in a tract or right-of-way dedicated to King County. Required vegetated flow paths for full dispersion and basic dispersion BMPs require a recorded declaration of covenant that stipulates restrictions on use AND shall be located in an easement that includes provisions for access and maintenance. King County maintenance of these vegetated flow paths will be limited to their FCBMP functionality. All other maintenance shall remain the responsibility of the owner(s). Access roads serving these facilities must also be located in the tract or right-of-way and must be connected to an improved public road right-of-way. Underground flow control or water quality facilities (tanks or vaults) may be allowed in private rights-of-way or roads if the easement includes provisions for facility access and maintenance.~~

Drainage Facilities to be Maintained by Private Parties

All drainage facilities maintained privately or by other public agencies, except flow control BMPs, must be maintained as specified in **Appendix A**, "Maintenance Requirements for Flow Control, Conveyance, and WQ Facilities," and as further prescribed in **Chapter 6** for water quality facilities, unless otherwise approved by the City. A copy of the **Operation and Maintenance Manual** submitted as part of the permit application (see Section 2.3.1) shall be retained on ***site*** and shall be transferred with the property to the new owner. A log of maintenance activity indicating when cleaning occurred and where waste was disposed of shall also be kept by the owner and be available for inspection by the City.

~~All privately maintained **flow control BMPs** must be maintained as specified in the ***site*/lot's** declaration of covenant and grant of easement per Section 1.2.9~~

~~[27] *Note: King County does not assume maintenance of individual lot drainage systems or drainage stub-outs serving single family residential lot downspout, footing, or yard drains.*~~

Per BMC 18.04, the City of Bothell may inspect all privately maintained drainage facilities for compliance with these requirements.

~~If the property owner(s) fails to maintain their facilities to the acceptable standards, the County may issue a written notice specifying the required remedial actions and requiring a schedule for timely completion of the actions. If these actions are not performed in a timely manner, the County may enter the property to perform the actions needed and bill the property owner(s) for the cost of the actions. If a hazard to public safety exists, the County may perform remedial actions without written notice.~~

~~If the proposed project is a commercial, industrial, or multifamily development or redevelopment, or a single family residential building permit, a **drainage facility declaration of covenant and grant of easement** (see Reference Section 8-J) must be recorded at the King County Office of Records and Elections prior to engineering plan approval.~~

Private detention and water quality facilities for all single family residential developments shall be located in a private drainage tract, outside of the public right-of-way, unless approved in writing by the Public Works Director. For all other projects, detention facilities shall be located on private property.

Whenever a flow control or water quality facility or flow control BMP is proposed to be located on a parcel separate from the parcel or parcels containing the target surfaces mitigated by the facility or BMP, provisions must be made to ensure that the owner or owners of the target surfaces have a perpetual right to operate and maintain the facility. This may be done either by recording an easement granting this right to the owner(s) of the target surfaces, or by conveying the land on which the facility sits (or an interest therein) to the owner(s) of target surfaces.

If the proposed project is a **residential subdivision development**, all privately maintained conveyance systems or other drainage facilities that convey flows through private property must be located in a **drainage easement dedicated to convey surface and storm water**. Individual owners of the properties containing these easements must maintain the drainage facilities through their property. The legal instrument creating drainage easements on private property must contain language that requires a private property owner to obtain written approval from the City prior to removing vegetation (except by routine mowing) from any drainage easement containing open, vegetated drainage facilities (such as swales, channels, ditches, ponds, etc.). See Reference Section 8-L, "Drainage Easement," for guidance.

1.2.7 CORE REQUIREMENT #7: FINANCIAL GUARANTEES AND LIABILITY

REQMT

All drainage facilities constructed or modified for projects must comply with the financial guarantee requirements in Chapter 1, Section 1-5, of the City of Bothell Design and Construction Standards and Specifications, excepting those privately maintained flow control BMPs not serving a private road designed for 2 or more lots.

1.2.8 CORE REQUIREMENT #8: WATER QUALITY FACILITIES

REQMT

All proposed projects, including ***redevelopment projects***, must provide water quality (WQ) facilities to treat the runoff from those new and replaced ***pollution-generating impervious surfaces*** and new ***pollution-generating pervious surfaces*** targeted for treatment as specified in the following sections.

These facilities shall be selected from a menu of water quality facility options specified by the area-specific facility requirements in Section 1.2.8.1 and implemented according to the applicable WQ implementation requirements in Section 1.2.8.2.

Intent: To require an efficient, cost-effective level of water quality treatment tailored to the sensitivities and resource protection needs of the downstream receiving water to which the ***project site*** drains, or, in the case of infiltration, protection of the receiving groundwater system.

Guide to Applying Core Requirement #8

Core Requirement #8 requires that WQ facilities be provided to remove pollutants from runoff discharging from a ***project site*** in accordance with one of the three area-specific WQ facility requirements found in Section 1.2.8.1. At a minimum, basic treatment is required for all PGIS and PGPS as specified once given threshold areas are reached or exceeded. Certain land uses require ***Enhanced Basic*** treatment to address the likelihood of elevated heavy metals levels, or ***Enhanced Basic*** treatment may also be required under certain circumstances it would not otherwise be required, but where receiving waters are impaired.

For efficient application of Core Requirement #8, the following steps are recommended:

1. Check the exemption language below to determine if or which threshold discharge areas of the project site must provide WQ facilities per Core Requirement #8.
2. Use any necessary site-specific information to determine the WQ treatment requirements.
3. Comply with the requirements specified in Section 1.2.8.1 for the WQ treatment you identified above.
4. Consult Section 1.2.8.2 for other design requirements, allowances, and flexible compliance provisions related to implementing water quality treatment.
5. Consult Sections 1.2.2, Core Requirement #2: Offsite Analysis, 1.2.2.1, Downstream Analysis, and 1.2.2.1.2, Downstream Water Quality Problems Requiring Special Attention.

Other Important Information about Core Requirement #8

Core Requirement #8 is the primary component of an overall water quality protection strategy required by this manual. Other requirements include the following:

- Core Requirement #4: **Conveyance System, Spill Control Provisions**, Section 1.2.4 — This provision generally applies whenever a project constructs or replaces onsite conveyance system elements that receive runoff from ***pollution-generating impervious surfaces***. The provision requires that runoff from such impervious surfaces be routed through a spill control device prior to discharge from the ***project site*** or into a natural onsite drainage feature.

- Core Requirement #4: **Conveyance System, Groundwater Protection**, Section 1.2.4 — This provision requires that ditches/channels be lined as needed to reduce the risk of groundwater contamination when they convey runoff from ***pollution-generating impervious surfaces*** that comes into direct contact with an outwash soil.

- Special Requirement #4: **Source Control**, Section 1.3.4 — This requirement applies water quality source controls from the *King County Stormwater Pollution Prevention Manual* to commercial, industrial, and multifamily projects.

- Special Requirement #5: **Oil Control**, Section 1.3.5 — This requirement applies special oil controls to those projects proposing to develop or redevelop a ***high-use site***.

❑ EXEMPTIONS FROM CORE REQUIREMENT #8

There are four possible exemptions from the requirement to provide **a water quality facility** per Core Requirement #8:

1. Surface Area Exemption

A proposed project or any ***threshold discharge area*** within the ***site*** of a project is exempt if it meets all of the following criteria:

a) Less than 5,000 square feet of ***new*** **plus** ***replaced PGIS*** that is **not** ***fully dispersed*** will be created, AND

b) Less than ¾ acre of ***new PGPS*** that is **not** ***fully dispersed*** will be added.

2. Surface Exemption for Transportation Redevelopment Projects

A proposed ***transportation redevelopment project*** or any ***threshold discharge area*** within the ***site*** of such a project is exempt if it meets all of the following criteria:

a) The **total** ***new impervious surface*** within the project limits is less than 50% of the existing impervious surface, AND

b) Less than 5,000 square feet of ***new PGIS*** that is **not** ***fully dispersed*** will be added, AND

c) Less than ¾ acre of ***new PGPS*** that is **not** ***fully dispersed*** will be added.

3. Cost Exemption for Parcel Redevelopment Projects

A proposed ***redevelopment project*** on a single or multiple parcel ***site*** or any ***threshold discharge area***

within the ***site*** of such a project is exempt if it meets all of the following criteria:

a) The **total valuation** of the project's proposed improvements (including interior improvements and excluding required mitigation improvements) is less than 50% of the assessed value of the existing ***site*** improvements, AND

b) Less than 5,000 square feet of ***new PGIS*** that is **not** ***fully dispersed*** will be added, AND

c) Less than ¾ acre of ***new PGPS*** that is **not** ***fully dispersed*** will be added.

4. Soil Treatment Exemption

A proposed project or any drainage area within a project is exempt:

- If the runoff from ***pollution-generating impervious and pollution generating pervious surfaces*** is infiltrated in a facility per Section 5.2.1 in soils that meet the groundwater protection soil quality, depth, and infiltration rate criteria given in Section 5.2.1; <u>except for</u> areas that are within one-quarter-mile of a *sensitive lake*[28].

[28] ~~See Sensitive Lake in **Key Terms and Definitions**. Sensitive Lake is a designation applied by the County to lakes that are particularly prone to eutrophication from development-induced increases in phosphorus loading. Such lakes are identified on the Water Quality Applications Map adopted with this manual and found online at http://www.kingcounty.gov/environment/water-and-land/stormwater/documents/surface-water-design-manual.aspx or viewed via King County's iMap Interactive Mapping Tool at http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx~~

1.2.8.1 AREA-SPECIFIC WATER QUALITY REQUIREMENTS

REQMT

Projects subject to Core Requirement #8 must provide a water quality facility selected from a menu of water quality facility options identified in the area-specific facility requirements and exceptions for the WQ treatment area in which the proposed project or ***threshold discharge area*** of the proposed project is located. These WQ treatment areas are listed below and their requirements and exceptions are detailed in the following subsections:

A. Basic WQ Treatment Areas

B. Sensitive Lake WQ Treatment Areas

C. Sphagnum Bog WQ Treatment Areas.

Intent: To apply an appropriate level of water quality treatment based on the sensitivities of receiving waters for the drainage area in which the project lies. These drainage areas are ~~identified as WQ treatment areas on the WQ Applications Map adopted with this manual~~ described in the sections below. In addition to a minimum basic standard, which applies broadly to most geographic areas, special menus are provided for land uses that generate the highest concentrations of metals in stormwater and for ***sites*** within the watersheds of sensitive lakes, and sphagnum bog wetlands.

A. BASIC WQ TREATMENT AREAS

Basic WQ Treatment is required, at a minimum, within the City of Bothell for a general, cost-effective level of treatment sufficient for most land uses. Some land uses, however, will need an increased level of treatment because they generate high concentrations of metals in stormwater runoff and acute concentrations of metals in streams are toxic to fish. The water quality facility requirements for Basic WQ Treatment Areas provide for this increase in treatment.

*Note: Any **threshold discharge area** that drains to a sphagnum bog wetland larger than 0.25 acres in size as described in Subsection C, "Sphagnum Bog WQ Treatment Areas" is considered to be located within a Sphagnum Bog WQ Treatment Area and is subject to the facility requirement of that area only (i.e., required treatment menu, target surfaces, and exceptions).*

Required Treatment Menu

REQUIREMENT

Within Basic WQ Treatment Areas, a water quality facility option from the **Basic WQ menu** shall be used to treat runoff from the surfaces listed under "Target Surfaces" below, except where such treatment is waived or reduced by the area-specific exceptions at the end of this subsection and except where the Enhanced Basic WQ menu is applicable as follows.

If 50% or more of the runoff that drains to any proposed water quality facility is from one or more of the **following land uses**, then the **Enhanced Basic WQ menu** shall be used in place of the Basic WQ menu for the design of this facility, except if such treatment is waived or reduced by the area-specific exceptions at the end of this subsection:

1. Residential subdivision development in which the actual density of single family units is equal to or greater than 8 units per acre of developed area.

2. Commercial, industrial, or multifamily land use.

3. A road with an expected average daily traffic (ADT) count of 2,000 or more vehicles or expected to serve 200 or more homes. Note: those roads defined in *the City of Bothell Design and Construction Standards and Specifications* as urban subaccess streets, rural subaccess streets, urban minor access streets – residential, rural minor access streets – residential, urban subcollectors, and rural subcollectors all serve less than 100 homes by definition.

Treatment Goal and Options

The treatment goal for facility options in the **Basic WQ menu** is 80% removal of total suspended solids (TSS) for flows or volumes up to and including the WQ design flow or volume for a typical rainfall year, assuming typical pollutant concentrations in urban runoff[29]. TSS is the general performance indicator for basic water quality protection because it is the most obvious pollutant of concern. TSS is not a single pollutant —it is a general term for a highly variable mixture of solid pollutants with variable particle size and particle density distributions, and to one degree or another containing a variety of sorbed dissolvable pollutants. The Basic WQ menu includes facilities such as wetponds, combined detention/wetponds, bioswales, vegetated filter strips, and sand filters. See Chapter 6 for specific facility choices and design details. Additional facility designs may appear in Reference 14 in the future.

The treatment goal for facility options in the **Enhanced Basic WQ menu** is to accomplish better removal of heavy metals and potentially other toxic materials than can be achieved by basic treatment, while still meeting the basic treatment goal of 80% TSS removal,. The specific target performance is > 30% reduction of dissolved copper and > 60% removal of dissolved zinc. Dissolved copper and zinc are indicators of a wider range of metals typically found in urban runoff that are potentially toxic to fish and other aquatic life. The Enhanced Basic WQ menu includes options for use of a basic-sized stormwater wetland, a large sand filter, or a combination of two facilities in series. See Chapter 6 for specific facility options and designs. Additional facility designs may appear in Reference 14 in the future.

Intent

The **Basic WQ menu** is intended to be applied to both stormwater discharges draining to surface waters and those infiltrating into soils that do not provide adequate groundwater protection (see Exemptions 4 and 5 from Core Requirement #8). Overall, the 80% TSS removal objective, in conjunction with special requirements for source control and ***high-use site*** controls, should result in good stormwater quality for all but the most sensitive water bodies. Increased water quality treatment is necessary for developments that generate the highest concentrations of metals and for developments that drain to sensitive lakes and sphagnum bog wetlands.

Facility options in the **Enhanced Basic WQ menu** are intended to remove more metals than expected from those in the Basic WQ menu. Lower metal concentrations reduce the risk to fish from exposure to both chronic and acute toxic concentrations of metals such as copper and zinc, and very low concentration copper deleterious olfactory effects. As the toxicity of metals depends on their concentration, this standard is most effective for ***project sites*** with a larger proportion of ***pollution- generating impervious surface*** like roadways and medium to high density subdivisions. The Enhanced Basic WQ menu is intended to apply to all such ***project sites*** that drain by surface flows to a fish-bearing stream. However, projects that drain entirely by pipe to the ***major receiving waters*** listed in Table 1.2.3.B may be excused from the increased treatment and may revert to the Basic WQ menu because concentration effects are of less concern as the overall flow volume increases; however, this exception is not applicable for WQ impaired segments per Section 1.2.2.1: Downstream Analysis, and 1.2.2.1.2: Downstream Water Quality Problems Requiring Special Attention, Metals Problem (Type 4).

Target Surfaces

Facilities **in Basic WQ Treatment Areas** must treat (either directly or in effect) the runoff from the following target surfaces within the ***threshold discharge area*** for which the facility is required:

1. ***New PGIS*** that is **not *fully dispersed*** per the Criteria for Fully Dispersed Surfaces in Core Requirement #3, or **not *farmland dispersed*** as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new PGIS*** shall be assumed based on expected driveway size as approved by the City.

[29] The influent concentration range for demonstrated pollutant removal is 100 to 200 mg/L. For influent concentrations lower than 100 mg/l the effluent goal is equal to or less than 20 mg/l. For influent concentrations greater than 200 mg/l, the goal is greater than 80% TSS removal.

2. ***New PGPS*** that is **not *fully dispersed*** and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the ***site,*** or **not *farmland dispersed*** as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new pervious surface*** shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement.

3. **Existing impervious surface** added since January 8, 2001 that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, and not yet mitigated with a City-approved water quality facility or flow control BMP. *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*

4. ***Replaced PGIS*** that is **not *fully dispersed*** or **not *farmland dispersed*** as specified in Appendix C on a non-redevelopment project.

5. ***Replaced PGIS*** that is **not *fully dispersed*** on a ***transportation redevelopment project*** in which ***new impervious surface*** is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.

6. ***Replaced PGIS*** that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, on a **parcel *redevelopment project*** in which the total of new plus ***replaced impervious surface*** is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing ***site*** improvements.

Exceptions

The following exceptions apply only **in Basic WQ Treatment Areas**:

1. The facility requirement **in Basic WQ Treatment Areas** as applied to **target *PGPS*** may be waived altogether for:

   ~~an agricultural project if there is a good faith agreement with the King Conservation District to implement a farm management plan for agricultural uses per KCC 21A.24 and KCC 16.82, developed with King Conservation District; or~~

   land uses, the City approves a ***landscape management plan*** (LMP) that controls solids, pesticides, fertilizers, and other erodible or leachable materials leaving the ***site***. LMP requirements can be found in Reference Section 4-C. LMP submittal requirements are given in Section 2.3.1.5.

2. The **Enhanced Basic WQ menu** as specified above for certain land uses may be reduced to the **Basic WQ menu** for treatment of any runoff that is infiltrated per the standards of Section 5.2. This exception is not allowed where infiltrating within one-quarter-mile of a fresh water designated for aquatic life use or that has an existing aquatic life use into soils that do not meet the groundwater protection standards described in Section 5.2.1.

3. The **Enhanced Basic WQ menu** as specified above for certain land uses may be reduced to the **Basic WQ menu** for treatment of any runoff that is discharged directly, via a non-fish-bearing conveyance system, all the way to the ordinary high water mark of a stream with a mean annual flow of 1,000 cfs or more (at the discharge point of the conveyance system) or a lake that is 300 acres or larger. This exception does not apply where the receiving water is impaired as described in the full description of **major receiving water** in the *Bothell Design and Construction Standards* or is **impaired for metals** according to **Downstream Analysis**.

4. The **Enhanced Basic WQ menu** as specified above for treating runoff from a commercial land use may be reduced to the **Basic WQ menu** if all of the following criteria are met:

   a) A facility from the Enhanced Basic WQ menu is not feasible, AND

b) No leachable heavy metals are currently used or proposed to be used in areas of the ***site***, exposed to the weather, AND

c) A covenant is recorded that prohibits future such use of leachable , heavy metals on the ***site*** (use the covenant in Reference Section 8-Q), AND

d) Less than 50% of the runoff draining to the proposed water quality facility is from any area of the ***site*** comprised of one or both of the following land uses:

- Commercial land use with an expected ADT of 100 or more vehicles per 1,000 square feet of gross building area.
- Commercial land use involved with vehicle repair, maintenance, or sales.

5. The facility requirement as applied to ***replaced PGIS*** may be waived if the City has adopted a plan and implementation schedule for fulfilling this requirement using **regional facilities**.

B. SENSITIVE LAKE WQ TREATMENT AREAS

Sensitive Lake WQ Treatment Areas are designated by the City in the watersheds of lakes that have a combination of water quality characteristics and watershed development potential that makes them particularly prone to eutrophication induced by development.

Note: For any **threshold discharge area** that drains to a sphagnum bog wetland larger than 0.25 acres in size as described in Subsection D, "Sphagnum Bog WQ Treatment Areas," the requirements of Sphagnum Bog WQ Treatment Areas (i.e., required treatment menu, target surfaces, and exceptions) shall apply to the **threshold discharge area**.

Required Treatment Menu

REQUIREMENT

Within Sensitive Lake WQ Treatment Areas, a water quality facility option from the **Sensitive Lake Protection menu** shall be used to treat runoff from the surfaces listed under "Target Surfaces" below, except where such treatment is waived or reduced by the area-specific exceptions at the end of this subsection and except where the Enhanced Basic WQ menu is applicable as follows. If 50% or more of the runoff that drains to any proposed water quality facility is from one or more of the **following land uses**, then a water quality facility option common to both the **Sensitive Lake Protection menu and Enhanced Basic WQ menu** shall be used for the design of this facility, except if such treatment is waived or reduced by the area-specific exceptions at the end of this subsection:

1. Residential subdivision development in which the actual density of single family units is equal to or greater than 8 units per acre of developed area.

2. Commercial, industrial, or multifamily land use.

3. A road with an expected average daily traffic (ADT) count of 2,000 or more vehicles or expected to serve 200 or more homes. Note: those roads defined in *the City of Bothell Design and Construction Standards and Specifications* as urban subaccess streets, rural subaccess streets, urban minor access streets – residential, rural minor access streets – residential, urban subcollectors, and rural subcollectors all serve less than 100 homes by definition.

Treatment Goal and Options

The treatment goal for facility options in the Sensitive Lake Protection menu is 50% annual average total phosphorus (TP) removal assuming typical pollutant concentrations in urban runoff.[30] This goal was

[30] Phosphorus concentrations of between 0.10 and 0.50 mg/L are considered typical of Seattle area runoff (Table 1, "Water Quality Thresholds

chosen as a realistic and cost-effective level of phosphorus removal. The Sensitive Lake Protection menu includes options for using either Basic WQ facilities of larger size, combinations of two facilities in series,[31] or a single facility in combination with land use planning elements that reduce phosphorus. See Chapter 6 for specific facility options and design details.

On some developments or portions thereof that have surface uses that generate the highest concentrations of metals in stormwater runoff, the treatment goal is expanded to include > 30% reduction of dissolved copper and > 60% removal of dissolved zinc. This expanded goal requires use of a water quality facility option that is common to both the Sensitive Lake Protection menu and the Enhanced Basic menu.

Intent

A project discharging runoff via surface flow contributes phosphorus loading to a sensitive lake regardless of distance from the lake. If discharge is via infiltration through coarse soils, it is also possible that phosphorus would be transported through the ground for some distance without attenuation. This groundwater transport distance is considered to be typically no more than one- quarter mile. Therefore, onsite treatment using the **Sensitive Lake Protection menu** is required prior to infiltration within one-quarter mile of a sensitive lake. Infiltration through finer soils is expected to provide significant attenuation of TP, so the general groundwater protection criteria specified in Reference 11-B under "Soil Treatment Exemption" are considered sufficient for infiltration through finer soils.

Where the treatment goal is expanded to include > 30% reduction of dissolved copper and > 60% removal of dissolved zinc, the facility options common to both the Sensitive Lake Protection menu and the Enhanced Basic WQ menu should meet this goal as well as the lake protection goal of 50% removal of annual average total phosphorous. The intent behind the enhanced heavy metals removal goal and why it is applied is described in Section 1.8.1.A.

Target Surfaces

Facilities **in Sensitive Lake WQ Treatment Areas** must mitigate (either directly or in effect) the runoff from the following target surfaces within the ***threshold discharge area*** for which the facility is required:

1. ***New PGIS*** that is **not *fully dispersed*** per the Criteria for Fully Dispersed Surfaces in Core Requirement #3, or **not *farmland dispersed*** as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new PGIS*** shall be assumed based on expected driveway size as approved by the City.

2. ***New PGPS*** that is **not *fully dispersed*** and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the ***site,*** or **not *farmland dispersed*** as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new pervious surface*** shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement. *Note: where the runoff from **target PGPS** is separated from the runoff from **target PGIS**, the Basic WQ menu may be used in place of the Sensitive Lake Protection menu for treatment of runoff from the **target PGPS** (see the area-specific exceptions at the end of this subsection).*

3. **Existing impervious surface** added since January 8, 2001 that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, and not yet mitigated with a City-approved water quality facility or flow control BMP. *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*

4. ***Replaced PGIS*** that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, on a non-redevelopment project.

Decision paper," King County Surface Water Management Division, April 1994).

[31] *In series* means that the entire treatment water volume flows from one facility to the other in turn.

5. ***Replaced PGIS*** that is **not *fully dispersed*** on a ***transportation redevelopment project*** in which ***new impervious surface*** is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.

6. ***Replaced PGIS*** that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, on a **parcel *redevelopment project*** in which the total of new plus ***replaced impervious surface*** is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing ***site*** improvements.

Exceptions

The following exceptions apply only **in Sensitive Lake WQ Treatment Areas**:

1. The **Basic WQ menu** may be used in place of the **Sensitive Lake Protection menu** for treatment of any **runoff that is infiltrated** according to the standards in Section 5.2. This exception is not allowed where infiltrating within one-quarter-mile of a phosphorous sensitive receiving water or a tributary to that receiving water into soils that do not meet the groundwater protection standards described in Section 5.2.1.

2. Application of the **Enhanced Basic WQ menu** as specified above for certain land uses may be waived for treatment of any runoff that is infiltrated according to the standards in Section 5.2. This exception is not allowed where infiltrating within one-quarter-mile of a fresh water designated for aquatic life use or that has an existing aquatic life use into soils that do not meet the groundwater protection standards described in Section 5.2.1.

3. Application of the **Enhanced Basic WQ menu** as specified above for certain land uses may be waived for treatment of any runoff that is discharged, via a non-fish-bearing conveyance system, all the way to the ordinary high water mark of a stream with a mean annual flow of 1,000 cfs or more (at the discharge point of the conveyance system) or a lake that is 300 acres or larger. This exception is not applicable for WQ impaired segments per Section 1.2.2.1: Downstream Analysis, and 1.2.2.1.2: Downstream Water Quality Problems Requiring Special Attention, Metals Problem (Type 4).

4. The **Enhanced Basic WQ menu** as specified above for treating runoff from a commercial land use may be waived if the all of the following criteria are met:

   a) No leachable metals (e.g., galvanized metals) are currently used or proposed to be used in areas of the ***site***, exposed to the weather, AND

   b) A covenant is recorded that prohibits future such use of leachable metals on the ***site***, exposed to the weather (use the covenant in Reference Section 8-Q), AND

   c) Less than 50% of the runoff draining to the proposed water quality facility is from any area of the ***site*** comprised of one or both of the following land uses:

      - Commercial land use with an expected ADT of 100 or more vehicles per 1,000 square feet of gross building area.

      - Commercial land use involved with vehicle repair, maintenance, or sales.

5. The **Basic WQ menu** may be used for treatment of any runoff from **target *PGPS*** that is treated separately from the runoff from **target *PGIS***.

6. The facility requirement as applied to **target *PGPS*** may be waived altogether ~~for an agricultural project if there is a farm management plan for agricultural uses per KCC 21A.24 and KCC 16.82, or~~ if the City approves a ***landscape management plan*** (LMP) that controls solids, pesticides, fertilizers, and other erodible or leachable materials leaving the ***site***.

7. The facility requirement as applied to ***replaced PGIS*** may be waived if the City has adopted a plan and implementation schedule for fulfilling this requirement using **regional facilities**.

Note: If a lake management plan has been prepared and adopted by the City of Bothell, additional treatment and/or other water quality measures may be required as specified in the plan and pursuant to Special Requirement #1, Section 1.3.1.

C. SPHAGNUM BOG WQ TREATMENT AREAS

Sphagnum Bog WQ Treatment Areas are areas from which runoff drains to or otherwise comes into contact with the vegetation of a ***sphagnum bog wetland***[32] **larger than 0.25 acres in *size***.[33] These wetlands support unique vegetation communities, and they tend to develop in areas where water movement is minimized. Although sphagnum bog wetlands are typically isolated from significant sources of surface and ground water and receive their main water supply from rainfall, there are instances where they are components of larger wetlands and may be subject to inundation by those wetlands during high intensity or long duration runoff events. Sphagnum bog wetlands are generally uncommon in the Puget Sound area; of all the inventoried wetlands in King County, only a small percentage have sphagnum bog wetland components.[34]

Only a portion of all sphagnum bog wetlands have been identified and mapped by King County. Consequently, many of these wetlands and their contributing drainage areas must be identified during the wetland identification and delineation for a ***project site*** and during offsite analysis as required in Core Requirement #2. A list of identified sphagnum bog wetlands is included on the WQ Applications Map and in the 1997 King County Bog Inventory, updated November 2002; however, if a wetland that meets the definition of a sphagnum bog wetland is found downstream of a ***project site*** and runoff from the ***project site*** drains to or otherwise comes into contact with the wetland's vegetation, the ***project site*** is considered to be within a Sphagnum Bog WQ Treatment Area whether the wetland is listed or not.

*Note: Any **threshold discharge area** from which runoff drains to or comes into contact with the vegetation of a sphagnum bog wetland larger than 0.25 acres in size is considered to be within a Sphagnum Bog WQ Treatment Area regardless of the WQ treatment area indicated by the WQ Applications Map.*

REQMT

Required Treatment Menu

A treatment option from the **Sphagnum Bog Protection menu** shall be used to treat runoff from the target surfaces specified below, except where this mitigation is waived or reduced by the area-specific exceptions at the end of this subsection.

Treatment Goals and Options

The treatment goals for protection of sphagnum bog wetlands include the control of nutrients, alkalinity, and pH. Although these goals may change as additional information about these wetlands becomes available, target pollutant removals for sphagnum bog protection are currently as follows:

- Total phosphorus reduction of 50%
- Nitrate + nitrite reduction of 40%
- pH below 6.5

[32] A sphagnum bog wetland is defined as a wetland dominated by sphagnum moss and which has an associated acid-loving plant community. See the *Bothell Design and Construction Standards* for more details on how the City of Bothell defines a sphagnum bog wetland.
[33] The size of a sphagnum bog wetland is defined by the boundaries of the sphagnum bog plant community.
[34] Approximately 3% of wetlands in the 1990 sensitive areas inventory are either sphagnum bog wetlands or include portions of a lake or wetland with sphagnum bog wetland characteristics.

- Alkalinity below 10 mg $CaCO_3$/L.

Facility options to meet these goals are limited; therefore, the City discourages developments from discharging runoff to sphagnum bog wetlands. Where infiltration of developed area runoff is not feasible or applicable per Section 5.2, water quality facility options include a *treatment train*[35] of two or three facilities in series. One of the facilities in the train must be a sand filter. The order of facilities in the treatment train is important; see Chapter 6 for specific facility options and design details.

Intent

Sphagnum bog wetlands support unique vegetation communities that are extremely sensitive to changes in alkalinity and nutrients from surface water inputs. The most effective way to prevent these changes is to infiltrate or redirect developed area runoff so it does not come into contact with the vegetation of a sphagnum bog wetland. However, this is not practicable for most development projects due to soil constraints precluding infiltration (see Section 5.2) and the onerous nature of bypassing runoff around a wetland. Therefore, where runoff contact with sphagnum bog vegetation cannot be avoided, the bog protection menu seeks to minimize certain changes in the chemistry of developed area runoff to protect this unique vegetation. This menu applies not only to runoff that drains directly to a sphagnum bog wetland but to runoff that otherwise comes into contact with the bog's vegetation, such as through inundation of the bog by an adjacent water body during high intensity or long duration runoff events.

While water quality facility options emphasize reduction of mineral elements (alkalinity) and nutrients in the runoff, little is known about their ability to reduce alkalinity or to actually protect sphagnum- based plant communities. In addition, the effect of frequent water level changes on the sphagnum plant community is also unknown but could be damaging. Hence, it is best to avoid discharge to sphagnum bog wetlands whenever possible. Permeable pavements that are tributary to sphagnum bog wetlands should be types other than Portland cement (PCC) permeable pavement, if feasible.

Target Surfaces

Facilities **in Sphagnum Bog WQ Treatment Areas** must mitigate (either directly or in effect) the runoff from the following target surfaces within the ***threshold discharge area*** for which the facility is required:

1. ***New PGIS*** that is **not *fully dispersed*** per the Criteria for Fully Dispersed Surfaces in Core Requirement #3, or **not *farmland dispersed*** as specified in Appendix C . For individual lots within residential subdivision projects, the extent of ***new PGIS*** shall be assumed based on expected driveway size as approved by the City.

2. ***New PGPS*** that is **not *fully dispersed*** and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the ***site,*** or **not *farmland dispersed*** as specified in Appendix C. For individual lots within residential subdivision projects, the extent of ***new pervious surface*** shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement.

3. **Existing impervious surface** added since January 8, 2001 that is **not *fully dispersed*** or **not *farmland dispersed*** as specified in Appendix C and not yet mitigated with a City-approved water quality facility or flow control BMP. *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*

4. Replaced PGIS that is **not *fully dispersed,*** or **not *farmland dispersed*** as specified in Appendix C, on a non-redevelopment project.

[35] A treatment train is a combination of two or more treatment BMPs connected in series (i.e., the design water volume passes through each facility in turn).

5. ***Replaced PGIS*** that is **not *fully dispersed*** on a ***transportation redevelopment project*** in which ***new impervious surface*** is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.

6. ***Replaced PGIS*** that is **not *fully dispersed*** or **not *farmland dispersed*** as specified in Appendix C on a **parcel *redevelopment project*** in which the total of new plus ***replaced impervious surface*** is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing ***site*** improvements.

Exceptions

The following exceptions apply only **in Sphagnum Bog WQ Treatment Areas**:

1. The **Basic WQ menu** may be used in place of the Sphagnum Bog Protection menu for treatment of any **runoff that is infiltrated** in a facility per Section 5.2. This exception is not allowed where infiltrating within one-quarter-mile of a phosphorous sensitive receiving water or a tributary to that receiving water into soils that do not meet the groundwater protection standards described in Section

   5.2.1. If the infiltration facility is located in soils not meeting the groundwater protection standards described in Section 5.2.1, and within the prescribed distance of a sensitive lake, then the Sensitive Lake Protection menu shall be used.

2. The facility requirement for Sphagnum Bog WQ Treatment Areas may be reduced to that of the surrounding WQ treatment area (i.e., either the Basic WQ Treatment Area or Sensitive Lake Treatment Area, whichever contains the Sphagnum Bog WQ Treatment Area) for treatment of any ***replaced PGIS*** **runoff**.

*Note: Unlike other WQ treatment areas, the facility requirement for Sphagnum Bog WQ Treatment Areas as applied to **target PGPS** may **not** be waived through a **farm management plan** or **landscape management plan**.*

1.2.8.2 WATER QUALITY IMPLEMENTATION REQUIREMENTS

Water quality facilities shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. METHODS OF ANALYSIS AND DESIGN

Water quality facilities shall be analyzed and designed as detailed in Chapter 6.

B. SITING OF WATER QUALITY FACILITIES

Required water quality facilities shall be located so as to treat the runoff from all target surfaces, except as allowed below under "Treatment Trades" and "Untreated Discharges."

Any other onsite or offsite runoff draining to a proposed water quality facility must be treated whether it is from a **target pollution-generating surface** or not and regardless of whether the runoff has already been treated by another facility. The facility must be sized for all flows/volumes entering the facility. This is because treatment effectiveness is determined in part by the total volume of runoff entering the facility.

C. TREATMENT TRADES

The runoff from **target pollution-generating surfaces** may be released untreated if an existing non- targeted pollution-generating surface of equivalent size and pollutant characteristics lying within the same watershed or stream reach tributary area is treated on the ***project site***. Such substitution is subject to the following restrictions:

1. The existing non-targeted pollution-generating surface is not currently being treated, is not required to be treated by any phase of the proposed project, is not subject to NPDES or other permit requirements, and is not under a compliance order or other regulatory action, AND

2. The proposal is reviewed and approved by the City.

D. UNTREATED DISCHARGES

If ***site*** topographic constraints are such that runoff from a **target pollution-generating surface** must be pumped to be treated by the required water quality facility, then the City may allow the area's runoff to be released untreated (except for those ***project sites*** draining to a sphagnum bog wetland) provided that all of the following conditions are met:

1. Treatment of the constrained area by filter strip, bioswale, or a linear sand filter is not feasible, and a

   treatment trade as described above is not possible.

2. The untreated target surface is less than 5,000 square feet of ***new plus replaced PGIS***.

3. Any **target *PGPS*** within the area to be released untreated shall be addressed with a ***landscape management plan*** (LMP), which must be submitted to and approved by the City. The LMP applies to the entire site and all drainage area tributary to the site within one or more contiguous parcels under the same ownership or documented legal control.

E. USE OF EXPERIMENTAL WATER QUALITY FACILITIES

Water quality facilities other than those identified in Chapter 6, Reference 14-A, or Reference 14-B may be allowed on an experimental basis if it can be demonstrated that they are likely to meet the pollutant removal goal for the applicable receiving water. Use of such facilities requires an experimental design adjustment, which requires approval by the City according to Section 1.4, "Adjustment Process,", Section 6.7, "Alternative Facilities", and Reference 8-F, Section 2.0, Experimental Design Adjustment Process and Requirements. Any new treatment technologies must be approved through the state Department of Ecology's *TAPE*[36] or *CTAPE*[37] program before the technology can be considered by the City. Monitoring will be required, the nature of which will depend on the pre-existing Ecology use-level designation, the number of existing facilities of this design for which monitoring data already exists, and review of the monitoring results from those facilities. When sufficient data on performance and maintenance requirements have been collected and if both are acceptable, the new facility may be added to the appropriate water quality menu for common use through a blanket adjustment or update of this manual. Criteria may be set, which if not met, may require replacement of the facility with a standard facility from SWDM Chapter 6.

F. OWNER RESPONSIBILITY FOR WATER QUALITY

Regardless of the means by which a property owner chooses to meet the water quality requirements of this manual – whether a water quality facility, a train of facilities, a treatment trade or an experimental water quality facility – it is the responsibility of the property owner to ensure that runoff from their ***site*** does not create water quality problems or degrade beneficial uses downstream. It is also the responsibility of the property owner to ensure that the discharge from their property is not in violation of state and federal laws.

[36] Ecology W, 2011. Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies: Technology Assessment Protocol – Ecology (TAPE), Publication No. 11-10-061, 2011 ed. Washington State Department of Ecology, Lacey, WA, pp. 1-73. https://fortress.wa.gov/ecy/publications/summarypages/1110061.html

[37] Chemical Technology Assessment Protocol- Ecology

G. PHYSICAL SCREENING

Any above-ground stormwater facility will be screened from public right-of-way and adjacent property according to the underlying zoning perimeter buffer requirements in the BMC.

H. SINGLE FAMILY RESIDENTIAL FACILITY LOCATION

Treatment facilities for all single-family residential developments shall be located in a private tract, outside of the public right-of-way, unless approved in writing from the Public Works Director. For all other projects, treatment facilities shall be located on private property.

1.2.9 CORE REQUIREMENT #9: FLOW CONTROL BMPS

REQUIREMENT

All proposed projects, including ***redevelopment projects***, must provide onsite flow control BMPs to mitigate the impacts of storm and surface water runoff generated by ***new impervious surface***, ***new pervious surface***, existing impervious surfaces, and ***replaced impervious surface*** targeted for mitigation as specified in the following sections. Flow control BMPs must be selected and applied according to the basic requirements, procedures, and provisions detailed in this section and the design specifications for each BMP in Appendix C, Section C.2.

Flow control BMPs are methods and designs for dispersing, infiltrating, or otherwise reducing or preventing development-related increases in runoff at or near the sources of those increases. Flow control BMPs include, but are not limited to, preservation and use of ***native vegetated surfaces*** to fully disperse runoff; use of other pervious surfaces to disperse runoff; roof downspout infiltration; permeable pavements; bioretention; limited infiltration systems; and reduction of development footprint.

Intent: To provide mitigation of hydrologic impacts that are not possible/practical to mitigate with a flow control facility. Such impacts include increases in runoff volumes and flashiness and decreases in groundwater recharge. Increased runoff volume and flashiness leads to higher and more variable stream velocities at low flows and more frequent water level fluctuations in streams and wetlands. This causes wash-out and stranding of aquatic species, algal scour and washout of organic matter, loss of vegetation diversity and habitat quality, and disruption of cues for spawning, egg hatching, and migration. Decreased groundwater recharge reduces water supply for human use and summer base flows in streams, which is critical to water temperature, salmonid use of smaller streams, and the habitat quality of mainstem side channels and wetlands used for spawning, rearing, and flood refuge. Flow control BMPs seek to reduce runoff volumes and flashiness and increase groundwater recharge by reducing imperviousness and making use of the pervious portions of ***development sites*** to maximize infiltration and retention of stormwater onsite. Thus, the goal is to apply flow control BMPs to ***new*** impervious surfaces, new pervious surfaces, ***replaced impervious surfaces, and*** existing impervious surfaces added since January 8, 2001 (*effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon)* to the maximum extent feasible without causing flooding or erosion impacts.

❑ EXEMPTION FROM CORE REQUIREMENT #9

There is a single exemption from the flow control BMP provisions of Core Requirement #9:

Basic Exemption

A proposed project is exempt if it meets the following criteria:

a) Less than 2,000 square feet of ***new*** plus ***replaced impervious surface*** will be created, AND

b) Less than 7,000 square feet of land disturbing activity will occur.

1.2.9.1 FLOW CONTROL BMP REQUIREMENTS OVERVIEW

Projects that are subject to Core Requirement #9 must apply flow control BMPs to either supplement the flow mitigation provided by required flow control facilities or provide flow mitigation where flow control facilities are not required. All such flow control BMPs are detailed in Appendix C of this manual. Flow control BMPs must be implemented per the requirements and approach detailed in Sections 1.2.9.2 and

1.2.9.3 below for individual lots and subdivisions or road improvement projects, respectively. As described within Sections 1.2.9.2 and 1.2.9.3, there are two methods of satisfying the FCBMP requirement: (1) application of BMPs to the maximum extent feasible using lists specific to the project location, size, and impervious coverage; or (2) using a continuous runoff model to demonstrate compliance with the Low Impact Development (LID) Performance Standard, described below.

A. Target surfaces

Target surfaces for application of Core Requirement #9 (FCBMPs) include new impervious surfaces, new pervious surfaces, replaced impervious surfaces, and any existing impervious surfaces added on or after January 8, 2001 (the effective date of the Endangered Species Act "take prohibition" issued by the federal government to protect Puget Sound Chinook salmon) not already mitigated with an approved FCBMP or flow control facility.

Projects that trigger Core Requirement #9 by disturbing 7,000 square feet or more of land, but where new plus replaced impervious is less than 2,000 square feet, may consider basic dispersion as an equal choice for treating the target impervious surfaces alongside full infiltration, limited infiltration, bioretention, and permeable pavement FCBMPs. These projects are not required to meet the minimum BMP implementation requirements described in “Small Lot BMP Requirements” and “Large Lot BMP Requirements,” (Requirement #5 on both lists), and are not required to comply with Core Requirement #6.

Any impervious surface served by an infiltration facility designed in accordance with the flow control facility requirement (Section 1.2.3.1), the facility implementation requirements (Section 1.2.3.2), and the design criteria for infiltration facilities (Section 5.2) is exempt from the flow control BMPs requirement.

~~Any impervious or pervious surface served by the farmland dispersion BMP detailed in Appendix C, Section C.2.5, is exempt from the flow control BMPs requirement.~~

Projects or threshold discharge areas of projects qualifying as exempt from the flow control facility requirement using the Direct Discharge Exemption in accordance with Section 1.2.3.1 do not have to achieve the Low Impact Development (LID) performance standard (described below), nor consider bioretention, permeable pavement, and full dispersion. However, the soil moisture holding capacity of **new pervious surfaces** on those projects (or portions of projects) must be protected ~~in accordance with KCC~~

~~16.82.100 (F) and (G)~~; full infiltration as detailed in Appendix C, Section C.2.2, Basic Dispersion per Appendix C, Section C.2.4, and perforated pipe connection as detailed in Appendix C, Section C.2.11 must be implemented for roofs, if feasible; and Basic Dispersion per Appendix C, Section C.2.4 must be implemented for other impervious surfaces, if feasible.

B. Low Impact Development Performance Standard

The LID Performance Standard is defined as follows:

For the target surfaces subject to Core Requirement #9, *Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Assume* ***historic site conditions*** *as the predeveloped condition.*

Projects that are either required or opt to demonstrate compliance with the LID Performance Standard using a continuous runoff model must protect the soil moisture capacity of new pervious ~~in accordance with KCC16.82.100 (F) and (G)~~.

Projects that are required or opt to model compliance with the LID Performance Standard are still subject to meeting applicable area specific flow control requirements as determined in Core Requirement #3 (Section 1.2.3).

Note that when demonstrating compliance with the LID Performance Standard, flow control BMPs are modeled explicitly, utilizing design infiltration rates as determined and selected per Section 5.2.1.

However, when modeling flow control facility sizing, water quality facility sizing, and the peak flow exceptions from the area-specific flow control facility requirement in Sections 1.2.3.1.A, B, and C, these BMPs are not modeled explicitly , but may use modeling credits as allowed and subject to the limitations described in Section 1.2.9.4 and Table 1.2.9.A. FCBMPs used to demonstrate compliance with the LID Performance Standard must meet the implementation requirements described in Section 1.2.9.4.

C. Where demonstrating compliance with the LID Performance Standard is Required

Subdivision and road improvement projects on sites/lots 5 acres or larger are required to demonstrate compliance with the LID Performance Standard -- the only exception being that single family residential projects (excluding subdivisions creating 10 lots or more) may opt to fully comply with requirements described in Section 1.2.9.3.3, “Large Rural Subdivision and Large Rural Road Improvement Projects BMP Requirements”.

Non-subdivision projects making improvements on an individual site/lot **5 acres or larger** are required to either demonstrate compliance with the LID Performance Standard or fully comply with requirements described in Section 1.2.9.2.3, “Large Rural Lot BMP Requirements”.

Other project types that are not subject to this modeling requirement may opt to use it in lieu of the BMP selection and application requirements described in Sections 1.2.9.2 and 1.2.9.3 below.

D. Implementation

Four kinds of implementation for the FCBMP requirement are described in this section as follows:

1. For **non-subdivision projects making improvements on an individual site/lot**, implementation of this requirement shall be in accordance with the "Individual Lot BMP Requirements" in Section 1.2.9.2, which specify the selection of BMPs and the extent of their application on the site/lot. This required implementation of flow control BMPs must occur as part of the proposed project and provisions must be made for their future maintenance as specified in Section 1.2.9.2. As allowed in Sections 1.2.3 and 1.2.8, credits for the application of flow control BMPs per Table 1.2.9.A may be used to reduce the size of a required flow control facility, reduce the size of a water quality facility, qualify for a flow control facility exception or bypass of target surfaces, or reduce the target surfaces subject to flow control or water quality facility requirements.

2. Subdivision projects and road improvement projects on sites that are 5 acres or larger AND located outside the Urban Growth Area (UGA) (Not applicable within the City of Bothell.)

3. **For subdivision projects** ~~on sites less than 5 acres in size OR within the UGA~~, implementation of flow control BMPs for associated plat infrastructure improvements (e.g. roads, sidewalks) shall be done per Section 1.2.9.4 and must occur concurrently and as part of the proposed project, while BMPs associated with the individual lot improvements may be delayed until construction on the lots. As allowed in Sections 1.2.3 and 1.2.8, credits for the application of flow control BMPs per Table 1.2.9.A. may be used to reduce the size of a required flow control facility, reduce the size of a water quality facility, qualify for a flow control facility exception or bypass of target surfaces, or reduce the target surfaces subject to flow control or water

quality facility requirements. To use these credits, flow control BMPs must be implemented as part of the proposed project and provisions must be made for their future maintenance as specified in Section 1.2.9.4. For subdivision projects proposing to take credit for future implementation of BMPs on individual lots, provisions must be made to assure their implementation as specified in Section 1.2.9.4.

4. **For road improvement projects** ~~**on sites less than 5 acres in size OR within the UGA**~~, implementation of flow control BMPs must occur as part of the proposed project. As allowed in Sections 1.2.3 and 1.2.8, credits for the application of flow control BMPs per Table 1.2.9.A may be used to reduce the size of a required flow control facility, reduce the size of a water quality facility, qualify for a flow control facility exception or bypass of target surfaces, or reduce the target surfaces subject to flow control or water quality facility requirements. To use these credits, flow control BMPs must be implemented as part of the proposed project and provisions must be made for their future maintenance as specified in Section 1.2.9.4.

The information presented in this section is organized as follows:

- Section 1.2.9.2, "Individual Lot BMP Requirements"

  "Small Lot BMP Requirements," Section 1.2.9.2.1

  "Large Lot BMP Requirements," Section 1.2.9.2.2

  "Large Rural Lot BMP Requirements," Section 1.2.9.2.3

  "Implementation Requirements for Individual Lot BMPs," Section 1.2.9.2.4

- Section 1.2.9.3, "Subdivision and Road Improvement Projects BMP Requirements"

  "Small Subdivision and Urban Subdivision Projects BMP Requirements," Section 1.2.9.3.1

  "Small Road Improvement and Urban Road Improvement Projects BMP Requirements," Section 1.2.9.3.2

  "Large Rural Subdivision and Large Rural Road Improvement Projects BMP Requirements," Section 1.2.9.3.3

- Section 1.2.9.4, "Requirements for Use of BMP Credits "

  "Use of Credits by Subdivision Projects," Section 1.2.9.4.1

  "Use of Credits by Projects within Rights-of-Way," Section 1.2.9.4.2

1.2.9.2 INDIVIDUAL LOT BMP REQUIREMENTS

For projects on individual ***sites*/lots**, flow control BMPs must be selected and applied according to the individual lot BMP requirements in this section. For purposes of applying flow control BMPs to individual ***sites*/lots**, three categories of requirements have been established based on the size of ***site*/lot** subject to improvements by the project, the extent of impervious surface coverage resulting from the project on the ***site*/lot**. These categories of requirements are as follows:

- Small Lot BMP Requirements (for ***sites*/lots** <22,000 square feet)
- Large Lot BMP Requirements (for ***sites*/lots** ≥22,000 square feet and less than 5 acres)
- Large Rural Lot BMP Requirements (for ***sites*/lots** ≥ 5 acres)

Flow control BMPs must be applied in the order of preference and to the extent specified for the category of individual lot requirements applicable to the proposed project as described in the following subsections. *Note: for lots created by a previous subdivision, some or all of these requirements may have been addressed by flow control BMPs installed on the lots or within common areas, tracts, or road right-of- way. In some cases, the type of BMPs required for a subdivision lot have already been established by a recorded covenant on the lot. See Section 1.2.9.4 for more information on pre-installed or pre-determined BMPs in subdivisions.*

1.2.9.2.1. SMALL LOT BMP REQUIREMENTS

IF the proposed project is on a ***site*/lot smaller than 22,000 square feet**, THEN flow control BMPs must be applied as specified in the requirements below OR the project must demonstrate compliance with the LID Performance Standard (described in Section 1.2.9.1.B) using an approved continuous runoff model. Projects on small lots are typically single family residential improvements (e.g., homes, outbuildings, etc.) but could be a small commercial development.

1. The feasibility and applicability of full dispersion as detailed in Appendix C, Section C.2.1 must be evaluated for all target impervious surfaces. If feasible and applicable, **full dispersion** must be implemented as part of the proposed project. Typically, small lot full dispersion will be applicable only in subdivisions where enough forest was preserved by tract, easement, or covenant to meet the minimum requirements for full dispersion in Appendix C, Section C.2.1.1.

2. Where full dispersion of target impervious roof areas is not feasible or applicable, or will cause flooding or erosion impacts, the feasibility and applicability of full infiltration as detailed in Appendix C, Section C.2.2 must be evaluated (*note, this will require a soils report for the **site/lot***). If feasible and applicable, **full infiltration of roof runoff** must be implemented as part of the proposed project.

3. All target impervious surfaces not mitigated by Requirements 1 and 2 above, must be mitigated to the maximum extent feasible using one or more BMPs from the following list. Use of a given BMP is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Feasible BMPs are required to be implemented. The BMPs listed below may be located anywhere on the ***site*/lot** subject to the limitations and design specifications for each BMP. These BMPs must be implemented as part of the proposed project.

   - **Full Infiltration** per Appendix C, Section C.2.2, or per Section 5.2, whichever is applicable

   - **Limited Infiltration** per Appendix C, Section C.2.3,

   - **Bioretention** per Appendix C, Section C.2.6, sized as follows:

     - Within the City of Bothell (Rainfall region SeaTac 1.0 and less): In till soils, provide bioretention volume based on 0.6 inches of equivalent storage depth; in outwash soils provide bioretention volume based on 0.1 inches of equivalent storage depth,

     - Inside the UGA (Rainfall regions greater than SeaTac 1.0): (Not applicable to the City of Bothell.)

     - ~~Outside the UGA~~: (Not applicable to the City of Bothell.)

   - ~~**Permeable Pavement** per Appendix C, Section C.2.7,~~(Permeable pavement can be used as an infiltration option, but it is not a stand-alone requirement for the City of Bothell.)

4. All target impervious surfaces not mitigated by Requirements 1,2 and 3 above, must be mitigated to the maximum extent feasible using the Basic Dispersion BMP described below. Use of Basic Dispersion is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Feasible BMPs are required to be implemented. Basic Dispersion BMPs may be located anywhere on the ***site*/lot** subject to the limitations and design specifications cited in Appendix C. The BMP must be implemented as part of the proposed project.

   - **Basic Dispersion** per Appendix C, Section C.2.4,

5. BMPs must be implemented, at minimum, for an impervious area equal to at least 10% of the ***site*/lot** for ***site*/lot sizes up to 11,000 square feet** and at least 20% of the ***site*/lot** for ***site*/lot sizes between 11,000 and 22,000 square feet**. If these minimum areas are not mitigated using feasible BMPs from Requirements 1, 2,

3, and 4 above, either a fee in lieu of the required minimum BMPs must be paid (requires that the City of Bothell has established a program for determining and utilizing the fees for stormwater focused retrofit projects) OR one or more BMPs from the following list are required to be implemented to achieve compliance. These BMPs must be implemented as part of the proposed project.

- **Reduced Impervious Surface Credit** per Appendix C, Section C.2.9,
- **Native Growth Retention Credit** per Appendix C, Section C.2.10.

6. The soil moisture holding capacity of **new pervious surfaces** must be protected ~~in accordance with KCC 16.82.100 (F) and (G). KCC 16.82.100(F) requires that~~ by retaining the duff layer or native topsoil to the maximum extent practicable. ~~KCC 16.82.100(G) requires~~ Soil amendment must be implemented to mitigate for lost moisture holding capacity where compaction or removal of some or all of the duff layer or underlying topsoil has occurred. The amendment must be such that the replaced topsoil is a minimum of 8 inches thick, unless the applicant demonstrates that a different thickness will provide conditions equivalent to the soil moisture holding capacity native to the site. The replaced topsoil must have an organic content of 5-10% dry weight and a pH suitable for the proposed surface vegetation (for most soils in the City of Bothell, 4 inches of well-rotted compost tilled into the top 8 inches of soil is sufficient to achieve the organic content standard.) The amendment must take place between May 1 and October 1. The specifications for compost for soil amendment can be found in Reference 11-C.

7. Any proposed connection of roof downspouts to the *local drainage system* must be via a **perforated pipe connection** as detailed in Appendix C, Section C.2.11.

1.2.9.2.2. LARGE LOT BMP REQUIREMENTS

IF the proposed project is on a ***site*/lot** that is **22,000 square feet or larger, but is not a Large Rural Lot as defined in Section 1.2.9.2.3,** THEN flow control BMPs must be applied as specified in the requirements below OR the project must demonstrate compliance with the LID Performance Standard (described in Section 1.2.9.1.B) using an approved continuous runoff model.

1. The feasibility and applicability of **full dispersion** as detailed in Appendix C, Section C.2.1 must be evaluated for all ***target impervious surfaces***. If feasible and applicable for any such surface, then full dispersion must be applied to that surface and implemented as part of the proposed project. Typically, full dispersion will be applicable only on the largest ***sites*/lots** where there may be enough forest area available within a ***threshold discharge area*** to meet the 15% ratio of ***fully dispersed*** impervious area to ***native vegetated surface***.

2. Where full dispersion of target impervious roof areas is not feasible or applicable, or will cause flooding or erosion impacts, the feasibility and applicability of **full infiltration of roof runoff** must be evaluated in accordance with Appendix C, Section C.2.2, or Section 5.2, whichever is applicable based on the type of project.[38] If feasible and applicable, full infiltration of roof runoff must be implemented as part of the proposed project.

3. All target impervious surfaces not mitigated by Requirements 1 and 2 above, must be mitigated to the maximum extent feasible using one or more BMPs from the following list. Use of a given BMP is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Feasible BMPs are required to be implemented. The BMPs listed below may be located anywhere on the site/lot subject to the limitations and design specifications for each BMP. These BMPs must be implemented as part of the proposed project.

- **Full Infiltration** per Section C.2.2, or per Section 5.2, whichever is applicable,

[38] For projects subject to Simplified Drainage Review, and for any single family residential project subject to Full or Large Project Drainage Review, the design requirements and specifications in Appendix C, Section C.2.2 may be used for evaluation and design of full infiltration on individual lots. For all other projects, full infiltration must be evaluated and designed in accordance with the infiltration facility standards in Section 5.2.

- **Limited Infiltration** per Appendix C, Section C.2.3,

- **Bioretention** per Appendix C, Section C.2.6, sized as follows:

  - Within the City of Bothell (Rainfall region SeaTac 1.0 and less): In till soils, provide bioretention volume based on 0.6 inches of equivalent storage depth; in outwash soils provide bioretention volume based on 0.1 inches of equivalent storage depth

  - ~~Inside the UGA (Rainfall regions greater than SeaTac 1.0):~~ (Not applicable to the City of Bothell.),

  - ~~Outside the UGA~~: (Not applicable to the City of Bothell.),

- ~~**Permeable Pavement** per Appendix C, Section C.2.7,~~ (Permeable pavement can be used as an infiltration option, but it is not a stand-alone requirement for the City of Bothell.)

4. All target impervious surfaces not mitigated by Requirements 1, 2 and 3 above, must be mitigated to the maximum extent feasible using the Basic Dispersion BMP described below. Use of Basic Dispersion is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Feasible BMPs are required to be implemented. Basic Dispersion BMPs may be located anywhere on the ***site*/lot** subject the limitations and design specifications cited in Appendix C. The BMP must be implemented as part of the proposed project.

   - **Basic Dispersion** per Appendix C, Section C.2.4,

5. BMPs must be implemented, at minimum, for impervious area amounts defined as follows. For projects that will result in an impervious surface coverage on the buildable portion of the site/lot of less than 45%, flow control BMPs must be applied to 50% of target impervious surfaces. For projects that will result in an impervious surface coverage 45-65% on the buildable portion of the site/lot, flow control BMPs must be applied to 50% of target impervious surfaces reduced by 1.5% for each 1% of impervious surface coverage above 45% (e.g. impervious coverage of 55% results in a requirement of FCBMPs applied to 35% of target impervious surfaces). For projects that will result in an impervious surface coverage greater than 65% on the buildable portion of the site/lot, flow control BMPs must be applied to 20% of the target impervious surfaces or to an impervious area equal to at least 10% of the site/lot, whichever is less. The buildable portion of the site/lot is the total area of the site/lot minus any critical areas and minus 200 ft. buffer areas from **a steep slope hazard**, **landslide hazard area**, or **erosion hazard area**. If these minimum areas are not mitigated using feasible BMPs from Requirements 1, 2, 3, and 4 above, either a fee in lieu of the required minimum BMPs must be paid (requires that the City has established a program for determining and utilizing the fees for stormwater focused retrofit projects) OR one or more BMPs from the following list are required to be implemented to achieve compliance. These BMPs must be implemented as part of the proposed project.

   - **Reduced Impervious Surface Credit** per Appendix C, Section C.2.9,

   - **Native Growth Retention Credit** per Appendix C, Section C.2.10.

6. The soil moisture holding capacity of **new pervious surfaces** must be protected ~~in accordance with KCC 16.82.100 (F) and (G). KCC 16.82.100(F) requires that~~ by retaining the duff layer or native topsoil to the maximum extent practicable. ~~KCC 16.82.100(G) requires~~ Soil amendment must be implemented to mitigate for lost moisture holding capacity where compaction or removal of some or all of the duff layer or underlying topsoil has occurred. The amendment must be such that the replaced topsoil is a minimum of 8 inches thick, unless the applicant demonstrates that a different thickness will provide conditions equivalent to the soil moisture holding capacity native to the site. The replaced topsoil must have an organic content of 5-10% dry weight and a pH suitable for the proposed surface vegetation (for most soils in the City of Bothell, 4 inches of well-rotted compost tilled into the top 8 inches of soil is sufficient to achieve the

organic content standard.) The amendment must take place between May 1 and October. 1. The specifications for compost for soil amendment can be found in Reference 11-C.

7. Any proposed connection of roof downspouts to the drainage system must be via a **perforated pipe connection** as detailed in Appendix C, Section C.2.11.

1.2.9.2.3. LARGE RURAL LOT BMP REQUIREMENTS

IF the proposed project is on a ***site*/lot** that is **5 acres or larger,** THEN the project must demonstrate compliance with the LID Performance Standard (described in Section 1.2.9.1.B) using an approved continuous runoff model.

As an alternative to demonstrating compliance with the LID Performance Standard via modeling as described above, agricultural projects and single family residential projects (excluding subdivisions creating 10 lots or more) are given the option to apply flow control BMPs as specified in the requirements below.

1. The feasibility and applicability of full dispersion as detailed in Section C.2.1 must be evaluated for all target impervious surfaces. If feasible and applicable, **full dispersion** must be implemented as part of the proposed project. Typically, full dispersion will be applicable only to ***sites*/lots** or portions of ***sites*/lots** where enough forest is preserved by a ~~clearing limit per KCC 16.82 or by~~ recorded tract, easement, or covenant to meet the minimum requirements for full dispersion in Section C.2.1.1.

2. Where full dispersion of target impervious roof areas is not feasible or applicable, or will cause flooding or erosion impacts, the feasibility and applicability of **full infiltration of roof runoff** must be evaluated in accordance with Section C.2.2, or Section 5.2, whichever is applicable based on the type of project.[39] If feasible and applicable, full infiltration of roof runoff must be implemented as part of the proposed project.

3. All target impervious surfaces not mitigated by Requirements 1 and 2 above, must be mitigated using one or more BMPs from the following list. Use of a given BMP is subject to evaluation of its feasibility and applicability as detailed in Appendix C. The BMPs listed below may be located anywhere on the site/lot subject to the limitations and design specifications for each BMP. These BMPs must be implemented as part of the proposed project.

   - **Full Infiltration** per Section C.2.2, or per Section 5.2, whichever is applicable,
   - Limited Infiltration per Section C.2.3,
   - **Bioretention** per Section C.2.6, sized as follows: In till soils, provide bioretention volume based on 1.9 inches of equivalent storage depth; in outwash soils, provide bioretention volume based on 1.0 inches of equivalent storage depth,
   - **Basic Dispersion** per Section C.2.4 followed by **Bioretention** per Section C.2.6, with bioretention sized as follows: In till soils, provide bioretention volume based on 0.9 inches of equivalent storage depth; in outwash soils, provide bioretention volume based on 0.2 inches of equivalent storage depth,
   - ~~**Permeable Pavement** per Section C.2.7,~~ (Permeable pavement can be used as an infiltration option, but it is not a stand-alone requirement for the City of Bothell.)

4. The soil moisture holding capacity of **new pervious surfaces** must be protected ~~in accordance with KCC 16.82.100 (F) and (G). KCC 16.82.100(F) requires that~~ by retaining the duff layer or native topsoil to the

[39] For projects subject to Simplified Drainage Review, and for any single family residential project subject to Full, Directed, or Large Project Drainage Review, the design requirements and specifications in Appendix C, Section C.2.2 may be used for evaluation and design of full infiltration on individual lots. For all other projects and any project proposing a full infiltration system serving more than one lot, full infiltration must be evaluated and designed in accordance with the infiltration facility standards in Section 5.2.

maximum extent practicable. ~~KCC 16.82.100(G) requires~~ Soil amendment must be implemented to mitigate for lost moisture holding capacity where compaction or removal of some or all of the duff layer or underlying topsoil has occurred. The amendment must be such that the replaced topsoil is a minimum of 8 inches thick, unless the applicant demonstrates that a different thickness will provide conditions equivalent to the soil moisture holding capacity native to the site. The replaced topsoil must have an organic content of 5-10% dry weight and a pH suitable for the proposed surface vegetation (for most soils in the City of Bothell, 4 inches of well-rotted compost tilled into the top 8 inches of soil is sufficient to achieve the organic content standard.) The amendment must take place between May 1 and October 1. The specifications for compost for soil amendment can be found in Reference 11-C.

5. BMPs must be applied to all new pervious surfaces according to the order of preference and extent of application specified in the following requirements:

   A. The feasibility and applicability of full dispersion as detailed in Section C.2.1 must be evaluated for all new pervious surface. If feasible and applicable, full dispersion must be implemented as part of the proposed project. Typically, full dispersion will be applicable only to sites/lots or portions of sites/lots where enough forest is preserved by a ~~clearing limit per KCC 16.82 or by~~ recorded tract, easement, or covenant to meet the minimum requirements for full dispersion in Section C.2.1.1.

   B. For that portion of new pervious surface not addressed in Requirement A above, one or more of the following BMPs must be implemented as part of the proposed project.

      - **Basic Dispersion** per Section C.2.4, onto native vegetated surfaces only

      - **Bioretention** per Appendix C, Section C.2.6, sized as follows: In till soils, provide bioretention volume based on 0.7 inches of equivalent storage depth; in outwash soils, provide bioretention volume based on 0.006 inches of equivalent storage depth

      - Limited Infiltration per Section C.2.3

1.2.9.2.4. INDIVIDUAL LOT BMP IMPLEMENTATION

The flow control BMPs required in Sections 1.2.9.2 above must be implemented generally based on the elements outlined below; however, applicants should contact the City for specific requirements:

1. **Implementation Responsibility.** All flow control BMPs required for the ***site*/lot** must be implemented (installed) by the applicant as part of the proposed project unless they have already implemented as part of a subdivision project that created the lot per Section 1.2.9.4.

2. **Maintenance Responsibility.** Maintenance of all required flow control BMPs is the responsibility of the owner of the ***site*/lot** served by these BMPs. The responsibility for such maintenance must be clearly assigned to the current and future owners of the ***site*/lot** through a "declaration of covenant and grant of easement" as described in Requirement 3 below.

3. **Declaration of Covenant and Grant of Easement.** To ensure future maintenance of flow control BMPs and allow for City inspection of BMPs, a declaration of covenant and grant of easement must be recorded for each ***site*/lot** that contains flow control BMPs. A draft of the proposed covenant must be reviewed and approved by the City prior to recording. All required covenants must be recorded prior to final construction approval for the proposed project. If the individual ***site*/lot** contains or will contain flow control or water quality facilities, then the drainage facility covenant in Reference Section 8-J (or equivalent) must be used. Otherwise, the flow control BMP covenant in Reference Section 8-M (or equivalent) must be used, and is designed to achieve the following:

a) Provide **notice** to future owners of the presence of flow control BMPs on the lot and the responsibility of the owner to retain, uphold, and protect the flow control BMP devices, features, pathways, limits, and restrictions.

b) Include as an **exhibit**, a *recordable version*[40] of the following drainage plan information:

- The **flow control BMP site plan** showing all developed surfaces (impervious and pervious) and the location and dimensions of flow control BMP devices, features, flowpaths (if applicable), and limits of native growth retention areas (if applicable). This plan(s) must be to scale and include ***site*** topography in accordance with the specifications for such plans in Appendix C, Section C.4.2. Also indicate any areas where City access is excluded (see paragraph 3.d below). *Note: The City may waive this element if, for example, the only flow control BMP proposed is a limit on impervious surface (reduced footprint).*

- The **flow control BMP design and maintenance details** for each flow control BMP per Appendix C, Section C.4.3. This includes a diagram (if applicable) of each flow control BMP device or feature and written maintenance and operation instructions and restrictions for each device, feature, flowpath (if applicable), native growth retention area (if applicable) and impervious surface coverage (if applicable). See Reference M for prepared 8-1/2"x11" maintenance instruction sheets. See http://www.kingcounty.gov/environment/water-and- land/stormwater/documents/surface-water-design-manual.aspx for downloadable BMP details.

Assure the exhibits are correctly cross-referenced in the declaration of covenant (the site plan is typically Exhibit A and the design/maintenance details are typically Exhibit B).

c) Require that each flow control BMP be operated and **maintained at the owner's expense** in accordance with the above exhibit.

d) Grant the City of Bothell or its successor the **right to enter** the property at reasonable times for purposes of inspecting the flow control BMPs and to perform any corrective maintenance, repair, restoration, or mitigation work on the flow control BMPs that has not been performed by the property owner within a reasonable time set by the City, and to charge the property owner for the cost of any maintenance, repair, restoration, or mitigation work performed by the City of Bothell.

The right to enter typically applies to the entire property, but occasionally excepts areas on the property agreed upon by the City to be excluded from access. Such areas are to be shown on the site plan described above.

e) Prohibit any **modification or removal** of flow control BMPs without written approval from the City of Bothell. In cases where the modification or removal is done under a City of Bothell development permit, the approval must be obtained from the City (or its successor) and a covenant must be recorded to reflect the changes. Approval will be granted only if equivalent protection in terms of hydrologic performance is provided by other means.

4. **Timing of Implementation.** All required flow control BMPs must be installed prior to final inspection approval of constructed improvements. For BMPs that rely on vegetation, the vegetation must be planted and starting to grow prior to final construction approval.

[40] Recordable version means one that meets the City of Bothell's "Standard Formatting Requirements for Recording Documents" pursuant to RCW 36.18.010 and 65.04.045, available online at http://your.kingcounty.gov/recelec/records/docs/formatting_requirements.pdf or from the City of Bothell Recorder's Office. These requirements include specifications for such things as page size (81/2" x 14" or smaller), font size (at least 8-point), and margin width (1" on all sides of every page if there is a standard cover sheet).

5. **Acceptance standards.** Flow control BMPs may be inspected during and/or following construction. Approval of the constructed BMPs will be based on verification that the materials and placement appear to meet the specifications and that the BMPs appear to function as designed. Onsite observations may be used to verify that materials are as specified and material receipts checked. Performance may be evaluated by a ***site*** visit while it is raining or by testing with a bucket of water or garden hose to check pavement permeability or proper connection to BMP devices/features, etc.

6. **Drainage concerns.** If the City determines that there is a potential for drainage impacts to a neighboring property, then additional measures may be required. Some flow control BMPs may not be appropriate in certain situations, and will not be allowed by the City where they may cause drainage problems.

7. **Geotechnical concerns.** A geotechnical engineer, engineering geologist, or the City staff geologist must evaluate and approve flow control BMPs that are proposed: (A) on slopes steeper than 15%; (B) within a setback from the top of slope equal to the total vertical height of the slope area that is steeper than 15%; or (C) within 200 feet of a ***steep slope hazard area***, ***erosion hazard area***, or ***landslide hazard area.*** In addition, the City may require review by a geotechnical engineer or engineering geologist of any proposed BMP that infiltrates, disperses, or directs overflow adjacent to or towards a steep ***slope hazard area***, ***erosion hazard area***, or ***landslide hazard area.*** The City may also require some projects to route flows down or around such slopes using non-perforated pipes. Some flow control BMPs may not be appropriate for these locations, and will not be allowed by the City where flows may cause erosion problems.

8. **Sewage system concerns.** If the City determines that there is a potential conflict between onsite sewage systems and flow control BMPs, additional measures may be required. Some projects may need to route flows past onsite sewage systems using non-perforated pipes. Also, some flow control BMPs may not be appropriate for these ***sites***, and will not be allowed where sewage systems may be impacted.

1.2.9.2.5. PHYSICAL SCREENING

Any above-ground stormwater facility will be screened from public right-of-way and adjacent property according to the underlying zoning perimeter buffer requirements in the BMC.

1.2.9.2.6. SINGLE FAMILY RESIDENTIAL FACILITY LOCATION

Detention facilities for all single-family residential developments shall be located in a private detention tract, outside of the public right-of-way, unless approved in writing from the Public Works Director. For all other projects, detention facilities shall be located on private property.

1.2.9.3 SUBDIVISION AND ROAD IMPROVEMENT PROJECTS BMP REQUIREMENTS

For subdivision and road improvement projects, flow control BMPs must be selected and applied according to the subdivision and road improvement projects BMP requirements in this section. For purposes of applying flow control BMPs to these projects, ~~three~~ categories of requirements have been established based on the ~~size of ***site/lot*** subject to~~ improvements by the project ~~**and the location of the project relative to Urban Growth Area boundaries**~~. These categories of requirements are as follows:

- Subdivision Projects BMP Requirements
- Road Improvement Projects BMP Requirements

Flow control BMPs must be applied in the order of preference and to the extent specified for the category of requirements applicable to the proposed project as described in the following subsections.

1.2.9.3.1. SUBDIVISION PROJECTS BMP REQUIREMENTS

IF the proposed project is a **subdivision project**, THEN Flow control BMPs for plat infrastructure improvements (e.g., road and sidewalk etc.) of these projects shall meet the requirements described in Section 1.2.9.3.2 below for "Road Improvement Project BMP Requirements." Implementation of flow control BMPs required for/on the individual lots of the subdivision may be deferred until a permit is obtained for construction on each lot and is therefore optional. However, if the applicant wishes to implement or make provision for implementation of BMPs for the lot improvements as part of the subdivision project for purposes of receiving BMP modeling credits, the individual lot BMP requirements described in Section 1.2.9.2 and implementation requirements for subdivision projects described Section 1.2.9.4.1 must be met.

1.2.9.3.2. ROAD IMPROVEMENT PROJECTS BMP REQUIREMENTS

IF the proposed project is a **road improvement project**, THEN flow control BMPs must be applied as specified in the requirements below.

1. The feasibility and applicability of full dispersion as detailed in Appendix C, Section C.2.1 must be evaluated for all target impervious surfaces. If feasible and applicable, **full dispersion** must be implemented as part of the proposed project. Typically, small lot full dispersion will be applicable only in subdivisions where enough forest was preserved by tract, easement, or covenant to meet the minimum requirements for full dispersion in Appendix C, Section C.2.1.1.

2. All target impervious surfaces not mitigated by Requirement 1 above, must be mitigated to the maximum extent feasible using one or more BMPs from the following list. Use of a given BMP is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Infeasible BMPs are not required to be implemented. The BMPs listed below may be located anywhere on the ***site*/lot** subject to the limitations and design specifications for each BMP. These BMPs must be implemented as part of the proposed project.

   - **Full Infiltration** per Section C.2.2, or per Section 5.2, whichever is applicable,

   - **Limited Infiltration** per Appendix C, Section C.2.3,

   - **Bioretention** per Appendix C, Section C.2.6, sized as follows:

     - Within the City of Bothell (Rainfall region SeaTac 1.0 and less): In till soils, provide bioretention volume based on 0.6 inches of equivalent storage depth; in outwash soils provide bioretention volume based on 0.1 inches of equivalent storage depth,

     - ~~Inside the UGA (Rainfall regions greater than SeaTac 1.0): In till soils, provide bioretention volume based on 0.8 inches of equivalent storage depth; in outwash soils, provide bioretention volume based on 0.4 inches of equivalent storage depth,~~ Not applicable to the City of Bothell.

     - ~~Outside the UGA: In till soils, provide bioretention volume based on 1.9 inches of equivalent storage depth; in outwash soils provide bioretention volume based on 1.0 inches of equivalent storage depth,~~ Not applicable to the City of Bothell.

   - ~~**Permeable Pavement** per Appendix C, Section C.2.7,~~ (Permeable pavement can be used as an infiltration option, but it is not a stand-alone requirement in the City of Bothell.)

3. All target impervious surfaces not mitigated by Requirements 1 and 2 above, must be mitigated to the maximum extent feasible using the Basic Dispersion BMP described below. Use of Basic Dispersion is subject to evaluation of its feasibility and applicability as detailed in Appendix C. Infeasible BMPs are not required to be implemented. Basic Dispersion BMPs may be located anywhere on the ***site*/lot** subject to the

limitations and design specifications cited in Appendix C. The BMPs must be implemented as part of the proposed project.

- **Basic Dispersion** per Appendix C, Section C.2.4,

4. The soil moisture holding capacity of **new pervious surfaces** must be protected ~~in accordance with KCC 16.82.100 (F) and (G). KCC 16.82.100(F) requires that~~ by retaining the duff layer or native topsoil to the maximum extent practicable. ~~KCC 16.82.100(G) requires~~ Soil amendment must be implemented to mitigate for lost moisture holding capacity where compaction or removal of some or all of the duff layer or underlying topsoil has occurred. The amendment must be such that the replaced topsoil is a minimum of 8 inches thick, unless the applicant demonstrates that a different thickness will provide conditions equivalent to the soil moisture holding capacity native to the site. The replaced topsoil must have an organic content of 5-10% dry weight and a pH suitable for the proposed surface vegetation (for most soils in the City of Bothell, 4 inches of well-rotted compost tilled into the top 8 inches of soil is sufficient to achieve the organic content standard.) The amendment must take place between May 1 and October 1. The specifications for compost for soil amendment can be found in Reference 11-C.

1.2.9.3.3. LARGE RURAL SUBDIVISION AND LARGE RURAL ROAD IMPROVEMENTS

(Not used within the City of Bothell.)

1.2.9.4 REQUIREMENTS FOR USE OF BMP CREDITS

Projects that implement flow control BMPs, whether required or optional, may use the flow control BMP credits described in this section subject to the implementation requirements in Section 1.2.9.2.4 (for Individual Lots), Section 1.2.9.4.1 below (for Subdivision Projects), and Section 1.2.9.4.2 below (for Right of Way Projects). Two kinds of credits are available:

First, any impervious surface served by a flow control BMP that meets the design specifications for that BMP in Appendix C may be modeled as indicated in Table 1.2.9.A (below). Such credits may be used in the following situations:

1. To compute post-development runoff time series when sizing required flow control facilities.

2. To compute post-development 100-year peak flows when assessing any of the peak flow exceptions from the area-specific flow control facility requirement in Sections 1.2.3.1.A, B, and C.

3. To compute post-development runoff time series when sizing required flow rate based water quality facilities (e.g. bioswales) and to re-characterize post developed land types when sizing volume based water quality facilities (e.g. wetponds, wetvaults).

Use of credits for water quality facility sizing as described above is limited to BMPs that are treating flows downstream from the BMP and tributary to a required water quality facility.

Second, any impervious or non-native pervious surface that is ***fully dispersed*** per the full dispersion criteria in Section 1.2.3.2.C is **not** considered a target surface of the area-specific flow control facility requirement (Section 1.2.3.1) or the area-specific water quality facility requirement (Section 1.2.8.1).

1.2.9.4.1. USE OF CREDITS BY SUBDIVISION PROJECTS

If a proposed project is a *subdivision project*,[41] implementation of flow control BMPs for plat infrastructure improvements (e.g. road, sidewalk, or other non-lot improvements) is required concurrent with the subdivision

[41] For purposes of applying flow control BMPs, the term subdivision or subdivision project refers to any project that is a short plat, plat, or binding site plan.

improvements. Implementation of flow control BMPs on the individual lots of the subdivision may be deferred until a permit is obtained for construction on each lot and is therefore optional as part of the subdivision project.

In order to receive the modeling credits (noted above) for flow control BMPs required for plat infrastructure improvements (e.g. road, sidewalk, or other non-lot improvements), and/or for individual lot BMPs where the applicant elects to implement or make provision for implementation of individual lot BMPs as part of the subdivision project, the following requirements must be met depending on where the BMPs are located on the ***site***.

TABLE 1.2.9.A FLOW CONTROL BMP FACILITY SIZING CREDITS(1)

Flow Control BMP Type	Facility Sizing Credit
Full dispersion	Model fully dispersed surface as forest(2)
Full infiltration(3)	Subtract impervious area that is fully infiltrated
Limited infiltration	Model tributary impervious surface as 90% impervious, 10% grass
Basic dispersion	Model dispersed impervious surface as 90% impervious, 10% grass
Farmland dispersion	Dispersed areas are considered non-targeted for flow control. Dispersed areas on sites with farm management plans are considered non-targeted for water quality treatment
Bioretention	Model tributary impervious surface as 90% impervious, 10% grass
Permeable pavement (unlined with no underdrain)	Model permeable pavement area as 50% impervious, 50% grass
Grassed modular grid pavement	Model modular grid pavement as all grass
Rainwater harvesting	Credit only allowed via and as specified in an approved drainage adjustment that details conditions of use.
Restricted footprint	Model footprint as restricted
Wheel strip driveways	Model credited area as 50% impervious, 50% grass
Minimum disturbance foundation	Model foundation area as 50% impervious, 50% grass
Open grid decking over pervious area	Model deck area as 50% impervious, 50% grass
Native growth retention credit	Model mitigated impervious area as 50% impervious, 50% grass
Perforated pipe connection	None

Notes:

(1) These credits do not apply when determining eligibility for exemptions from Core Requirement #3, Core Requirement #8, or exceptions from the flow control or water quality facility requirements unless otherwise noted in the exemption or exception. Explicit modeling of BMP infiltration for facility sizing is not allowed. When applying modeling credits for flow control facility sizing, infiltrative BMPs tributary to the facility that are included in the modeling scenario (including the permeable pavement element with area reduced to 50% impervious area fraction, or other BMPs (e.g., bioretention, trenches, drywells) treating upstream runoff) must have the infiltration option *turned off* during the flow routing analysis for facility sizing to avoid double-counting the BMP infiltration benefit. Alternatively, the permeable pavement BMP with infiltration turned off may be represented by an impervious area land use element of equivalent area.

(2) Surface shall be modeled using the soil type found at that location on the site.

(3) For any project subject to Simplified Drainage Review, and for any single family residential project subject to Directed, Full or Large Project Drainage Review, the design requirements and specifications in Appendix C, Section C.2.2 may be used for design of full infiltration on individual lots. For all other projects, including any project where full infiltration is proposed to serve more than one lot, full infiltration must be designed in accordance with infiltration facility standards in Section 5.2.

A. Subdivision Implementation of BMPs within Road Right-of-Way

These are flow control BMPs installed within public or private road right-of-way as part of the construction of street and drainage improvements for the subdivision. To receive credit for these BMPs, the subdivision project must meet all of the following requirements:

1. The BMPs must serve impervious surface located only within the road right-of-way.

2. The BMPs must be shown on the **site improvement plans** submitted with the engineering plans for the proposed project as specified in Section 2.3.1.2.

3. If the road right-of-way will be maintained by the City of Bothell, the BMPs must be approved by the City of Bothell Storm Utility and Operations ~~through a road variance~~ prior to engineering plan approval.

4. If the road right-of-way will be privately maintained, provision must be made for future **maintenance** of the BMPs in accordance with Core Requirement #6, Section 1.2.6. ~~As specified in Core Requirement #6, King County will assume maintenance of such BMPs in certain cases.~~

5. If the City of Bothell will be assuming maintenance of the BMPs, the BMPs must comply with the drainage facility **financial guarantee and liability requirements** in Core Requirement #7, Section 1.2.7.

B. Subdivision Implementation of BMPs within Dedicated Tracts

These are flow control BMPs installed on or associated with the features (e.g., forest) of common area tracts dedicated by the subdivision. Such BMPs may serve future improvements on lots, common area improvements, or road right-of-way improvements. To receive credit for these BMPs, the subdivision project must meet all of the following requirements:

1. The BMPs must be shown on the **site improvement plans** submitted with the engineering plans for the proposed project as specified in Section 2.3.1.2.

2. Provision must be made for future **maintenance** of the BMPs in accordance with Core Requirement

   #6, Section 1.2.6. ~~When maintenance by King County is specified by Core Requirement #6, King County will assume maintenance of BMP devices (e.g. dispersion trenches) that are within a tract dedicated to King County for drainage purposes. King County will not assume maintenance of BMP devices located in common areas dedicated for purposes other than just drainage (e.g., play areas, parks, etc.). Where King County maintenance is specified by Core 6, the County will assume maintenance for FCBMP vegetated flow paths that are within an easement that allows for inspection and maintenance by the County. King County maintenance of these vegetated flow paths will be limited to their FCBMP functionality.~~ All maintenance shall be the responsibility of the property or facility owner(s) per BMC 18.04.270.

3. BMPs to be maintained by King County in accordance with Core Requirement #6 must comply with the drainage facility **financial guarantee and liability requirements** in Core Requirement #7, Section 1.2.7.

4. If the BMPs installed within a dedicated tract satisfy some or all of the BMP requirements for individual lots per Section 1.2.9.2, then a **note** must be placed on the **recorded documents** for the subdivision indicating those lots for which BMPs have been provided.

C. Subdivision Implementation of BMPs on Individual Lots

These are flow control BMPs installed on a subdivision's proposed lots as part of the subdivision project. For example, the subdivision developer may elect to pre-install some or all of the flow control BMPs required by the individual lot BMP requirements in Section 1.2.9.2. To receive credits for these BMPs, the subdivision project must meet all of the following requirements:

1. The flow control BMPs must be installed and implemented in accordance with the individual lot BMP requirements in Section 1.2.9.2. This includes recording a **declaration of covenant and grant of easement** for each lot with BMPs as specified in Implementation Requirement 3 of Section 1.2.9.2.4. If not all of the required BMPs are installed on a lot as part of the subdivision project, language must be included in the covenant notifying the future lot owner of additional required BMPs.

2. BMPs to be installed on individual lots as part of the subdivision project must be shown on the **site improvement plans** submitted with the engineering plans for the proposed project as specified in Section 2.3.1.2.

D. Subdivision Future Implementation of BMPs on Individual Lots

These are flow control BMPs stipulated to be installed on some or all of a subdivision's proposed lots by a declaration of covenant recorded for each such lot. To receive credits for these BMPs, the subdivision project must meet all of the following requirements:

1. Demonstrate through a lot-specific assessment that the flow control BMPs stipulated for each lot are **feasible and applicable** according to the individual lot BMP requirements in Section 1.2.9.2 and the BMP design specifications in Appendix C. This lot-specific assessment must be included in the TIR submitted with engineering plans for the subdivision. The assessment shall include any soils reports, calculations, or other information necessary to select and properly apply BMPs.

2. Record a **declaration of covenant and grant of easement** for each lot stipulating the type or types of BMP being proposed for credit. This covenant must be as specified in Implementation Requirement 3 of Section 1.2.9.2.4, except as follows:

   a) The **FCBMP site plan**(s) may be waived depending on the BMPs proposed or may be conceptual, showing only the information necessary to stipulate the type or types of BMP being proposed for credit. For example, if the BMP is full dispersion, the approximate location of future impervious surface and the limits of the "native vegetated flowpath segment" (see Appendix C, Section C.2.1) must be shown. If the BMP is full infiltration, the approximate location of future impervious surface, septic drain field (if applicable), and infiltration devices must be shown. For all other BMPs, the "design and maintenance details" (see Item b below) for each proposed BMP per Appendix C may be sufficient as determined by the City.

   b) The **FCBMP design and maintenance details** must include the dimensions of all proposed devices, features, and flowpaths, expressed as unit amounts per square foot of impervious surface served or as a percentage of the lot size or impervious surface created.

   c) The **notice** to future lot owners must indicate that they are responsible to install the flow control BMP or BMPs stipulated for the lot prior to final inspection approval of constructed lot improvements. Alternative BMPs that provide equivalent performance may be proposed at the time of permit application for proposed lot improvements. In any case, a revised covenant will need to be recorded to reflect the final approved BMPs and site improvement plan(s).

3. If single family residential lots are being created, a note must be placed on the recorded documents for the subdivision indicating the following:

   "Single family residences and other improvements constructed on the lots created by this subdivision must implement the flow control best management practices (BMPs) stipulated in the drainage plan declaration of covenant and grant of easement recorded for each lot. Compliance with this stipulation must be addressed in the small project drainage plan submitted for drainage review when application is made for a single family residential building permit for the lot."

4. If **commercial lots** are being created, a **note** must be placed on the **recorded documents** for the subdivision indicating the following:

"Improvements constructed on the lots created by this subdivision must implement the flow control best management practices (BMPs) stipulated in the drainage plan declaration of covenant and grant of easement recorded for each lot. Compliance with this stipulation must be addressed in the engineering plans submitted for drainage review when application is made for a permit to make improvements to the lot."

5. If a **binding site plan** is being created, a **note** must be placed on the **recorded documents** for the subdivision indicating the following:

   "Improvements constructed on the lots created by this binding site plan must implement the flow control best management practices (BMPs) stipulated in the drainage plan declaration of covenant and grant of easement recorded for each lot. Compliance with this stipulation must be addressed in the engineering plans submitted for drainage review when application is made for a permit to make improvements to the lot."

1.2.9.4.2. USE OF CREDITS BY PROJECTS WITHIN RIGHTS-OF-WAY

If a proposed project is located primarily within an established public or private right-of-way, implementation of flow control BMPs is as required per Section 1.2.9.3. To receive credit for these BMPs, the project must meet all of the following requirements:

1. The BMPs must serve **impervious surface** located only within the right-of-way.

2. If the right-of-way is **road right-of-way** that will be maintained by the City of Bothell, the BMPs must be approved by the City of Bothell Storm Utility and Operations ~~through a **road variance**~~ prior to engineering plan approval.

3. If the right-of-way will be privately maintained, provision must be made for future **maintenance** of the BMPs in accordance with Core Requirement #6, Section 1.2.6. As specified in Core Requirement #6, the City will assume maintenance of such BMPs in certain cases.

4. If the City of Bothell will be assuming maintenance of the BMPs, the BMPs must comply with the drainage facility **financial guarantee and liability requirements** in Core Requirement #7, Section 1.2.7.

1.3 SPECIAL REQUIREMENTS

This section details the following five special drainage requirements that may apply to the proposed project depending on its location or ***site***-specific characteristics:

- "Special Requirement #1: Other Adopted Area-Specific Requirements," Section 1.3.1
- "Special Requirement #2: Flood Hazard Area Delineation," Section 1.3.2
- "Special Requirement #3: Flood Protection Facilities," Section 1.3.3
- "Special Requirement #4: Source Control," Section 1.3.4
- "Special Requirement #5: Oil Control," Section 1.3.5.

1.3.1 SPECIAL REQUIREMENT #1: OTHER ADOPTED AREA-SPECIFIC REQUIREMENTS

This manual is one of several adopted regulations in the City that apply requirements for controlling drainage on an area-specific basis. These regulations include the following:

- **Critical Drainage Areas (CDAs):** The City of Bothell may establish CDAs in areas where flooding and/or erosion conditions present an imminent likelihood of harm to the welfare and safety of the surrounding community. The special requirements in CDAs typically include more restrictive flow control and clearing standards. Contact the City directly for more information regarding CDA boundaries.

- **Master Drainage Plans (MDPs):** MDPs are comprehensive drainage plans prepared for urban planned developments (UPDs) or other large, complex projects (described in Section 1.1.2.5). Projects covered by a MDP must meet any adopted requirements specific to that plan.

- **Basin Plans (BPs):** The Bothell City Council adopts basin plans to provide for the comprehensive assessment of resources and to accommodate growth while controlling adverse impacts to the environment. A basin plan may recommend specific land uses, regional capital projects, and special drainage requirements for future development within the basin area it covers.

- **Salmon Conservation Plans (SCPs):** Salmon conservation plans are comprehensive, ecosystem- based plans intended to identify and assess the means to protect and restore salmon habitat through mechanisms such as habitat improvements, regulations, incentives, BMPs, land acquisition, and public education activities. These plans are developed in collaboration with other jurisdictions within a water resource inventory area (WRIA) designated by the state under WAC 173-500-040 and spanning several basins or subbasins.

- **Stormwater Compliance Plans (SWCPs):** Stormwater compliance plans are a subbasin or outfall specific assessment of the quantity and/or quality of the City of Bothell's municipal separate storm sewer system discharges to determine actions necessary for compliance with the National Pollutant Discharge Elimination System (NPDES) General Municipal Stormwater Permit issued by the state Department of Ecology pursuant to the federal Clean Water Act. These plans/studies may recommend capital projects, flow control standards, water quality controls, public education activities, or other actions deemed necessary for compliance with the Clean Water Act and RCW 90.48, Water Pollution Control.

- **Lake Management Plans (LMPs):** The Bothell City Council adopts lake management plans to provide for comprehensive assessment of resources and to accommodate growth while controlling adverse impacts from nutrient loading to selected lakes. A lake management plan may recommend nutrient control through special drainage and source control requirements for proposed projects within the area it covers.

- **Flood Hazard Management Plan (FHMPs):** The City of Bothell Flood Hazard Management Plan and related updates is a regional plan prepared in accordance with RCW 86.12.200 and is a functional element of the City of Bothell Comprehensive Plan for the purpose of reducing flood risks. It includes (1) policies to guide floodplain land use and flood risk reduction activities; (2) geographically based descriptions of hazards and associated strategic vision; (3) program and project recommendations, including capital improvement projects, maintenance, relocation and elevation of homes, flood warning improvements, and river planning activities; and (4) implementation priorities for program and project recommendations. The FHMP is updated every 5 years.

- **Shared Facility Drainage Plans (SFDPs):** SFDPs are approved by the City of Bothell to allow two or more projects to share drainage facilities required by this manual. Projects covered by a SFDP must meet any specific requirements of that plan.

Threshold	Requirement
IF a proposed project is in a designated ***Critical Drainage Area*** or in an area included in an adopted master drainage plan, basin plan, salmon conservation plan, stormwater compliance plan, flood hazard management plan, lake management plan, or shared facility drainage plan . . .	THEN the proposed project shall comply with the drainage requirements of the ***Critical Drainage Area***, master drainage plan, basin plan, salmon conservation plan, stormwater compliance plan, flood hazard management plan, lake management plan, or shared facility drainage plan, respectively.

Application of this Requirement

The drainage requirements of adopted CDAs, MDPs, BPs, SCPs, SWCPs, FHMPs, LMPs, and SFDPs shall be applied in addition to the drainage requirements of this manual unless otherwise specified in the adopted regulation. Where conflicts occur between the two, the drainage requirements of the adopted area-specific regulation shall supersede those in this manual.

Examples of drainage requirements found in other adopted area-specific regulations include the following:

- More or less stringent flow control
- More extensive water quality controls
- Forest retention requirements
- Infiltration restrictions
- Groundwater recharge provisions
- Discharge to a constructed regional flow control or conveyance facility.

Adjustments to vary from the specific drainage requirements mandated by CDAs, BPs, SCPs, SWCPs, FHMPs, and LMPs may be pursued through the adjustment process described in Section 1.4 of this manual. Copies of all adopted CDAs, basin plans, SCPs, SWCPs, FHMPs, and lake management plans are available from the City.

Projects covered by SFDPs shall demonstrate that the shared facility will be available by the time the project is constructed and that all onsite requirements are met. Projects covered by a SFDP are still required to provide any onsite controls necessary to comply with drainage requirements not addressed by the shared facility.

1.3.2 SPECIAL REQUIREMENT #2: FLOOD HAZARD AREA DELINEATION

Flood hazard areas are composed of the 100-year floodplain~~, zero-rise flood fringe, zero-rise floodway, FEMA floodway, and channel migration zones~~ as described in BMC 14.04. If a proposed project contains or is adjacent to a ***flood hazard area*** as determined by the City, this special requirement requires the project to determine those components that are applicable and delineate them on the project's site improvement plans and recorded maps.

Floodplains are subject to inundation during extreme events. The 100-year floodplain~~, and floodway if applicable,~~ is delineated in order to minimize flooding impacts to new development and to prevent aggravation of existing flooding problems by new development. Regulations and restrictions concerning development within a 100-year floodplain are found in the critical areas code, BMC 14.04, and in the shorelines code, BMC 13.09.

Channel migration zones are areas within the lateral extent of likely stream channel movement that are subject to risk due to stream bank destabilization, rapid stream incision, stream bank erosion and shifts in the location

of stream channels, as shown on the City's Channel Migration Zone maps. The channel migration zone includes two additional components, the *severe channel migration hazard area*, which includes the present channel width plus the area at greatest risk of lateral movement, and the *moderate channel migration hazard area*, which is the remaining portion of the channel migration zone.

Regulations and restrictions concerning development within channel migration zones and their hazard area components are found in the critical areas code, BMC 14.04.

Threshold	Requirement
IF a proposed project contains or is adjacent to a ***flood hazard area*** for a river, stream, lake, wetland, closed depression, marine shoreline, or a King County-mapped channel migration zone, or if other City of Bothell regulations require study of flood hazards related to the proposed project . . .	THEN the 100-year floodplain, and applicable floodway, shall be determined and their boundaries, together with the boundaries of the severe and moderate channel migration hazard area (if applicable), shall be delineated on the site improvement plans and profiles, and on any final subdivision maps prepared for the proposed project.

Application of this Requirement

The applicant is required to use the best available floodplain/floodway data when delineating the 100-year floodplain and floodway boundaries on site improvement plans and profiles, and on any final subdivision maps. The **floodplain/floodway delineation** used by the applicant shall be in accordance with BMC 14.04, BMC 13.09, and associated public rules. If floodplain/floodway data and delineation does not exist, then a floodplain/floodway analysis shall be prepared by the applicant as described in Section 4.4.2, "Floodplain/Floodway Analysis."

Projects or related flood studies that are expected to result in a change to base flood elevations published in FEMA Flood Insurance Studies and Rate Maps, must also comply with FEMA regulations 44CFR, part 65 and the Analysis and Mapping Procedures for Non-accredited Levee Systems, including requirements for providing letters of map revisions.

If the ***site*** is located within a **channel migration zone** mapped by the City, the proposed development must comply with ~~KCC 21A.24 and~~ associated public rules.

1.3.3 SPECIAL REQUIREMENT #3: FLOOD PROTECTION FACILITIES

Flood protection facilities, such as **levees** and **revetments** require a high level of confidence in their structural integrity and performance. Proper analysis, design, and construction are necessary to protect against the potentially catastrophic consequences if such facilities should fail.

Threshold	Requirement
IF a proposed project will: • rely on an existing flood protection facility (such as a levee or revetment) for protection against hazards posed by erosion or inundation, OR • modify or construct a new flood protection facility . . .	THEN the applicant shall demonstrate that the flood protection facility, as determined by a licensed professional engineer, conforms with siting, structural stability, environmental, and all other relevant standards cited in the following regulations and documents: • Washington State *Integrated Streambank Protection Guidelines*, • Corps of Engineers *Manual for Design and Construction of Levees* (EM 1110-2-1913), • BMC 14.04, BMC 13.09, ~~KCC16.85~~ and • Special Requirement #1 (specifically the City of Bothell Flood Hazard Management Plan) AND, flood containment levees shall meet or exceed the professional engineering standards summarized in FEMA National Flood Insurance mapping regulations (44 CFR, subsection 65.10) or FEMA's Analysis and Mapping Procedures for non-Accredited Levee Systems.

Application of this Requirement

Conformance with the requirements listed above shall be addressed in the Technical Information Report submitted with the project's engineering plans (see Section 2.3.1.1).

Conformance also requires that certain **easement requirements** (outlined in Section 4.1) be met in order to allow City access to the facility. If the proposed project contains an existing City flood protection facility or proposes to rely on a City flood protection facility, the applicant shall provide an easement to the City consistent with the river protection easement requirements outlined in Section 4.1.

1.3.4 SPECIAL REQUIREMENT #4: SOURCE CONTROLS

Water quality source controls prevent rainfall and runoff water from coming into contact with pollutants, thereby reducing the likelihood that pollutants will enter public waterways and violate water quality standards or City stormwater discharge permit limits. The City of Bothell requires the use the King County *Stormwater Pollution Prevention Manual* for citizens, businesses, and industries to identify and implement source controls for activities that often pollute water bodies. The City of Bothell provides advice about source control implementation upon request. The City may, however, require mandatory source controls at any time through formal code enforcement if complaints or studies reveal water quality violations or problems, in accordance with BMC 18.04.260

Threshold	Requirement
IF a proposed project requires a commercial building or commercial ***site*** development permit . . .	THEN water quality source controls applicable to the proposed project shall be applied as described below in accordance with the *Stormwater Pollution Prevention Manual*.

Application of this Requirement

When applicable per the *Stormwater Pollution Prevention Manual*, **structural source control measures**, such as car wash pads or dumpster area roofing, shall be applied to the entire ***site*** containing the proposed project, not just the ***project site***. If the applicant is a tenant or lessee for only a portion of the ***site***, the City may limit the entire ***site*** application of structural source controls to only that portion of the ***site*** occupied or leased by the applicant. All applicable structural source control measures shall be shown on the site improvement plans submitted for engineering review and approval. Other, **nonstructural source control measures**, such as covering storage piles with plastic or isolating areas where pollutants are used or stored, are to be implemented after occupancy and need not be addressed during the plan review process. All commercial, industrial, and multifamily projects (irrespective of size) undergoing drainage review are required to implement applicable source controls.

Activities That May Result In Structural Improvements

There are a number of activities that may require structures and/or specific drainage configurations in order to protect stormwater and maintain compliance with City code. Roof structures, wheel washes, cement pads, shutoff valves, containment berms and indoor mop sinks are all examples of things that need to be in place prior to commencing the activity. These may require building permits and other approvals prior to construction.

Below are some highlighted activities and the numbered BMP activity sheets in the *Stormwater Pollution Prevention Manual* that provide more detail:

Commercial Composting

Structural improvements: paved composting and storage pads, leachate collection system, lined collection ponds, wheel wash system

- A-24 Commercial Composting

Fueling of equipment and vehicles

Structural improvements: Portland cement pads, roofs, spill control devices, trench drains, oil/water separators

- A-17 Fueling Operations
- A-48 Older Fueling Operations

Horse stables

Structural improvements: Wash racks connected to sanitary sewer or separate infiltration area, manure containment areas

- A- 35 Livestock

Mining of sand or gravel

Structural improvements: Wheel wash system and track-out control, catch basin inserts

- A-41 Wheel Wash System

Painting, Finishing, & Coating of Vehicles & Equipment

Structural improvements: Permitted, enclosed paint booths

- A-22 Painting, Finishing, & Coating of Vehicles, Products, & Equipment

Restaurants and food trucks

Structural improvements: Indoor sinks for mat and rack washing and mop and wastewater disposal.

- A-8 Storage of Solid and Food Wastes
- A-12 Cleaning of Cooking Equipment

Outdoor storage of erodible materials, e.g. compost, bark, sand, etc.

Structural improvements: Wheel wash system and track-out control, berms, containment areas, covering, catch basin inserts

- A-41 Wheel Wash and Tire Bath Track-Out Control

Outdoor storage or processing of galvanized materials

Structural improvements: Roofs or other covering, stormwater collection and treatment system

- A-21 Manufacturing and Post-Processing of Metal Products

Storage of liquid materials

Structural improvements: Secondary containment, roofed structures, spill control devices

- A-2 Storage of Liquid Materials in Stationary Tanks
- A-3 Storage of Any Liquid Materials in Portable Containers

Utility Corridor Maintenance

Structural improvements: Road stabilization

- A-45 Maintenance of Public & Private Utility Corridors & Facilities

Washing of cars, trucks and equipment (not just commercial car washes)

Structural improvements: Dedicated wash pads, sewer connection, holding tanks, catch basin inserts

- A-13 Vehicle washing

Wood Treatment & Preserving

Structural improvements: Paved, contained and covered storage and processing areas

- A-23 Wood Treatment & Preserving

1.3.5 SPECIAL REQUIREMENT #5: OIL CONTROL

Projects proposing to develop or redevelop a ***high-use site*** must provide oil controls in addition to any other water quality controls required by this manual. Such ***sites*** typically generate high concentrations of oil due to high traffic turnover, on-site vehicle or heavy or stationary equipment use, some business operations, e.g. automotive recycling, or the frequent transfer of liquid petroleum or coal derivative products.

The traffic threshold in the definition above focuses on vehicle turnover per square foot of building area (trip generation) rather than ADT alone because oil leakage is greatest when engines are idling or cooling. In general, all-day parking areas are not intended to be captured by these thresholds except those for diesel vehicles, which tend to leak oil more than non-diesel vehicles. The petroleum storage and transfer stipulation is intended to address regular transfer operations like service stations, not occasional filling of heating oil tanks.

Threshold	Requirement
IF a proposed project: • develops a ***site*** that will have ***high-use site*** characteristics, OR • is a ***redevelopment project*** proposing $100,000 or more of improvements to an existing ***high-use site,*** OR • is a ***redevelopment project*** that results in new plus replaced pollution generating impervious surfaces of 5,000 square feet or more or new pollution generating pervious surface of ¾ acre or more improvements to an existing ***high-use site*** …	THEN the project must treat runoff from the high-use portion of the ***site*** using oil control treatment options from the High-Use menu (described below and detailed in Chapter 6).

High-Use Menu

High-use oil control options are selected to capture and detain oil and associated pollutants. The goal of this treatment is no visible sheen on runoff leaving the facility, or less than 10 mg/L total petroleum hydrocarbons (TPH) in the runoff, depending on the facility option used. Oil control options include facilities that are small, handle only a limited tributary area, and require frequent maintenance, as well as facilities that treat larger areas and generally have less frequent maintenance needs. Facility choices include catch basin inserts, linear sand filters, and oil/water separators. See Chapter 6 for specific facility choices and design details.

Application of this Requirement

For ***high-use sites*** located within a larger commercial center, only the impervious surface associated with the high-use portion of the ***site*** is subject to treatment requirements. If common parking for multiple businesses is provided, treatment shall be applied to the number of parking stalls required for the high-use business only. However, if the treatment collection area also receives runoff from other areas, the water quality facility must be sized to treat all water passing through it.

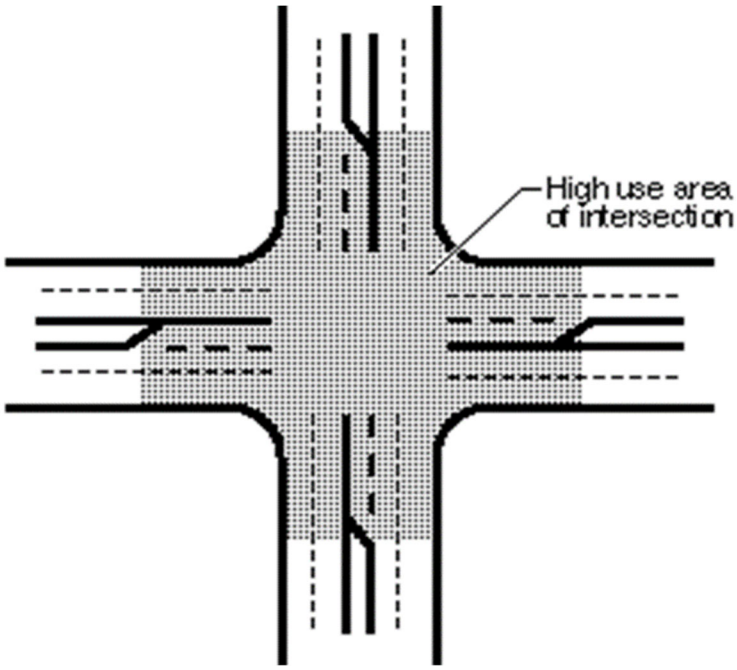
High-use roadway intersections shall treat the intersection itself, plus lanes where vehicles accumulate during the signal cycle, including all lanes, from the beginning of the left turn pocket (see Figure 1.3.5.A below). If no left turn pocket exists, the treatable area shall begin at a distance of 75 feet from the stop line. If runoff from the intersection drains to more than two collection areas that do not combine within the intersection, treatment may be limited to any two of the collection areas. Oil control facilities shall be designed for all flows tributary to the oil control facility including flow from otherwise exempt areas that are not bypassed around the facility.

Note: For oil control facilities to be located in public road right-of-way and maintained by the City of Bothell, only coalescing plate or baffle oil/water separators shall be used unless otherwise approved through an adjustment. Catch basin inserts are not allowed for oil control.

Methods of Analysis

The traffic threshold for the High-Use menu shall be estimated using information from *Trip Generation*, published by the Institute of Transportation Engineers, from a traffic study prepared by a professional engineer or transportation specialist with experience in traffic estimation, or from documented data from the City of Bothell Department of Transportation.

FIGURE 1.3.5.A TREATABLE AREAS FOR HIGH-USE ROAD INTERSECTIONS



1.4 ADJUSTMENT PROCESS

1.4.1 ADJUSTMENTS

Adjustments to the Minimum Requirements may be granted prior to permit approval and construction. The City of Bothell may grant an adjustment. Refer to BMC 18.02.040 Permissible Alternatives to Bothell Standards for requirements and procedures to request adjustments.

1.4.2 EXCEPTIONS/VARIANCES

Exceptions/variances (exceptions) to the Minimum Requirements may be granted by the City of Bothell. Refer to Bothell Municipal Code (BMC) 18.08 for information.

CHAPTER 2
DRAINAGE PLAN SUBMITTAL

BOTHELL, WASHINGTON

SURFACE WATER DESIGN MANUAL

Plans for Permits and Drainage Review

Plans Required for Permit Submittal

Plans Required for Drainage Review

Plans Required with Initial Permit Application

Subdivision, UPD, and Binding Site Plans

Short Subdivisions

Commercial Site Development

Single Family Residential

Other Permits

Drainage Review Plan Specifications

Engineering Plan Specifications

Projects in Targeted Drainage Review

Plans Required After Drainage Review

Plan Changes After Permit Issuance

Final Corrected Plan Submittal

Final Plat, Short Plat, and Binding Site Plan Submittals

CHAPTER 2

DRAINAGE PLAN SUBMITTAL

Bothell Design and Construction Standards Chapter 1-9 details the City's Plan Review requirements for submittal and drafting standards. This chapter is offered as a supplement. In cases where requirements conflict between references, contact the City for clarification.

This chapter details the drainage related submittal requirements for engineering design plans as part of a permit application to the City. The intent of these requirements is to present consistent formats for design plans and the technical support data required to develop the plans. These conventions are necessary to review engineering designs for compliance with City ordinances and regulations, and to ensure the intent of the plan is easily understood and implemented in the field. Properly drafted design plans and supporting information also facilitate the construction, operation, and maintenance of the proposed system long after its review and approval. When plans comply with the formats and specifications contained herein, they facilitate review and approval with a minimum of time-consuming corrections and resubmittals.

Note that this chapter primarily describes how to submit drainage plans for review—what must be submitted, in what formats, at what times and to what offices. The basic drainage requirements that these plans must address are contained in Chapter 1, "Drainage Review and Requirements." The specific design methods and criteria to be used are contained in Chapters 3, 4, 5, and 6.

Several key forms used in the plan review process are reproduced in Reference Section 8, "Forms and Worksheets." The drainage submittal requirements for different types of developments are contained in this chapter with the exception of Master Drainage Plans, which are contained in a separate publication titled *Master Drainage Planning for Large or Complex Site Developments*, available from the King County Department of Natural Resources and Parks (DNRP) or the City. For information on general requirements for any permit type and on the appropriate submittal location, refer to the **customer information bulletins** prepared by the City for this purpose.

Chapter Organization

The information presented in this chapter is organized into four main sections as follows:

- Section 2.1, "Plans for Permits and Drainage Review"
- Section 2.2, "Plans Required with Initial Permit Application"
- Section 2.3, "Drainage Review Plan Specifications"
- Section 2.4, "Plans Required After Drainage Review."

2.1 PLANS FOR PERMITS AND DRAINAGE REVIEW

The City is responsible for the review of all engineering aspects of private development proposals. Drainage review is a primary concern of engineering design. This section describes the **types of engineered drainage plans** required for engineering review at various permit review stages. *Refer to the* City *customer information bulletins for other details or requirements, such as the submittal and expiration periods set for each type of permit application, review fees, right-of-way use requirements, and other code requirements.*

2.1.1 PLANS REQUIRED FOR PERMIT SUBMITTAL

Most projects require some degree of drainage plans or analysis to be submitted with the initial permit application (see Table 2.1.2.A). Subdivisions~~, urban plan developments (UPDs), and binding site plans~~ require engineered **preliminary plans** be submitted with the initial permit application. ~~Short plats require site plans (may be engineered or non-engineered) to be submitted with the initial permit application.~~ Preliminary plans and site plans provide general information on the proposal, including location of critical areas, road alignments and right-of-way, ***site*** topography, building locations, land use information, and lot dimensions. They are used to determine the appropriate drainage conditions and requirements to be applied to the proposal during the drainage review process.

Single family residential building permits ~~and short plats with one undeveloped lot~~ require only a **site plan** with the initial permit application. Commercial permits and binding site plans require full **engineering plans** (see below). Other permits may have project specific drainage requirements determined by the City or described in the City customer information bulletins.

2.1.2 PLANS REQUIRED FOR DRAINAGE REVIEW

For drainage review purposes, **engineering plans** consist of the following:

1. **Site improvement plans** (see Section 2.3.1.2), which include all plans, profiles, details, notes, and specifications necessary to construct road, drainage, and off-street parking improvements.

2. A **construction stormwater pollution prevention (CSWPP) plan**, which identifies the measures and BMPs required to prevent the discharge of sediment-laden water and other pollutants associated with construction/***land disturbing activities***. The CSWPP plan includes two component plans: an **erosion and sediment control (ESC) plan** (see Section 2.3.1.3), which addresses prevention of sediment-laden discharges; and a **stormwater pollution prevention and spill (SWPPS) plan** (see Section 2.3.1.4), which addresses prevention of other pollutant discharges.

3. A **technical information report (TIR)** (see Section 2.3.1.1), which contains all the technical information and analysis necessaryto develop the site improvement plan and CSWPP plan.

Note: A landscape management plan is also included if applicable (see Section 2.3.1.5).

Plans Required for Targeted Drainage Review

Projects under Targeted Drainage Review usually require engineering plans, except that only certain sections of the technical information report are required to be completed and the site improvement plan may have a limited scope depending upon the characteristics of the proposed project. The scope of these plans should be confirmed during the **project predesign meeting** with the City. For other permits, such as single family residential permits, the scope of the targeted engineering analysis is usually determined during the City engineering review.

Plans Required for a Modified Site Improvement Plan

Projects without major drainage improvements may be approved to submit *a modified site improvement plan*. Major drainage improvements usually include water quality or flow control facilities, conveyance systems, bridges, and road right-of-way improvements. For projects requiring engineering plans for road construction, a **modified site improvement plan** is not allowed. See Section 2.3.1.2 for further information.

Plans Required for Simplified Drainage Review

Simplified drainage plans (see Appendix C.4) are a simplified form of site improvement and CSWPP plans (without a TIR or a separate SWPPS plan) that may be prepared by a non-engineer from a set of pre-engineered design details. Simplified drainage plans are only allowed for single family or agricultural projects in Simplified Drainage Review but may be required for individual lots created by a subdivision project to show how required flow control BMPs and ESC and SWPPS measures will be applied to future lot construction.

For single family residential permits, the level and scope of drainage plan requirements are determined by the City during drainage review. Some projects subject to Simplified Drainage Review may also require Targeted Drainage Review. A detailed discussed on Simplified Drainage Review requirements, including BMP design, CSWPP components, and permit submittal requirements, is presented in Appendix C.

TABLE 2.1.2.A DRAINAGE PLAN SUBMITTALS

Type of Permit or Project	Plans Required with Initial Permit Application	Type of Drainage Review	Plans Required for Drainage Review
SUBDIVISIONS, ~~UPDs, AND BINDING SITE PLANS~~	Plat Map(5) Preliminary Plans Level 1 Downstream Analysis	Full or Targeted Drainage Review(2)	• Preliminary Plans(5) • Engineering Plans(1)
		Large Project Drainage Review	• Preliminary Plans(5) • Master Drainage Plan(4) or Special Study • Engineering Plans(1)
~~SHORT PLATS~~	~~Site Plan(5)~~	~~Simplified Drainage Review~~	~~Simplified Drainage Plans(3)~~
	~~Site Plan(5)~~ ~~Level 1 Downstream Analysis~~	~~Simplified Drainage Review AND Targeted Drainage Review(2)~~	~~• Simplified Drainage Plans(3)~~ ~~• Engineering Plans(1)~~
		~~Full or Targeted Drainage Review(2)~~	~~Engineering Plans(1)~~
COMMERCIAL PERMITS AND BINDING SITE PLANS	Engineering Plans(1),(2)	Full or Targeted Drainage Review	Engineering Plans(1)
SINGLE FAMILY RESIDENTIAL BUILDING PERMITS OR PERMITS FOR AGRICULTURAL PROJECTS	Site Plan(5) for Single Family Residential Building Permits Site Plan(5) or other project-specific plan as specified by the City for ***agricultural projects***	Simplified Drainage Review	Simplified Drainage Plans(3)
		Simplified Drainage Review AND Targeted Drainage Review(2) AND Directed Drainage Review(6)	• Simplified Drainage Plans(3) • Engineering Plans(1)(6)
		Full or Targeted Drainage Review(2)	Engineering Plans(1)
OTHER PROJECTS OR PERMITS	Project-specific (contact the City or use the City customer information bulletins)	Full or Targeted Drainage Review(2)	Engineering Plans(1)

Notes:

(1) Submittal specifications for **engineering plans** are detailed in Section 2.3.1.

(2) Submittal specifications for **Targeted Drainage Review** are found in Section 2.3.2.

(3) Specifications for submittal of **Simplified drainage plans** are found in Appendix C, *Simplified Drainage Requirements* (detached).

(4) Specifications for submittal of **master drainage plans or special studies** are found in King County's publication titled *Master Drainage Planning for Large or Complex Site Developments.*

(5) Submittal specifications for these plans are found in the application packages and in the City Customer information Bulletins.

(6) Scope of submittals for **Directed Drainage Review** is determined by the City review staff in a preapplication meeting with the applicant. Submittal specifications per Notes 1, 2, and 3.

2.2 PLANS REQUIRED WITH INITIAL PERMIT APPLICATION

This section describes the submittal requirements for initial permit applications at the City. The **timing for submittal** of engineering plans will vary depending on permit type. For subdivisions and short plats, this submittal usually follows the City's approval of preliminary plans. For commercial building permits, engineering plans must be submitted as part of the initial permit application. For other permit types the drainage plan requirements are determined during the permit review process.

Note: If engineering plans are required to be submitted with the initial permit application, they must be accompanied by the appropriate supporting documents (e.g., required application forms, an environmental checklist, etc.). For more details, see the City's customer information bulletins.

Design Plan Certification

All preliminary plans and engineering plans must be stamped by a ***civil engineer***.

All land boundary surveys and legal descriptions used for preliminary and engineering plans must be stamped by a **land surveyor** licensed in the State of Washington. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the ***civil engineer*** stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Land Surveyors.

2.2.1 SUBDIVISIONS

Applications for proposed subdivision projects must include engineered **preliminary plans**, which are used to help determine engineering plan requirements to recommend to the Hearing Examiner. Preliminary plans shall include the following:

1. **A conceptual drainage plan** prepared, stamped, and signed by a ***civil engineer***. This plan must show the location and type of the following:

   a) Existing and proposed flow control facilities

   b) Existing and proposed water quality facilities

   c) Existing and proposed conveyance systems.

   The level of detail of the plan should correspond to the complexity of the project.

2. **A Level 1 Downstream Analysis** as required in Core Requirement #2 and outlined under "TIR Section 3, Offsite Analysis." This offsite analysis shall be submitted in order to assess potential offsite drainage and water quality impacts associated with development of the project, and to help propose appropriate mitigation of those impacts. A higher level of offsite analysis may be requested by the City prior to preliminary approval, or as a condition of engineering plan submittal. The offsite analysis must be prepared, stamped, and signed by a ***civil engineer***.

3. **Survey/topographic information.** The submitted ***site*** plan and conceptual drainage plan shall include the following:

   a) Field topographic base map to accompany application (aerial topography allowed with the City's permission)

   b) Name and address of surveyor and surveyor's seal and signature

c) Notation for field or aerial survey

d) Datum and benchmark/location and basis of elevation

e) Location of all critical areas (include the City of Bothell designation number, or identify as undesignated)

f) Contour intervals per the following chart:

Zoning Designation	Contour Intervals
Densities of developed area of over 2 DU per acre	2 feet at less than 15% slope 5 feet at 15% slope or more
Densities of developed area of 2 DU or less per acre	5 feet

2.2.2 COMMERCIAL SITE DEVELOPMENT AND BINDING SITE PLANS

Applications for commercial permits and binding site plan projects require that **engineering plans** be submitted as part of the initial permit application. Most commercial or binding site plan projects will go through Full Drainage Review and require complete engineering plans. Projects that qualify for limited scope engineering design should request Targeted Drainage Review during the preapplication meeting with the City.

2.2.3 SINGLE FAMILY RESIDENTIAL

Applications for single family residential permits[42] require a non-engineered **site plan** to be submitted. The specifications for site plans are outlined in the City's customer information bulletins. Where single family residential projects quality for Simplified Drainage Review, see Appendix C for submittal requirements.

As part of the Written Drainage Assessment required in Section C.4.4, the applicant shall include an impervious surface calculation

2.2.4 OTHER PERMITS

Other permit applications will require project-specific information. Initial submittal requirements can be obtained by contacting the City or consulting the City's customer information bulletins.

[42] The specific level of required drainage analysis and design is usually determined during the preliminary drainage review of the plans submitted with the application. The overall plan review process may be expedited if the project is submitted with the appropriate level of detail.

2.3 DRAINAGE REVIEW PLAN SPECIFICATIONS

This section presents the specifications and contents required of plans to facilitate drainage review. Most projects subject to **Full Drainage Review** will require engineering plans that include a "technical information report (TIR)," "site improvement plans," and a "construction stormwater pollution prevention (CSWPP) plan," which includes an "erosion and sediment control (ESC) plan" and a "stormwater pollution prevention and spill (SWPPS) plan." In addition, a "landscape management plan" may also be required to comply with Core Requirement #8 (see Section 1.2.8). For more information on the types of projects subject to Full Drainage Review, see Section 1.1.2.4.

Small projects with specific drainage concerns that are subject to **Targeted Drainage Review** also require engineering plans that include the same elements, except that the TIR may be of limited scope. The site improvement plans, ESC and SWPPS plans may also be of limited scope, but must meet all applicable specifications. For more information on the types of projects subject to Targeted Drainage Review, see Section 1.1.2.2.

Projects subject to **Simplified Drainage Review** may be required to submit "Simplified drainage plans." These are simplified drainage and erosion control plans that may be prepared by a non-engineer from a set of pre-engineered design details, and which do not require a TIR or a separate SWPPS plan. The *Simplified Drainage Requirements* booklet available at the City and appended to this manual (detached Appendix C) contains the specifications for Simplified drainage plans and details on the Simplified Drainage Review process.

Note: Projects in Simplified Drainage Review may be required to submit engineering plans if they are also subject to Targeted Drainage Review as determined in Section 1.1.2.2 and Appendix C. Also, short plats in Simplified Drainage Review will be required to submit engineering plans if roadway construction is a condition of preliminary approval.

Agricultural and single family residential projects that do not qualify for Simplified Drainage Review may qualify for **Directed Drainage Review**, which requires a specialized list of submittals (plans, technical reports, etc.) and engineering requirements determined by the City permit review staff that ensures compliance with all core and special requirements of the SWDM. The scope of the submittal requirement is determined in a preapplication meeting with the applicant and the City review staff. Specifications for the plans and TIR generally follow those described for the other review types but may be reduced in scope or complexity in accordance with the City's determination.

Design Plan Certification

All preliminary plans and engineering plans must be stamped by a ***civil engineer***.

All land boundary surveys, and legal descriptions used for preliminary and engineering plans must be stamped by a **land surveyor** licensed in the State of Washington. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the ***civil engineer*** stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Land Surveyors.

2.3.1 ENGINEERING PLAN SPECIFICATIONS

For drainage review purposes, **engineering plans** must consist of the following:

1. A TIR as detailed in Section 2.3.1.1, AND

2. Site improvement plans as detailed in Section 2.3.1.2, AND

3. A CSWPP plan, which includes an ESC plan as detailed in Section 2.3.1.3 and a SWPPS plan as detailed in Section 2.3.1.4.

4. Also, if applicable per Section 1.2.8, a landscape management plan, as detailed in Section 2.3.1.5, must be included.

Projects in Targeted Drainage Review require a limited scope TIR with site improvement plans and a CSWPP plan, as detailed in Section 2.3.2. The City may allow a **modified site improvement plan** for some projects in Targeted Drainage Review (see Section 2.3.2) or where major improvements (e.g., detention facilities, conveyance systems, bridges, road right-of-way improvements, etc.) are not proposed.

2.3.1.1 TECHNICAL INFORMATION REPORT (TIR)

The full TIR is a comprehensive supplemental report containing all technical information and analysis necessary to develop the site improvement plan. This report shall contain all calculations, conceptual design analysis, reports, and studies required and used to construct a complete site improvement plan based on sound engineering practices and careful geotechnical and hydrological design. The TIR must be stamped and dated by a ***civil engineer***.

The TIR shall contain the following **ten sections**, preceded by a table of contents:

1. Project Overview
2. Conditions and Requirements Summary
3. Offsite Analysis
4. Flow Control, Low Impact Development (LID) and Water Quality Facility Analysis and Design
5. Conveyance System Analysis and Design
6. Special Reports and Studies
7. Other Permits
8. CSWPP Analysis and Design
9. Bond Quantities, Facility Summaries, and Declaration of Covenant
10. Operations and Maintenance Manual.

Every TIR must contain each of these sections; however, if a section does not apply, the applicant may simply mark "N/A" and a brief explanation shall be provided. This standardized format allows a quicker, more efficient review of information required to supplement the site improvement plan.

The **table of contents** should include a list of the ten section headings and their respective page numbers, a list of tables with page numbers, and a list of numbered references, attachments, and appendices.

When the TIR package requires **revisions**, the revisions must be submitted in a complete TIR package.

❑ TIR SECTION 1 – PROJECT OVERVIEW

The project overview must provide a general description of the proposal, predeveloped and developed ***site*** conditions, ***site*** and ***project site*** area, size of the improvements, and the disposition of stormwater runoff before and after development. The overview shall identify and discuss difficult ***site*** parameters, the natural drainage system, and drainage to and from adjacent property, including bypass flows.

The following figures are required:

Figure 1. TIR Worksheet

Include a copy of the TIR Worksheet (see Reference Section 8-A).

Figure 2. Site Location

Provide a map that shows the general location of the ***site***. Identify all roads that border the ***site*** and all significant geographic features and critical areas (lakes, streams, steep slopes, etc.).

Figure 3. Drainage Basins, Subbasins, and Site Characteristics

This figure shall display the following:

1. Show acreage of subbasins.
2. Identify all ***site*** characteristics.
3. Show existing discharge points to and from the ***site***.
4. Show routes of existing, construction, and future flows at all discharge points and downstream hydraulic structures.
5. Use a minimum USGS 1:2400 topographic map as a base for the figure.
6. Show (and cite) the length of travel from the farthest upstream end of a proposed storm system in the development to any proposed flow control facility.

Figure 4. Soils

Show the soils within the following areas:

1. The project site
2. The area draining to the ***site***
3. The drainage system downstream of the ***site*** for the distance of the downstream analysis (see Section 1.2.2).

Copies of King County Soil Survey **maps** may be used; however, if the maps do not accurately represent the soils for a proposed project (including offsite areas of concern), it is the design engineer's responsibility to ensure that the actual soil types are properly mapped. Soil classification symbols that conform to the *SCS Soil Survey for King County* shall be used; and the equivalent soil type (till, outwash, or wetlands) per the approved stormwater model shall be indicated (see Table 3.2.2.B).

Subdivision projects will need to evaluate the soils on each lot for applicability of the full infiltration and other low impact flow control BMPs as specified in Core Requirement 9. This soils report, as well as geotechnical investigations necessary for proposed infiltration facilities, shall be referenced in the TIR Overview and submitted under Special Reports and Studies, TIR Section VI. A figure in the required geotechnical report that meets the above requirements may be referenced to satisfy 1, 2, and 3 above.

Projects located in outwash soils may need to provide a **low-permeability liner** or a **treatment liner** for water quality facilities and upstream conveyance ditches, consistent with the specifications for such liners in Section 6.2.4.

❑ TIR SECTION 2 – CONDITIONS AND REQUIREMENTS SUMMARY

The intent of this section is to ensure all preliminary approval conditions and applicable requirements pertaining to ***site*** engineering issues have been addressed in the site improvement plan. All conditions and requirements for the proposed project shall be included.

In addition to the core requirements of this manual, adopted basin plans and other plans as listed in Special Requirement #1 should be reviewed and applicable requirements noted. Additionally, critical area requirements, conditions of plat approval, and conditions associated with development requirements (e.g., conditional use permits, rezones, variances and adjustments, SEPA mitigations, etc.) shall be included.

❑ TIR SECTION 3 – OFFSITE ANALYSIS

All projects in engineering review shall complete, at a minimum, an Offsite Analysis, except for projects meeting the exemptions outlined in Section 1.2.2. The Offsite Analysis is usually completed as part of the initial permit application and review process, and is to be included in the TIR. *Note: If offsite conditions have been altered since the initial submittal, a new offsite analysis may be required.*

The primary component of the offsite analysis is the **downstream analysis** described in detail below. Upstream areas are included in this component to the extent they are expected to be affected by backwater effects from the proposed project. Other components of the offsite analysis could include, but are not limited to, evaluation of impacts to fish habitat, groundwater levels, groundwater quality, or other environmental features expected to be significantly impacted by the proposed project due to its size or proximity to such features.

Levels of Analysis

The offsite analysis report requirements vary depending on the specific ***site*** and downstream conditions. Each project submittal shall include at least a Level 1 downstream analysis. Upon review of the Level 1 analysis, the City may require a Level 2 or Level 3 analysis. If conditions warrant, additional, more detailed analysis may be required. *Note: Potential impacts upstream of the proposal shall also be evaluated*.

Level 1 Analysis

The Level 1 analysis is a qualitative survey of each downstream system leaving a ***site***. This analysis is required for all proposed projects and shall be submitted with the initial permit application.

Depending on the findings of the Level 1 analysis, a Level 2 or 3 analysis may need to be completed or additional information may be required. If further analysis is required, the applicant may schedule a meeting with the City staff.

Level 2 or 3 Analysis

If drainage problems are identified in the Level 1 analysis, a Level 2 (rough quantitative) analysis or a Level 3 (more precise quantitative) analysis may be required to further evaluate proposed mitigation for the problem. The City staff will determine whether a Level 2 or 3 analysis is required based on the evidence of existing or potential drainage problems identified in the Level 1 analysis and on the proposed design of onsite drainage facilities. The Level 3 analysis is required when results need to be as accurate as possible: for example, if the ***site*** is flat; if the system is affected by downstream controls; if minor changes in the drainage system could flood roads or buildings; or if the proposed project will contribute more than 15 percent of the total peak flow to the drainage problem location. The Level 2 or 3 analysis may not be required if the City determines from the Level 1 analysis that adequate mitigation will be provided.

Additional Analysis

Additional, more detailed hydrologic analysis may be required if the City determines that the downstream analysis has not been sufficient to accurately determine the impacts of a proposed project on an existing or potential drainage problem. This more detailed analysis may include a **point of compliance analysis** as detailed in Section 3.3.6.

Scope of Analysis

Regardless of the level of downstream analysis required, the applicant shall define and map the study area (Task 1), review resources (Task 2), inspect the study area (Task 3), describe the drainage system and problems (Task 4), and propose mitigation measures (Task 5) as described below.

Task 1. Study Area Definition and Maps

For the purposes of Task 2 below, the study area shall extend downstream one mile (minimum flowpath distance) from the proposed project discharge location and shall extend upstream as necessary to encompass the offsite drainage area tributary to the proposed ***project site***. **For the purposes of Tasks 3, 4, and 5,** the study area shall extend downstream to a point on the drainage system where the proposed ***project site*** constitutes less than 15 percent of the total tributary drainage area, but not less than one-quarter mile (minimum flowpath distance). The study area shall also extend upstream of the ***project site*** a distance sufficient to preclude any backwater effects from the proposed project.

The offsite analysis shall include a **site map** showing property lines, and the **best available topographical map** (e.g., a minimum a USGS 1:24000 Quadrangle Topographic map) with the study area boundaries, ***site*** boundaries, downstream flowpath for a distance of one mile, and potential/existing problems (Task 4) shown. Other maps, diagrams, photographs and aerial photos may be helpful in describing the study area.

Task 2. Resource Review

To assist the design engineer in preparing an offsite analysis, the City has gathered information regarding existing and potential flooding, erosion, and water quality problems. For all levels of analysis, all of the resources described below shall be reviewed for existing/potential problems in the study area (*upstream and one mile downstream of the* ***project site***):

- Adopted **basin plans** available from the City, King County, Ecology, and the library. For areas where there is no adopted **basin plan**, **Basin Reconnaissance Summary Reports** may be useful.
- Floodplain/floodway (**FEMA**) **maps** available on FEMA's website and the library.
- Other **offsite analysis reports** in the same subbasin, if available (check with the City records staff).
- Critical areas maps available from the City.
- **Drainage complaints**[43] **and studies** available from the City's Surface Water Engineer in Public Works. Call 425-806-6800 for information or to schedule an appointment. See also Surface Water under Utilities on the COBMap website: http://www.bothellwa.gov/cobmap
- Road drainage problems (contact the City).
- U.S. Department of Agriculture, ***King County Soils Survey*** available online and at the library.
- **Wetlands Inventory** maps available at the City and King County.
- Sammamish River **studies** available from the City.
- Washington State Department of Ecology's latest published Clean Water Act **Section 303d list of polluted waters** posted at the following website: http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html.

[43] Note: drainage complaints that are more than 10 years old are not required for Level 1 downstream analysis.

- Adopted **stormwater compliance plans** available from the City.

Potential/existing problems identified in the above documents shall be documented in the **Drainage System Table** (see Reference Section 8-B) as well as described in the text of the **Level 1 Downstream Analysis Report**. If a document is not available for the ***site***, note in the report that the information was not available as of a particular date. If necessary, additional resources are available from the City, King County, the Washington State Department of Fisheries and Wildlife (WDFW), the State Department of Ecology (Ecology), the United States Army Corps of Engineers (Corps), and the public works departments of other municipalities in the vicinity of the proposed ***project site***.

Task 3. Field Inspection

The design engineer shall physically inspect the existing on- and offsite drainage systems of the study area for each discharge location. Specifically, he/she shall investigate any evidence of the following existing or potential problems and drainage features:

Level 1 Inspection:

1. Investigate any problems reported or observed during the resource review.
2. Locate all existing/potential constrictions or lack of capacity in the existing drainage system.
3. Identify all existing/potential downstream drainage problems as defined in Section 1.2.2.1.
4. Identify existing/potential overtopping, scouring, bank sloughing, or sedimentation.
5. Identify significant destruction of aquatic habitat or organisms (e.g., severe siltation, bank erosion, or incision in a stream).
6. Collect qualitative data on features such as land use, impervious surfaces, topography, and soil types.
7. Collect information on pipe sizes, channel characteristics, drainage structures, and relevant critical areas (e.g., wetlands, streams, steep slopes).
8. Verify tributary basins delineated in Task 1.
9. Contact neighboring property owners or residents in the area about past or existing drainage problems, and describe these in the report (optional).
10. Note the date and weather conditions at the time of the inspection.

Level 2 or 3 Inspection:

1. Perform a Level 1 Inspection.
2. Document ***existing site conditions*** (approved drainage systems or pre-1979 aerial photographs) as defined in Core Requirement #3.
3. Collect quantitative field data. For Level 2, conduct rough field survey using hand tape, hand level, and rod; for Level 3, collect field survey profile and cross-section topographic data prepared by an experienced surveyor.

Task 4. Drainage System Description and Problem Descriptions

Each drainage system component and problem shall be addressed in the offsite analysis report in three places: on a map (Task 1), in the narrative (Task 4), and in the *Offsite Analysis Drainage System Table* (see Reference Section 8-B).

Drainage System Descriptions: The following information about drainage system components such as pipes, culverts, bridges, outfalls, ponds, tanks, and vaults shall be included in the report:

1. Location (corresponding map label and distance downstream/upstream from ***site*** discharge)

2. Physical description (type, size, length, slope, vegetation, and land cover)

3. Problems including copies of any relevant drainage complaints

4. Field observations.

Problem Descriptions: All existing or potential drainage and water quality problems (e.g., ponding water, high/low flows, siltation, erosion, listed water bodies, etc.) identified in the resource review or field inspection shall be described in the offsite analysis. These descriptions will help in determining if such problems require special attention per Core Requirement #2 (see Section 1.2.2.1) because they are one of three defined drainage problem types or one of seven defined water quality problem types. Special attention may include more analysis, additional flow control, or other onsite or offsite mitigation measures as specified by the problem-specific mitigation requirements set forth in Sections 1.2.2.2 and 1.2.2.3.

The following information shall be provided for each existing or potential **drainage problem**:

1. Description of the problem (ponding water, high or low flows, siltation, erosion, slides, etc.).

2. Magnitude of or damage caused by the drainage problem (siltation of ponds, dried-up ornamental ponds, road inundation, flooded property, flooded building, flooded septic system, significant destruction of aquatic habitat or organisms).

3. General frequency and duration of drainage problem (dates and times the problem occurred, if available).

4. Return frequency of storm or flow (cfs) of the water when the problem occurs (optional for Level 1 and required for Levels 2 and 3). *Note: A Level 2 or 3 analysis may be required to accurately identify the return frequency of a particular downstream problem; see Section 3.3.3.*

5. Water surface elevation when the problem occurs (e.g., elevation of building foundation, crest of roadway, elevation of septic drainfields, or wetland/stream high water mark).

6. Names and concerns of involved parties (optional for all levels of analysis).

7. Current mitigation of the drainage problem.

8. Possible cause of the drainage problem.

9. Whether the proposed project is likely to aggravate (increase the frequency or severity of) the existing drainage problem or create a new one based on the above information. For example, an existing erosion problem should **not** be aggravated if Level 2 flow control is already required in the region for the design of onsite flow control facilities. Conversely, a downstream flooding problem inundating a home every 2 to 5 years will likely be aggravated if only Level 1 flow control is being applied in the region. See Section 1.2.3.1 for more details on the effectiveness of flow control standards in addressing downstream problems.

The following information shall be provided for each existing or potential **water quality problem**:

1. Description of the problem as documented by the State or City in the problem's listing. This should include the pollutant or pollutants of concern, the nature or category of the listing, and any other background information provided in the listing.

2. Flow path distance downstream of the ***project site*** and percentage of area draining to the problem that the ***project site*** occupies.

3. Possible or probable cause of the water quality problem.

4. Any current mitigation of the water quality problem.

Task 5. Mitigation of Existing or Potential Problems

For any existing or potential offsite **drainage problem** determined to be one of the three defined problem types in Section 1.2.2.1, the design engineer must demonstrate that the proposed project neither aggravates (if existing) nor creates the problem as specified in the drainage problem-specific mitigation requirements set forth in Section 1.2.2.2. The engineer must review each relevant drainage complaint found and include a narrative explaining how each complaint problems is addressed or mitigated. Actual copies of the relevant complaints must be included in the Analysis. To meet these requirements, the proposed project may need to provide additional onsite flow control as specified in Table 1.2.3.A (see also Section 3.3.5), or other onsite or offsite mitigation measures as described in Section 3.3.5.

For any existing or potential **water quality problem** determined to be one of the seven defined water quality problem types in Section 1.2.2.1, the design engineer must document how the applicable water quality problem-specific mitigation requirement in Section 1.2.2.3 will be met.

❑ TIR SECTION 4 – FLOW CONTROL, LOW IMPACT DEVELOPMENT (LID) AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

Existing Site Hydrology (Part A)

This section of the TIR shall include a discussion of assumptions and ***site*** parameters used in analyzing the existing ***site*** hydrology.

The acreage, soil types, and land covers used to determine existing flow characteristics, along with basin maps, graphics, and exhibits for each subbasin affected by the development, shall be included. This section must also include the LID feasibility discussion and clear discussion of the findings of the geotechnical report.

The following information must be provided on a topographical map:

1. Delineation and acreage of areas contributing runoff to the ***site***

2. Flow control facility and BMP location(s)

3. Outfall(s)

4. Overflow route(s).

The scale of the map and the contour intervals must be sufficient to determine the basin and subbasin boundaries accurately. The direction of flow, the acreage of areas contributing drainage, and the limits of development shall all be indicated on the map.

Each subbasin contained within or flowing through the ***site*** shall be individually labeled and parameters for the approved stormwater model referenced to that subbasin.

All natural streams and drainage features, including wetlands and depressions, must be shown. Rivers, closed depressions, streams, lakes, and wetlands must have the 100-year floodplain (and floodway where applicable) delineated as required in Special Requirement #2 (see Section 1.3.2) and by the critical areas requirements in BMC 14.04.

Developed Site Hydrology (Part B)

This section shall provide narrative, mathematical, and graphical presentations of parameters selected and values used for the developed ***site*** conditions, including acreage, soil types and land covers, roadway layouts, and all constructed drainage facilities and any required flow control BMPs.

Developed subbasin areas and flows shall be clearly depicted on a map and cross-referenced to computer printouts or calculation sheets. Relevant portions of the calculations shall be highlighted and tabulated in a listing of all developed subbasin flows.

All maps, exhibits, graphics, and references used to determine developed ***site*** hydrology must be included, maintaining the same subbasin labeling as used for the existing ***site*** hydrology whenever possible. If the boundaries of the subbasin have been modified under the developed condition, the labeling should be modified accordingly (e.g., Subbasin "Am" is a modified version of existing Subbasin "A").

Complete stormwater facility model results shall be presented in an appendix, with the following information highlighted:

- Target and developed land cover areas in acres
- Flow duration exceedance curves
- Flow duration table indicating Pass/Fail frequency and extent
- Clear description of control structure geometry
- For sites with a stormwater facility serving more than one parcel: documentation of the maximum hard surface coverage per lot assumed for the stormwater facility design, and comparison of that assumed hard surface coverage against the zoned maximum hard surface coverage for those lots.

Performance Standards (Part C)

The design engineer shall include brief discussions of the following:

- The applicable **area-specific flow control facility standard** determined from the Flow Control Applications Map per Section 1.2.3.1, any modifications to the standard to address onsite or offsite drainage conditions, and applicable **flow control BMP requirements** determined from Section1.2.3.3 and Core Requirement 9;
- The applicable **conveyance system capacity standards** per Section 1.2.4; and
- The applicable **area-specific water quality treatment menu** determined from the Water Quality Applications Map per Section 1.2.8.1, and any applicable special requirements for **source control** or **oil control** determined from Sections 1.3.4 and 1.3.5.

Flow Control System (Part D)

This section requires:

- An **illustrative sketch** of the flow control facility (or facilities), required flow control BMPs, and appurtenances. The facility sketch (or sketches) must show basic measurements necessary to calculate the storage volumes available from zero to the maximum head, all orifice/restrictor sizes and head relationships, control structure/restrictor orientation to the facility, and facility orientation on the ***site***. The flow control BMP sketch (or sketches) must show basic measurements and dimensions, orientation on the ***site***, flowpath lengths, etc.

- The applicant shall include all **supporting documentation** such as computer printouts, calculations, equations, references, storage/volume tables, graphs, soils data, geotechnical reports and any other aides necessary to clearly show results and methodology used to determine the storage facility volumes and flow control BMP applications.

- **Facility documentation** files, flow duration comparison files, peaks files, return frequency or duration curves, etc., developed with the approved model shall be included to verify the facility meets the performance standards indicated in Part C.

- The **volumetric safety factor** used in the design shall be clearly identified, as well as the reasoning used by the design engineer in selecting the safety factor for this project.

- If **flow control BMP credits** are used as allowed in Core Requirement 9, documentation must be provided, explaining how the credits will be used and how the criteria for use of credits will be met.

- If the flow control system is an infiltration facility, the soils data, groundwater mounding analysis, and other calculations used to determine the **design infiltration rate** shall be provided.

- **Flow control BMP infeasibility** discussion and supporting documentation shall also be included in Part D.

Water Quality System (Part E)

This section requires an **illustrative sketch** of the proposed water quality facility (or facilities), source controls, oil controls, and appurtenances. This sketch (or sketches) of the facility, source controls, and oil controls must show basic measurements and dimensions, orientation on the ***site***, location of inflow, bypass, and discharge systems, etc.

The applicant shall also include all **supporting documentation** such as computer printouts, calculations, equations, references, and graphs necessary to show the facility was designed and sized in accordance with the specifications and requirements in Chapter 6. If the **water quality credit option** is used as allowed in Section 6.1.3, documentation must be provided, identifying the actions that will be taken to acquire the requisite credits.

❑ TIR SECTION 5 – CONVEYANCE SYSTEM ANALYSIS AND DESIGN

This section shall present a detailed analysis of any existing conveyance systems, and the analysis and design of the proposed stormwater collection and conveyance system for the development. This section also includes any analysis required for the design of bridges to convey flows and pass sediments and debris per Section 4.4.3. Analysis information should be presented in a clear, concise manner that can be easily followed, checked, and verified. All pipes, culverts, catch basins, channels, swales, and other stormwater conveyance appurtenances must be clearly labeled and correspond directly to the engineering plans.

The **minimum information** included shall be pipe flow tables, flow profile computation tables, nomographs, charts, graphs, detail drawings, and other tabular or graphic aides used to design and confirm performance of the conveyance system.

Verification of capacity and performance must be provided for each element of the conveyance system. The analysis must show design velocities and flows for all drainage facilities within the development, as well as those offsite that are affected by the development. If the final design results are on a computer printout, a separate summary tabulation of conveyance system performance shall also be provided.

❑ TIR SECTION 6 – SPECIAL REPORTS AND STUDIES

Some ***site*** characteristics, such as steep slopes or wetlands, pose unique road and drainage design problems that are particularly sensitive to stormwater runoff. As a result, the City may require the preparation of special reports and studies that further address the ***site*** characteristics, the potential for impacts associated with the development, and the measures that would be implemented to mitigate impacts.

Special reports shall be prepared by people with expertise in the particular area of analysis. **Topics of special reports** may include any of the following:

- Floodplain delineation in accordance with Section 1.3.2
- Flood protection facility conformance in accordance with Section 1.3.3
- Critical areas analysis and delineation
- Geotechnical/soils (soils documentation supporting flow control BMP design, infiltration rate determination and infeasibility conclusions may also be located in TIR Section 6)
- Groundwater, including groundwater mounding analyses required for infiltration design
- Slope protection/stability
- Erosion and deposition
- Geology
- Hydrology
- Fluvial geomorphology
- Anadromous fisheries impacts
- Water quality
- Structural design
- Structural fill.

❑ TIR SECTION 7 – OTHER PERMITS

Construction of road and drainage facilities may require additional permits from other agencies for some projects. These additional permits may contain more restrictive drainage plan requirements. This section of the TIR should provide the titles of any other permits, the agencies requiring the other permits, and the permit requirements that affect the drainage plan. Examples of other permits are listed in Section 1.1.3. If a UIC well registration is required, a copy must be provided.

❑ TIR SECTION 8 – CSWPP PLAN ANALYSIS AND DESIGN

This section of the TIR should include the analysis and design information used to prepare the required **construction stormwater pollution prevention (CSWPP) plan**. This information should be presented in two parts associated with the CSWPP plan's two component plans, the erosion sediment control (ESC) plan (Part A) and the stormwater pollution prevention and spill control (SWPPS) plan (Part B). See Sections 2.3.1.3 and 2.3.1.4 for plan specifications and contents. This CSWPP plan is intended to be equivalent to and may be more stringent than that required for the NPDES Stormwater Construction Permit issued by Ecology.

ESC Plan Analysis and Design (Part A)

This section must include all hydrologic and hydraulic information used to analyze and design the erosion and sediment control measures, including final ***site*** stabilization measures. The TIR shall explain how proposed ESC measures comply with the *Erosion and Sediment Control Standards* in detached Appendix D and show compliance with the implementation requirements of Core Requirement #5, Section 1.2.5.

Part A must include the following:

1. Provide sufficient information to **justify** the overall ESC plan and the choice of individual ESC measures. At a minimum, there shall be a discussion of each of the measures specified in Section 1.2.5 and their applicability to the proposed project.

2. Include all **hydrologic and hydraulic information** used to analyze and size the ESC facilities shown in the engineering plans. Describe the methodology, and attach any graphics or sketches used to size the facilities.

3. Identify areas with a particularly **high susceptibility to erosion** because of slopes or soils, as well as areas to be protected for existing and proposed flow control BMPs. Discuss any special measures taken to protect these areas as well as any special measures proposed to protect water resources on or near the ***site***.

4. Identify any ESC recommendations in any of the **special reports** prepared for the project. In the project geotechnical report supporting flow control BMP design, provide recommendations to address mitigation of flow control BMP areas impacted by erosion and/or sedimentation during construction. If these special reports' recommendations are not included in the ESC plan, provide justification.

5. If proposing **exceptions or modifications** to the standards detailed in the *Erosion and Sediment Control Standards* in detached Appendix D, clearly present the rationale. If proposing techniques or products different from those detailed in the *ESC Standards*, provide supporting documentation so the City can determine if the proposed alternatives provide similar protection.

SWPPS Plan Design (Part B)

The **stormwater pollution prevention and spill control plan** must identify all activities that could contribute pollutants to surface and storm water during construction. This section of the TIR must provide sufficient information to justify the selection of specific stormwater pollution prevention (SWPPS) BMPs proposed to be applied to the pollution-generating activities that will occur with construction of the proposed project. BMPs applicable to such activities are found in the *Construction Stormwater Pollution Prevention and Spill Control (CSWPP) Standards* (detached Appendix D) and the *Stormwater Pollution Prevention Manual.*

At a minimum, there shall be a discussion of each anticipated pollution-generating activity and the pollution prevention BMPs selected to address it. If there are any **calculations** required for the selected BMP, include those in the discussion. If an **alternative BMP** or major modification to one of the City's standard BMPs will be used, a written request must be submitted for review and approval, detailing how the alternative will work. An "Alternative BMP Request Form" is available in the *Stormwater Pollution Prevention Manual*.

Updates or revisions to the SWPPS plan may be requested by the City at any time during project construction if the City determines that pollutants generated on the construction site have the potential to contaminate surface, storm, or ground water.

The SWPPS plan shall also **discuss the receiving waters**, especially if the receiving water body is listed on the **303d list**. Information must be provided that shows the plan meets **TMDL requirements**. Discuss the 303(d) listed pollutant generated or used onsite and any special handling requirements or BMPs.

❑ TIR SECTION 9 – BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

Bond Quantities Worksheet

Each plan submittal requires a construction quantity summary to establish appropriate bond amounts. Using the *Site Improvement Bond Quantities Worksheet* (Reference 8-H), the design engineer shall separate existing right-of-way and erosion control quantities from other onsite improvements. In addition, the design engineer shall total the amounts based on the unit prices listed on the form.

Drainage facilities for single family residential building permits, which are normally not bonded, shall be constructed and approved prior to granting the certificate of occupancy.

Flow Control and Water Quality Facility Summary Sheet and Sketch

Following approval of the plans, a *Flow Control and Water Quality Facility Summary Sheet and Sketch* (see Reference 8-D) shall be submitted along with an $8^1/_2$" x 11" plan sketch for each facility proposed for construction. The plan shall show a north arrow, the tract, the facility access road, the extent of the facility, and the control structure location. The approximate street address shall be noted. At project completion, the Summary Sheet and Sketch shall be updated in the Final Corrected TIR to reflect the completed project (see Section 2.4.2).

Declaration of Covenant for Privately Maintained Flow Control and WQ Facilities

Any declaration of covenant and grant of easement required for proposed flow control and water quality facilities per Section 1.2.6 must be included here for **review and approval before recording**. The necessary covenant exhibits, and maintenance instructions associated with the facility type (see Reference 5), shall be included with the declaration of covenant. **After approval by** the City, the declaration of covenant and grant of easement must be signed and recorded at the office of City of Bothell Records and Elections before any permit is approved. A copy of the recorded document shall be included in the Final Corrected TIR (see Section 2.4.2).

Declaration of Covenant for Privately Maintained Flow Control BMPs

Any declarations of covenant and grant of easement required for proposed flow control BMPs per Core Requirement 9 must be included here for **review and approval before recording**. The necessary covenant exhibits, and maintenance instructions associated with the flow control BMP type (see Reference 5), shall be included with the declaration of covenant. **After approval by** the City, all such documents must be signed and recorded at the office of City of Bothell Records and Elections before any permit is approved. A copy of the recorded document shall be included in the Final Corrected TIR (see Section 2.4.2) or otherwise provided to the City if no TIR was required.

❑ TIR SECTION 10 – OPERATIONS AND MAINTENANCE MANUAL

For each flow control and water quality facility and/or BMP that is to be privately maintained, and for those that have special non-standard features, the design engineer shall prepare an operations and maintenance manual. The manual should be simply written and should contain a brief description of the facility or BMP, what it does, and how it works. In addition, the manual shall include a copy of the *Maintenance Requirements for Flow Control, Conveyance, and WQ Facilities* (see Appendix A) and provide an outline of maintenance tasks and the recommended frequency each task should be performed. This is especially important for flow control BMP and water quality facilities where proper maintenance is critical to facility performance. For this reason, most of the flow control facility designs in Chapter 5 and the water quality facility designs in Chapter 6 include "maintenance considerations" important to the performance of each facility. BMP maintenance instructions by BMP type, prepared in 8-1/2”x11” size for inclusion in TIRs and declarations of covenant, are also provided in Reference 5.

2.3.1.2 SITE IMPROVEMENT PLAN

Site improvement plans shall portray design concepts in a clear and concise manner. The plans must present all the information necessary for persons trained in engineering to review the plans, as well as those persons skilled in construction work to build the project according to the design engineer's intent. Supporting documentation for the site improvement plans must also be presented in an orderly and concise format that can be systematically reviewed and understood by others. A CAD drawing file (.dwg) of the site improvement plan must be submitted along with paper copies.

The **vertical datum** on which all engineering plans, plats, binding site plans, and short plats are to be based must be the North American Vertical Datum of 1988 (NAVD88) and the datum must be tied to at least one City of Bothell or King County Survey Control Network benchmark. The benchmark(s) shall be shown or referenced on the plans. If a City of Bothell or King County Survey Control Network benchmark does not exist within $^{1}/_{2}$ mile of the subject property, or if 250 feet or greater of total vertical difference exists between the starting benchmark and the project, an assumed or alternate vertical datum may be used. Approximate datum correlations can be found in Table 4.4.2.B.

Horizontal control for all plats, binding site plans, and short plats shall reference the North American Datum of 1983/91 as the coordinate base and basis of bearings. All horizontal control for these projects must be referenced to a minimum of two City of Bothell or King County Survey Horizontal Control monuments. If two horizontal control monuments do not exist within one mile of the project, an assumed or alternate coordinate base and basis of bearings may be used. Horizontal control monument and benchmark information is available from the City.

The site improvement plans consist of all the plans, profiles, details, notes, and specifications necessary to construct road, drainage structure, and off-street parking improvements. Site improvement plans include the following:

- A **base map** (described under “Base Map” below), and
- ***Site* plan and profiles** (see below under “General Plan Format”).

Note: Site improvement plans must also include grading plans if onsite grading extends beyond the roadway.

Modified Site Improvement Plan

The City may allow a modified site improvement plan for some projects in Targeted Drainage Review (see Section 2.3.2) or Directed Drainage Review, or where major improvements (e.g., detention facilities, conveyance systems, bridges, road right-of-way improvements, etc.) are not proposed. The modified site improvement plan must:

1. Be drawn on a 11" x 17" or larger sheet,
2. Accurately locate structure(s) and access, showing observance of the setback requirements given in this manual, the critical areas code (BMC 14.04), or other applicable documents,
3. Provide enough information (datum, topography, details, notes, etc.) to address issues as determined by the City.

❑ GENERAL PLAN FORMAT

Site improvement plans ~~should use City Roads Standard Map Symbols (see http://www.kingCity.gov/~/media/transportation/kcdot/roads/engineering/documents/CADDFiles/2014 KCDOTCADDStandardsManual.ashx) as appropriate, and must include Standard Plan Notes (see Reference Section 7). Each plan~~ must follow the general format detailed below:

1. Plan sheets and profile sheets, or combined **plan and profile sheets**, specifications, and detail sheets as required shall be on "D-size" sheets (24" x 36"). "E-size" sheets (36" x 42") are also acceptable for commercial proposals, except that associated right-of-way improvements must be on "D-size" sheets (24" x 36"). Original sheets shall be archive quality reproducibles, Mylar, or equal.

2. **Drafting details** shall generally conform to ~~the King County Standard Map Symbols (see http://www.kingcounty.gov/~/media/transportation/kcdot/roads/engineering/documents/CADDFiles/2014KCDOTCADDStandardsManual.ashx) with~~ standard text height of 0.125" (1/8"). Existing features shall be shown with dashed lines or as half-toned (screened) in order to clearly distinguish existing features from proposed improvements.

3. Each submittal shall contain a **project information/cover sheet** with the following:

   a) Title: Project name and the City file number

   b) Table of contents (if more than three pages)

   c) Vicinity map

   d) Name and phone number of utility field contacts (e.g., water, sanitary sewer, gas, power, telephone, and TV) and the One-Call number (811 or 1-800-424-5555)

   e) The City of Bothell's preconstruction/inspection notification requirements

   f) Name and phone number of the erosion control/CSWPP supervisor

   g) Name and phone number of the surveyor

   h) Name and phone number of the owner/agent

   i) Name and phone number of the applicant

   j) Legal description

   k) Plan approval signature block for the City

   l) Name and phone number of the engineering firm preparing the plans (company logos acceptable)

   m) Fire Marshal's approval stamp (if required)

   n) Statement that mailbox locations have been designated or approved by the U.S. Postal Service (where required)

   o) List of conditions of preliminary approval and conditions of approved adjustments and variances on all ***site*** improvements.

4. An **overall site plan** shall be included if more than three plan sheets are used. The overall plan shall be indexed to the detail plan sheets and include the following:

   a) The complete property area development

   b) Right-of-way information

   c) Street names and road classification

   d) All project phasing and proposed division boundaries

e) All natural and proposed drainage collection and conveyance systems with catch basin numbers shown.

5. Each sheet of the plan set shall be stamped, signed, and dated by a ***civil engineer***. At least one sheet showing all boundary survey information must be provided and stamped by a **land surveyor** licensed in the State of Washington.

6. **Detail sheets** shall provide sufficient information to construct complex elements of the plan. Details may be provided on plan and profile sheets if space allows.

7. A **title block** shall be provided on each plan sheet. At a minimum, the title block shall list the following:

   a) Development title

   b) Name, address, and phone number of the firm or individual preparing the plan

   c) A revision block

   d) Page (of pages) numbering

   e) Sheet title (e.g., road and drainage, grading, erosion and sediment control, stormwater pollution prevention and spill control).

8. A blank **approval block** (4" high x 6" wide) shall be provided on each plan sheet. Two such blocks shall be provided on the first sheet of a plan set.

9. The **location and label** for each section or other detail shall be provided.

10. **Critical areas**, critical area buffers, and critical area building setbacks as required by BMC 14.04 shall be delineated and labeled.

11. All **match lines** with matched sheet number shall be provided.

12. All division or phase lines and the **proposed limits of construction** under the permit application shall be indicated.

13. **Wetlands** shall be labeled with the number from the City's wetland inventory, or shall be labeled as "uninventoried" if not listed on the wetland inventory.

14. The **standard plan notes** that apply to the project shall be provided on the plans (see Reference Section 7-B).

15. Commercial building permit applications shall include the **designated zoning** for all properties adjacent to the development ***site***(s).

❑ BASE MAP

A site improvement plan **base map** provides a common base and reference in the development and design of any project. A base map helps ensure that the engineering plans, grading plans, and CSWPP plans are all developed from the same background information. This base map shall include the information listed in Table 2.3.1.A.

TABLE 2.3.1.A BASE MAP REQUIREMENTS	
Feature	**Requirements**
Ground Surface Topography	Provide topography within the ***site*** and extending beyond the property lines. Contour lines must be shown as described in "Plan View: Site Plan and Roadway Elements" below.
Surface Water Discharge	Provide ground surface elevations for a reasonable "fan" around points of discharge extending at least 50 feet downstream of all point discharge outlets.
Hydrologic Features	Provide spot elevations in addition to contour lines to aid in delineating the boundaries and depth of all existing floodplains, wetlands, channels, swales, streams, storm drainage systems and BMPs, roads (low spots), bogs, depressions, springs, seeps, swales, ditches, pipes, groundwater, and seasonal standing water.
Other Natural Features	Show the location and relative sizes of other natural features such as rock outcroppings, existing vegetation, and trees 12 inches in diameter and greater that could be disturbed by the project improvements and construction activities (within tree canopy), noting species.
Threshold Discharge Areas	Delineate and show the boundaries of the surface water drainage threshold discharge areas on the site.
Flows	Provide arrows that indicate the direction of surface flow on all public and private property and for all existing conveyance systems.
Floodplains/ Floodways	Show the floodplain/floodways as required by the flood hazard portion of the critical areas code (BMC 14.04) and Section 4.4.2.
General Background Information	Show the location and limits of all existing: • Property boundaries • Structures • Easements (including dimensions) • Total property (including dimensions) • Roads and right-of-way • Sanitary sewers and water utilities • Common open space • Public dedications • Other manmade features affecting existing topography/proposed improvements.
Development Limitations	Delineate limitations to the development that may occur as identified on the TIR worksheet, Part 11 (see Reference 8-A).

❑ SITE PLAN AND PROFILES

The design engineer shall provide plans and profiles for all construction, including but not limited to the following information:

Plan View: Site Plan and Roadway Elements

1. Provide **property lines**, **right-of-way lines**, and widths for proposed roads and intersecting roads.

   Note: the condition of all public right-of-way and the right to use it as proposed must be verified.

2. Provide all existing and proposed **roadway features**, such as centerlines, edges of pavement and shoulders, ditchlines, curbs, and sidewalks. In addition, show points of access to abutting properties and roadway continuations.

3. Show existing and proposed **topography contours** at 2-foot intervals (5-foot intervals for slopes greater than 15 percent, 10-foot intervals for slopes greater than 40 percent). Contours may be extrapolated from USGS mapping, aerial photos, or other topography map resources. However, contours shall be field verified for roadway and stream centerlines, steep slopes, floodplains, drainage tracts easements, and conveyance systems. Contours shall extend 50 feet beyond property lines to resolve questions of setback, cut and fill slopes, drainage swales, ditches, and access or drainage to adjacent property.

4. Show the location of all existing **utilities** and proposed utilities (except those designed by the utility and not currently available) to the extent that these will be affected by the proposed project. Clearly identify all existing **utility poles**.

5. Identify all roads and adjoining subdivisions.

6. Show **right-of-way** for all proposed roadways, using sufficient dimensioning to clearly show exact locations on all sections of existing and proposed dedicated public roadway.

7. Clearly differentiate areas of **existing pavement** and areas of **new pavement**. If the project is a

   redevelopment project, delineate areas of ***replaced impervious surface***.

8. For subdivision projects, generally use **drawing scales** of 1"=50'; however, 1"=100' is optional for development of lots one acre or larger. For commercial, multi-family, or other projects, generally use scales of 1"=20'; however, 1"=10', 1" = 30', 1"=40' and 1"=50' are acceptable. Show details for clarification, including those for intersections and existing driveways, on a larger scale.

Plan View: Drainage Conveyance

1. Sequentially **number all catch basins and curb inlets** starting with the structure farthest downstream.

2. Represent **existing storm drainage facilities and BMPs** in dashed lines and label with "Existing."

3. Clearly label existing storm drainage **facilities to be removed** with "Existing to be removed."

4. Show the length, diameter, and material for all **pipes**, **culverts**, and **stub-outs**. Include the slope if not provided on the profile view. Material may be noted in the plan notes. Where open conveyance is provided, and a **low-permeability liner** or **treatment liner** is required per Section 6.2.4, indicate the limits of such liner(s).

5. Clearly label **catch basins** as to size and type (or indicate in the plan notes).

6. Clearly label **stub-out locations** for footing drains and other lot-specific connections to the storm drainage system. Locate all stub-outs to allow gravity flow from the lowest corner of the lot to the connecting catch basin.

7. Show datum, benchmark locations, and elevations on each plan sheet.

8. Clearly label all stub-out locations for any **future pipe connections**.

9. Clearly show on the plans all drainage **easements, tracts**, access easements, Native Growth Retention Areas, Critical Area Tracts, Critical Area Setback Areas, and building setback lines. Show dimensions, type of restriction, and use.

10. Using arrows, indicate the **drainage direction** of hydraulic conveyance systems.

Plan View: Other

1. Show the location, identification, and dimensions of all **buildings, property lines, streets, alleys**, and **easements.**

2. Show the locations of **structures on abutting properties** within 50 feet of the proposed ***project site***.

3. Show the location of all proposed **drainage facility fencing**, together with a typical section view of each fencing type.

4. Provide section details of all **retaining walls and rockeries**, including sections through critical portions of the rockeries or retaining walls.

5. Show all existing and proposed buildings with projections and overhangs.

6. Show the location of all **wells** on ***site*** and within 100 feet of the ***site***. Note wells to be abandoned.

7. Show the location and dimensions of proposed **flow control BMP** devices, features, pathways, limits, and set-asides.

8. Show the location and dimensions of structural **source control BMPs** required by the *SWPPS Standards* in Appendix D and the *Stormwater Pollution Prevention Manual*.

Profiles: Roadway and Drainage

1. Provide **existing centerline ground profile** at 50-foot stations and at significant ground breaks and topographic features, with average accuracy to within 0.1 feet on unpaved surface and 0.02 feet on paved surface.

2. For publicly maintained roadways, provide **final road and storm drain profile** with the same stationing as the horizontal plan, to show stationing of points of curve, tangent, and intersection of vertical curves, with elevation of 0.01 feet. Include tie-in with intersecting pipe runs.

3. On a grid of numbered lines, provide a continuous plot of **vertical positioning against horizontal**.

4. Show finished **road grade and vertical curve data** (road data measured at centerline or edge of pavement). Include stopping sight distance.

5. Show all **roadway drainage**, including drainage facilities and BMPs that are within the right-of-way or easement.

6. On the profile, show slope, length, size, and type (in plan notes or on a detail sheet) for all **pipes and detention tanks** in public right-of-way.

7. Indicate the **inverts** of all pipes and culverts and the elevations of catch basin grates or lids. It is also desirable, but not required, to show invert elevations and grate elevations on plan sheets.

8. For pipes that are proposed to be within 2.0 feet of finished grade, indicate the **minimum cover dimensions**.

9. Indicate **roadway stationing** and offset for all catch basins.

10. Indicate vertical and horizontal scale.

11. Clearly label all profiles with respective street names and plan sheet reference numbers, and indicate all profile sheet reference numbers on plan sheets, if drawn on separate sheets.

12. Locate match points with existing pavements, and show elevations.

13. Show all property boundaries.

14. Label all match line locations.

15. Provide profiles for all **12-inch and larger pipes** and for **channels** (that are not roadside ditches).

16. Show the location of all existing and proposed (if available or critical for clearance) **gas**, **water**, and **sanitary sewer crossings**.

17. Show energy dissipater locations.

18. Identify **datum** used and all **benchmarks** (may be shown on plan view instead). Datum and benchmarks must refer to established control when available.

19. Use a **vertical scale** of 1"=5'. As an exception, vertical scale shall be 1"=10' if the optional 1"=100' horizontal scale is used on projects with lots one acre or larger. Clarifying details, including those for intersections and existing driveways, should use a larger scale.

20. **Split sheets**, with the profile aligned underneath the plan view, are preferred but not required.

❑ DETAILS

The design engineer shall provide details for all construction, including but not limited to the following.

Flow Control, Water Quality, and Infiltration Facility and BMP Details

1. Provide a scaled drawing and supporting details of each detention pond or vault, flow control BMP, and water quality facility, including the tract boundaries.

2. Show predeveloped and finished grade **contours** at 2-foot intervals. Show and label **maximum design water elevation**.

3. Dimension all **berm widths**.

4. Show and label at least two **cross sections** through a pond or water quality facility, or any BMP large enough to require design elements of ponds and/or water quality facilities. One cross section must include the restrictor when included in the design.

5. Specify **soils and compaction requirements** for pond construction and flow control BMP construction. Specify **low-permeability liners** or **treatment liners** as required for ponds and ditches per Section 6.2.4.

6. Show the location and detail of **emergency overflows**, **spillways**, and **bypasses**.

7. Specify rock protection/energy dissipation requirements and details.

8. Provide **inverts** of all pipes, grates, inlets, tanks, and vaults, and **spot elevations** of the pond bottom.

9. Show the location of **access roads** to control manholes and pond/forebay bottoms.

10. Provide plan and section views of all **energy dissipaters**, including **rock splash pads**. Specify the size of rock and thickness.

11. Show **bollard locations** on plans. Typically, bollards are located at the entrance to drainage facility access roads.

12. On the pond or water quality facility detail, show the size, type (or in plan notes), slope, and length of all **pipes**.

13. Show to scale the section and plan view of **restrictor and control structures**. The plan view must show the location and orientation of all inlet pipes, outlet pipes, and flow restrictors.

14. Draw details at one of the following **scales**: 1"=1', 1"=2', 1"=4', 1"=5', 1"=10', or 1"=20'.

Structural Plan Details

Any submittal that proposes a structure (e.g., bridge crossing, reinforced concrete footings, walls, or vaults) shall include plan sheets that include complete working drawings showing dimensions, steel placement, and specifications for construction. Structures may require a design prepared and **stamped by a professional structural engineer licensed in the State of Washington**, and an application for a separate commercial building permit.

2.3.1.3 EROSION AND SEDIMENT CONTROL (ESC) PLAN

This section details the specifications and contents for ESC plans. Note that an ESC plan includes the plan's drawings plus an ESC report, which provides all supporting information and any additional direction necessary for implementing ESC measures and meeting ESC implementation requirements. The ESC plan's drawings may be simplified by the use of the symbols and codes provided for each ESC measure in the *Erosion and Sediment Control Standards* in detached Appendix D. In general, the ESC plan's drawings shall be submitted as a separate plan sheet(s). However, there may be some relatively simple projects where providing separate grading and ESC plan drawings is unnecessary.

❑ GENERAL SPECIFICATIONS

The **site improvement plan** shall be used as the base of the ESC plan. Certain detailed information that is not relevant (e.g., pipe/catch basin size, stub-out locations, etc.) may be omitted to make the ESC plan easier to read. At a minimum, the ESC plan shall include all of the information required for the base map (see Table 2.3.1.A), as well as existing and proposed roads, driveways, parking areas, buildings, drainage facilities and BMPs, utility corridors not associated with roadways, *relevant critical areas*[44] and critical area buffers, and proposed final topography. A smaller scale may be used to provide better comprehension and understanding.

The ESC plan shall generally be designed for proposed topography, not existing topography, since rough grading is usually the first step in ***site*** disturbance. The ESC plan shall **address all phases of construction** (e.g., clearing, grading, installation of utilities, surfacing, and final stabilization). If construction is being phased, separate ESC plans may need to be prepared to address the specific needs for each phase of construction.

The ESC plan outlines the minimum requirements for anticipated ***site*** conditions. During construction, **ESC plans shall be revised as necessary** by the CSWPP supervisor or as directed by the City to address changing ***site*** conditions, unexpected storm events, or non-compliance with the ESC performance criteria in Core Requirement #5.

The **ESC plan** shall be consistent with the information provided in Section 8 of the TIR and **shall address the following:**

1. Identify areas with a high susceptibility to erosion.
2. Provide all details necessary to clearly illustrate the intent of the ESC design.
3. Include ESC measures for all on- and offsite utility construction included in the project.
4. Specify the construction sequence. The construction sequence shall be specifically written for the proposed project. An example construction sequence is provided in Appendix D.
5. Include ESC standard plan notes (see Reference Section 7-B).

[44] Relevant critical areas, for the purposes of drainage review, include aquatic areas, wetlands, flood hazard areas, erosion hazard areas, landslide hazard areas, steep slope hazard areas, and critical aquifer recharge areas.

6. Include an inspection and maintenance program for ESC measures, including designation of a CSWPP supervisor who is a certified ESC professional and identification of phone numbers for 24-hour contact.

7. Include the basis and calculations for selection and sizing of ESC measures.

❑ MEASURE-SPECIFIC INFORMATION

ESC plan drawings must include the following information specific to applicable ESC measures and implementation requirements. As noted above, this information may need to be updated or revised during the life of the project by the CSWPP supervisor or as directed by the City.

Clearing Limits

1. **Delineate** clearing limits.

2. Provide **details** sufficient to install and maintain the clearing limits.

Cover Measures

1. Specify the type and location of **temporary cover measures** to be used onsite.

2. If **more than one type** of cover measure is to be used onsite, indicate the areas where the different measures will be used, including steep cut and fill slopes.

3. If the type of cover measures to be used will vary depending on the time of year, soil type, gradient, or some other factor, specify the **conditions that control the use of the different measures**.

4. Specify the nature and location of **permanent cover measures**. If a landscaping plan is prepared, this may not be necessary.

5. Specify the approximate amount of cover measures necessary to cover all disturbed areas.

6. If **netting, blankets, or plastic sheeting** are specified, provide typical detail sufficient for installation and maintenance.

7. Specify the **mulch types**, **seed mixes**, **fertilizers**, and **soil amendments** to be used, as well as the application rate for each item.

8. For **surface roughening**, describe methods, equipment and areas where surface roughening will be use.

9. If **PAM** is used, show location(s) and describe application method.

10. When **compost blankets** are used, show location, application rates, and the name of the supplier to document that compost meets quality specifications per Reference 11-C.

Perimeter Protection

1. Specify the **location and type** of perimeter protection to be used.

2. Provide **typical details** sufficient to install and maintain the perimeter protection.

3. If **silt fence** is to be used, specify the type of fabric to be used.

4. If **compost berms or socks** are used, documentation must be provided to assure the supplier meets the criteria and compost meets quality standards per Reference 11-C.

Traffic Area Stabilization

1. Locate the construction entrance(s).
2. Provide **typical details** sufficient to install and maintain the construction entrance.
3. Locate the construction roads and parking areas.
4. Specify the measure(s) that will be used to create **stabilized construction roads and parking areas**. Provide sufficient detail to install and maintain.
5. If a **wheel wash** or **tire bath system** will be installed, provide location, typical details for installation and maintenance.
6. Provide a list of **dust control** products that will be used onsite and the location of potential application areas.

Sediment Retention

1. Show the **locations** of all sediment ponds and traps.
2. Dimension pond **berm widths** and all inside and outside pond slopes.
3. Indicate the **trap/pond storage** required and the depth, length, and width dimensions.
4. Provide typical **section views** through pond and outlet structures.
5. If **chemical or electrocoagulation treatment** of sediment-laden waters will be used, approval documentation from Ecology must be included (see SWPPS plan requirements for chemical storage).
6. Provide details for **disposal of contaminated or chemically treated waters** (e.g., where Chitosan or CO2 have been used) (see SWPPS plan requirements for chemical storage).
7. Include appropriate **approval documentation from local sewer districts** if contaminated or chemically treated water will be discharged to the sanitary sewer.
8. Provide typical details of the control structure and dewatering mechanism.
9. Detail **stabilization techniques** for outlet/inlet protection.
10. Provide details sufficient to install **cell dividers**.
11. Specify mulch or recommended **cover of berms and slopes**.
12. Indicate the **required depth gage** with a prominent mark at 1-foot depth for sediment removal.
13. Indicate **catch basins** that are to be protected.
14. Indicate existing and proposed flow control BMP areas that are to be protected.
15. Provide details of the catch basin and flow control BMP protection sufficient to install and maintain.

Surface Water Control

1. **Locate** all pipes, ditches, interceptor ditches, dikes, and swales that will be used to convey stormwater.

2. Provide **details** sufficient to install and maintain all **conveyances**.

3. Indicate locations of **outlet protection** and provide detail of protections.

4. Indicate locations and outlets of any possible **dewatering systems**. Provide details of alternative discharge methods from dewatering systems if adequate infiltration rates cannot be achieved. Do not route dewatering water, clean or untreated, through stormwater sediment ponds.

5. Indicate the location of any **level spreaders** and provide details sufficient to install and maintain.

6. Show all temporary pipe inverts.

7. Provide location and specifications for the **interception of runoff from disturbed areas** and the conveyance of the runoff to a non-erosive discharge point.

8. Provide locations of rock check dams.

9. Provide **details**, including front and side sections, of typical **rock check dams**.

Protection of Existing and Proposed Flow Control BMP Areas

1. Provide perimeter protection at existing and proposed flow control BMP locations

2. Provide cautionary plan notes emphasizing avoidance of negative impacts to receptor soils and existing vegetation to remain.

BMP Maintenance

1. Provide adequate plan notes for guidance of BMP maintenance methods and schedules.

2. Include an inspection and maintenance program for ESC measures.

Management of the Project

1. Provide plan notes to clarify and emphasize the management responsibilities for the project.

2. Include an inspection and maintenance program for ESC measures, including designation of a CSWPP supervisor who is a certified ESC professional and identification of phone numbers for 24-hour contact.

Wet Season Requirements

1. Provide a **list** of all applicable wet season requirements.

2. Clearly identify that from October 1st through April 30th, no soils shall be exposed for more than two consecutive working days. Also note that this **two-day requirement** may be applied at other times of the year if storm events warrant more conservative measures.

3. Clearly identify that **exposed soils shall be stabilized** at the end of the workday prior to a weekend, holiday, or predicted rain event.

Critical Areas Restrictions

1. **Delineate and label** the following critical areas, and any applicable buffers, that are on or adjacent to the ***project site***: aquatic areas, wetlands, ***flood hazard areas***, ***erosion hazard areas***, ***landslide hazard areas***, ***steep slope hazard areas***, and ***critical aquifer recharge areas***.

2. If construction creates disturbed areas within any of the above listed critical areas or associated buffers, specify the type, locations, and details of any measures or other provisions necessary to **comply with the critical area restrictions** in Appendix D and protect surface waters and steep slopes.

2.3.1.4 STORMWATER POLLUTION PREVENTION AND SPILL (SWPPS) PLAN

This section details the specifications and contents for SWPPS plans, which together with ESC plans, comprise the construction stormwater pollution prevention (CSWPP) plan that must be submitted as part of the engineering plans required for drainage review. Additional guidance for developing the SWPPS plan can be found in the *SWPPS Standards* in Appendix D, *Construction Stormwater Pollution Prevention Standards*, in the *Stormwater Pollution Prevention Manual* and in the *Stormwater Management Manual for Western Washington (SWMMWW)* published by the Washington State Department of Ecology (Ecology).

The SWPPS plan must be kept on ***site*** during all phases of construction and shall **address the construction-related pollution-generating activities outlined in Subsection A below**. The plan must include a description of the methods the general contractor will use to ensure sub-contractors are aware of the SWPPS plan. A **form or record** must be provided that states all sub-contractors have read and agree to the SWPPS plan.

A SWPPS plan consists of the following three elements, which are further described in Subsections B, C, and D below:

1. A **site plan** showing the location and description of BMPs required to prevent pollution and control spills from construction activities and from chemicals and other materials used and stored on the construction site. See Subsection B below for more specifics on the SWPPS site plan.

2. A **pollution prevention report** listing the potential sources of pollution and identifying the operational, source control, and treatment BMPs necessary to prevent/mitigate pollution from these sources. See Subsection C below for more specifics on the SWPPS pollution prevention report.

3. A **spill prevention and cleanup report** describing the procedures and BMPs for spill prevention and including provisions for cleanup of spills should they occur. See Subsection D below for more specifics on the SWPPS spill prevention and cleanup report.

A. ACTIVITY-SPECIFIC INFORMATION REQUIRED

At a minimum, the SWPPS plan shall address, if applicable, the following pollution-generating activities typically associated with construction and include the information specified below for each activity. If other pollution-generating activities associated with construction of the proposed project are identified, the SWPPS plan must address those activities in a similar manner.

Storage and Handling of Liquids

1. Identify liquids that will be handled or stored onsite, including but not limited to petroleum products, fuel, solvents, detergents, paint, pesticides, concrete admixtures, and form oils.

2. Specify **types and sizes of containers** of liquids that will be stored/handled onsite. Show locations on the SWPPS site plan.

3. Describe **secondary containment methods** adequately sized to provide containment for all liquids stored onsite. Show the locations of containment areas on the SWPPS site plan.

Storage and Stockpiling of Construction Materials and Wastes

1. **Identify** construction materials and wastes that may be generated or stockpiled onsite. Show the

locations where these materials and wastes will be generated and stockpiled on the SWPPS site plan.

2. Specify type of **cover measures** to be used to keep rainwater from contacting construction materials and wastes that can contribute pollutants to storm, surface, and ground water.

3. If wastes are kept in **containers**, describe how rainwater will be kept out of the containers.

Fueling

1. Specify **method of onsite fueling** for construction equipment (i.e. stationary tanks, truck mounted tanks, wet hosing, etc.). If stationary tanks will be used, show their location on the SWPPS site plan.

2. Describe type and size of tanks.

3. Describe **containment methods for fuel spills** and make reference to the SWPPS site plan for location information.

4. If fueling occurs **during evening hours**, describe lighting and signage plan. Make reference to the SWPPS site plan for location information.

Maintenance, Repairs, and Storage of Vehicles and Equipment

1. Identify **maintenance and repair areas** and show their locations on the SWPPS site plan. Use of drip pans or plastic beneath vehicles is required. A note to this effect must be shown on the SWPPS site plan.

2. Describe method for collection, storage, and disposal of **vehicle fluids**.

3. If an area is designated for vehicle maintenance, **signs must be posted** that state no vehicle washing may occur in the area. A note to this effect must be shown on the SWPPS site plan.

Concrete Saw Cutting, Slurry, and Washwater Disposal

1. Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Identify **truck washout areas** to assure such areas are not within a ***critical aquifer recharge area***. If they are, the washout area must be lined with an impervious membrane. Show location information on the SWPPS site plan. Locate washout area at least 50 feet from sensitive areas such as storm drains, open ditches, or water bodies, including wetlands.

2. Specify **size of sumps** needed to collect and contain slurry and washwater. Show location information on the SWPPS site plan.

3. Identify **areas for rinsing hand tools** including but not limited to screeds, shovels, rakes, floats and trowels. Show the locations of these areas on the SWPPS site plan.

4. Describe **methods for collecting, treating, and disposal** of waste water from exposed aggregate processes, concrete grinding and saw cutting, and new concrete washing and curing water.

Handling of pH Elevated Water

New concrete vaults/structures may cause collected water to have an elevated pH. This water cannot be discharged to storm or surface water until neutralized.

1. Provide details on **treating/neutralizing water** when pH is not within neutral parameters. Written approval from Ecology is required before using chemical treatment other than CO2 or dry ice to adjust pH.

2. Provide details on **disposal of water** with elevated pH or of the treated water.

Application of Chemicals including Pesticides and Fertilizers

1. Provide a **list of chemicals** that may be used on the ***project site*** and the application rates.

2. Describe **where and how chemicals will be applied**. Show location information on the SWPPS site plan.

3. Describe **where and how chemicals will be stored**. Show location information on the SWPPS site plan.

B. SWPPS SITE PLAN

The ***site*** plan element of the SWPPS plan shall include all of the information required for the base map (see Table 2.3.1.A), as well as existing and proposed roads, driveways, parking areas, buildings, drainage facilities, utility corridors not associated with roadways, *relevant critical areas*[45] and associated buffers, and proposed final topography. A smaller scale may be used to provide more comprehensive details on specific locations of each activity and specific prevention measure. In addition to this information, the following items, at a minimum, shall be provided as applicable:

1. Identify locations where **liquids will be stored** and delineate secondary containment areas that will be provided.

2. Identify locations where **construction materials and wastes** will be generated and stockpiled.

3. Identify location of **fueling for vehicles and equipment** if stationary tanks will be used.

4. Delineate **containment areas** for fuel spills.

5. Show location of **lighting and signage** for fueling during evening hours.

6. Delineate **maintenance and repair areas** and clearly note that drip pans or plastic shall be used beneath vehicles. Also, clearly note that signs must be posted that state no **vehicle washing** may occur in the area.

7. Delineate truck washout areas and identify the location of slurry/washwater sumps and rinsing areas for tools.

8. Delineate where **chemicals** will be applied and identify where they will be stored.

9. Identify where **spill response materials** will be stored.

C. POLLUTION PREVENTION REPORT

This report provides the specifics on pollution prevention and must include the following information in addition to the activity-specific information specified in Subsection A above:

1. List the possible **sources of pollution** per Subsection A above and identify the BMPs to be used for each source to prevent pollution. Include any **supporting information** (site conditions, calculations, etc.) for the selection and sizing of pollution prevention BMPs.

2. Identify the **personnel** responsible for pollution prevention and clearly list the responsibilities of each person identified. **Contact information** for these personnel must be clearly identified in the report and on the SWPPS site plan.

[45] Relevant critical areas, for the purposes of drainage review, include aquatic areas, wetlands, flood hazard areas, erosion hazard areas, landslide hazard areas, steep slope hazard areas, and critical aquifer recharge areas.

3. Describe the **procedures** to be used for monitoring pollution prevention BMPs and for responding to a BMP that needs attention, including keeping records/reports of all inspections of pollution prevent BMPs (see Reference Section 8-E for examples of worksheets that may be used).

D. SPILL PREVENTION AND CLEANUP REPORT

This report provides the specifics on spill prevention and cleanup and must include the following information in addition to any activity-specific information in Subsection A above related to spill prevention:

1. List the possible **sources of a spill** and identify the BMPs to be used for each source to prevent a spill.

2. Identify **personnel** responsible for spill prevention and cleanup and clearly list the responsibilities of each person identified. **Contact information** for these personnel must be clearly identified in the report and on the SWPPS site plan. (On typical projects, the primary contact for SWPPS issues will be

   the CSWPP supervisor, who may be managing other spill responders to assure compliance; complex projects may warrant specialist personnel for specific site applications.)

3. Describe the **procedures** to be used for monitoring spill prevention BMPs and for responding to a spill incident, including keeping records/reports of all inspections and spills (see Reference Section 8-E for examples of worksheets that may be used).

4. Identify where **spill response materials** will be stored. Make reference to the SWPPS site plan for location information.

5. Identify **disposal methods** for contaminated water and soil after a spill.

2.3.1.5 LANDSCAPE MANAGEMENT PLANS (IF APPLICABLE)

Approved landscape management plans are allowed to be used as an alternative to the requirement to formally treat (with a facility) the runoff from pollution generating pervious surfaces subject to Core Requirement #8 (see Section 1.2.8). A *landscape management plan* is a City-approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and reduce the discharge of suspended solids and other pollutants.

If a landscape management plan is proposed, it must be submitted with the engineering plans for the proposed project. The elements required for evaluation of landscape management plans, and general guidance for preparing landscape management plans, are provided in Reference Section 4-C.

If a landscape management plan is proposed, it must be submitted with the engineering plans for the proposed project. The elements listed below are required for evaluation of landscape management plans.

1. Provide a ***site* vicinity map** with topography.
2. Provide a **site plan** with topography. Indicate areas with saturated soils or high water tables.
3. Provide a **plant list** (provide both common and scientific names) that includes the following information:
   a) Indicate any drought-tolerant plants, disease resistant varieties, species for attracting beneficial insects (if any) and native plants.
   b) For shrubs and groundcovers, indicate the proposed spacing.
   c) For turf areas, indicate the grass mix or mixes planned. Indicate sun/shade tolerance, disease susceptibility, drought tolerance and tolerance of wet soil conditions.
4. Provide a **landscape plan**. Indicate placement of landscape features, lawn areas, trees, and planting groups (forbs, herbs, groundcovers, etc.) on the ***site***.

5. Include information on **soil preparation** and fertility requirements.
6. Provide information on the design of the **irrigation method** (installed sprinkler system, drip irrigation system, manual, etc.)
7. Provide a **landscape maintenance plan**, including the following:
   a) Physical care methods, such as thatch removal or aeration, and mowing height and frequency
   b) Type of fertilizer (including N-P-K strength) and fertilization schedule or criteria
   c) Type of chemicals to be used for common pests such as crane fly larvae, and the criteria or schedule for application
   d) Any biocontrol methods.
8. Provide information about the storage of pesticides or other chemicals, and disposal measures that will be used.
   a) If applicable, indicate how the chemicals will be stored on the ***site*** between applications to prevent contact with stormwater or spills into the storm drainage system.
   b) Indicate how excess quantities of fertilizers or chemicals will be handled for individual applications.
9. Provide an **implementation plan** (see Reference Section 4-C for guidance on preparing the implementation plan).

2.3.2 PROJECTS IN TARGETED DRAINAGE REVIEW (TDR)

This section outlines the specifications and contents of limited scope engineering plans allowed for projects in Targeted Drainage Review. Table 2.3.2.A specifies the minimum required elements of the targeted technical information report based on the type of permit or project, and on the three categories of project characteristics subject to Targeted Drainage Review per Section 1.1.2.2.

TABLE 2.3.2.A MINIMUM ENGINEERING PLAN ELEMENTS(1) FOR PROJECTS IN TARGETED DRAINAGE REVIEW

Type of Permit or Project	**Drainage Review Type**	**Project Category 1**(2) Projects in TDR that contain or are adjacent to a ***flood***, ***erosion***, or ***steep slope hazard area***; or are within a ***CDA*** or LHDA; or propose 7,000 sf of ***land disturbing activity*** (3 acres if in Simplified DR).	**Project Category 2**(2) Projects in TDR that propose to ***construct or modify*** a 12" or larger pipe/ditch, or receive runoff from a 12" or larger pipe/ditch	**Project Category 3**(2) ***Redevelopment projects*** in TDR that propose $100,000 or more of improvements to an existing ***high-use site***
SINGLE FAMILY RESIDENTIAL (SFR) BUILDING PERMITS SHORT PLATS PERMITS FOR AGRICULTURAL PROJECTS	Targeted Drainage Review ONLY	• TIR Sections 1, 2, and 6 (minimum) • Simplified ESC Plan(3) and SWPPS Plan • Site Improvement Plan(5),	• TIR Sections 1, 2, 3, 5, 6, 7, and 8 (minimum) • Simplified ESC Plan(3) and SWPPS Plan • ESC Plan(4) for conveyance work • Site Improvement Plan(5)	N/A
	Targeted Drainage Review COMBINED WITH Simplified Drainage Review	• TIR Sections 1, 2, and 6 (minimum) • Simplified ESC Plan(3) and SWPPS Plan • Site Improvement Plan(5)	• TIR Sections 1, 2, 3, 5, 6, 7, and 8 (minimum) • Simplified ESC Plan(3) and SWPPS Plan • ESC Plan(4) for conveyance work • Site Improvement Plan(5)	N/A
OTHER PROJECTS OR PERMITS	Targeted Drainage Review ONLY	• TIR Sections 1, 2, 6, and 8 (minimum) • ESC Plan(4) and SWPPS Plan for any site disturbance work • Site Improvement Plan(5)	• TIR Sections 1, 2, 3, 5, 6, 7, and 8 (minimum) • ESC Plan(4) and SWPPS Plan for any site disturbance work • Site Improvement Plan(5)	• TIR Sections 1, 2, 4, 8, and 10 (minimum) • ESC Plan(4) and SWPPS Plan for any site disturbance work • Site Improvement Plan(5)

Notes:

(1) The above plan elements are considered the recommended minimum for most development cases in Targeted Drainage Review. The City may add to these elements if deemed necessary for proper drainage review. *Predesign meetings with* the City *are recommended to identify all required elements*.

(2) For more detailed descriptions of project categories, see Section 1.1.2.2. *If the proposed project has the characteristics of more than one category, the plan elements under each applicable category shall apply.*

(3) Simplified ESC plans are an element of the Simplified drainage plan as explained in the *Simplified Drainage Requirements* booklet (detached Appendix C).

(4) ESC plans shall meet the applicable specifications detailed in Section 2.3.1.3

(5) Site improvement plans shall meet the applicable specifications detailed in Section 2.3.1.2. The City may allow modified site improvement plans as described in Section 2.3.1.2.

2.4 PLANS REQUIRED AFTER DRAINAGE REVIEW

This section includes the specifications and contents required of those plans submitted at the end of the permit review process or after a permit has been issued.

2.4.1 PLAN CHANGES AFTER PERMIT ISSUANCE

If changes or revisions to the originally approved engineering plans require additional review, the revised plans shall be submitted to the City for approval prior to construction. The plan change submittals shall include all of the following:

1. The appropriate Plan Change Order form(s)
2. ~~One copy~~ Three copies of the revised TIR or addendum
3. Three sets of the engineering plans
4. Other information needed for review.

2.4.2 FINAL CORRECTED PLAN SUBMITTAL

During the course of construction, changes to the approved engineering plans are often required to address unforeseen field conditions or design improvements. Once construction is completed, it is the applicant's responsibility to submit to the City a **final corrected plan**. These corrected drawings must be professionally drafted revisions applied to the original approved plan, excluding the CSWPP plan, and must include all changes made during the course of construction. This plan need not be a precisely surveyed as-built drawing but should show what was finally constructed in terms of drainage system elements. The final corrected plan must be stamped, signed, and dated by a ***civil engineer***. A CAD drawing file (.dwg) of the final corrected plan must be submitted along with paper copies. The CAD file must contain all the pages of the plan set for road and drainage infrastructure, but need not contain other sheets.

A **final corrected TIR**, updated to include all changes made to the originally approved TIR during the course of construction, must be submitted with the final corrected plan. In addition to any design changes and supporting calculations and documentation, the final corrected TIR shall include a final updated Stormwater Facility Summary Sheet (see Reference 8-D) and signed/recorded copies of all required easements and declarations of covenant.

A copy of any required Landscape Management Plan (see Section 2.3.1.5) shall accompany the plans and TIR. The electronic copy of the final corrected TIR may be in .pdf or other approved format, and three (3) hardcopies of the final TIR shall also be submitted for distribution by the City to appropriate departments.

Disposition of Approved Engineering Plans for Subdivisions

Upon engineering plan approval of any subdivision ~~(including PUDs, binding site plans, and short plats)~~, the City will make a set of reproducible mylars (cost to be paid by the applicant) and return the original set to the applicant's engineer. The City will retain this reproducible set, utilizing it to make copies for public inspection, distribution, and base reference as required. At the time the development is accepted for maintenance by the City, the City's set of reproducibles shall be replaced by the corrected original set for permanent public records with the City.

2.4.3 FINAL PLAT~~, SHORT PLAT, AND BINDING SITE PLAN~~ SUBMITTALS

Any subdivision to be finalized, thereby completing the subdivision process and legally forming new lots, requires a **final submittal for approval and recording**. Binding site plans and short plats also require a final submittal for approval and recording. The final plat or map page shall contain the elements summarized and specified in detail in the City customer information bulletins. Submittals shall be accompanied by appropriate fees as prescribed by the City Code. Final submittals will be allowed only after the approval of preliminary plans (for subdivisions only) and any required engineering plans, and after the construction of any required drainage facilities.

All final map sheets and pages shall be prepared by a **land surveyor** licensed in the State of Washington and shall conform to all state and local statutes.

The final submittal for recording only applies to **subdivisions** (plats)~~, **binding site plans**, and **short plats**~~. This plan is required by state and local statutes.

In addition to the requirements described in the City's customer information bulletins, submittals for final recording of subdivisions, short plats, and binding site plans **must include the following information:**

1. Indicate **dimensions** of all easements, tracts, building setbacks, tops of slopes, wetland boundaries, and floodplains.

2. Include **pertinent restrictions** as they apply to easements, tracts, and building setback lines.

3. Include the **dedication and indemnification clause** as provided in Reference Section 8-G.

4. State the **maximum amount of added impervious surface** and **proposed clearing per lot** as determined through engineering review. The maximum amount of impervious surface may be expressed in terms of percentage of lot coverage or square feet.

Include a recorded **declaration of covenant and grant of easement** for each lot on which flow control BMPs are installed or stipulated per Core Requirement 9, Section 1.2.9.4.1, and each lot for which flow control BMPs are installed in a separate dedicated tract per Section 1.2.9.4.1